In Pursuit of the Determinants of Users' Views on and Usage Practices Associated with the use of Virtual Systems in an Emerging Economy

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Abstract

While there has been extensive research on the adoption of an innovation in general, research on adoption of a specific innovation such as virtual systems in an emerging economy is relatively scarce. This research addresses this lacuna in the extant literature by empirically investigating the potential drivers impacting on the practice of virtual systems at the individual level in an emerging economy, Bangladesh. The data for the study comprises responses obtained through a cross-sectional survey of individuals using a structured instrument. Data were analyzed using correlation and multiple regression analysis. Findings suggest that a personal initiative is one of the strongest predictors of virtual device adoption, followed by self-fulfillment with innovation and peer pressure. Surprisingly benefits and social pressure did not show any significant relationship with usage. The implications of these findings are highlighted in the paper along with the limits and future potential of research in this area.

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1. Introduction

The current information era, characterized by the unprecedented growth of information technology has driven virtual systems to emerge as a powerful vehicle of communication globally. Consequently, the usage and practice of virtual systems have been rapidly growing at the individual and organizational levels. The growing importance of virtual systems has resulted in the generation of research interests amongst practitioners and academics in various aspects of virtual systems including its usage, benefits and relevance of the system to individuals, businesses and the community. In this paper smart phones are selected as the focus of research because this device is increasingly emerging as a personal and business tool in terms of data management, email communication and internet access (Daponte, Vito, Picariello, & Riccio, 2013; Chappel & Paliwal, 2014; Zhang, Mao, Rau, Choe, Bela, & Wang, 2013; Ding, Chien, Hung, Lin, Kuo, Hsu, & Chung, 2013). The virtual device is a convergence of regular mobile phone, and personal digital assistants (PDA), and is positioned as a notebook computer (Chang, Chen & Zhou, 2009). Smartphone/virtual devices currently represent 16.7 percent penetration worldwide and, given the growing popularity of this device, the penetration trends are expected to increase rapidly in coming years. This is evidenced by the fact that the predicted number of smartphones was set at 1.038 billion units in 2012 compared to 708 million in the previous year; a 46.6 percent growth rate in a single year (Smartphone, 2013). Technology usage including mobile virtual devices is also increasing rapidly in the developing world, including Bangladesh. According to Internet World Statistics (2013) internet users in Bangladesh increased from 100,000 in 2000 to 8,054,190 in 2012.

Although virtual devices are gradually gaining acceptance from all walks of life, the device was initially popular among young people for social inclusion and connecting them to their peers to reinforce their ongoing relationships, and to ensure security and safety as well as maintain status among their peers (Balakrishnan & Raj, 2012; Srivastava, 2005; Carroll, Howard, Peck & Murphy, 2002). Today virtual devices have emerged as a business tool and a vehicle of communication for organizations including SMEs to serve their customers and suppliers with quick and efficient services and thereby contribute to business performance in terms of increased profits and market shares, globally. More specifically virtual devices are now used for enhanced communication via email and short messaging, web information services such as weather forecasts, stock quotes, data base services for telephone directory, maps and guides, entertainment and commercial services such as banking, stock trade, online auction etc. (Lu, Yao & Yu, 2005, Massey, Talukder, 2003; Khatri & Ramesh, 2004).

Motivation for the Study

While numerous studies on mobile devices have been published, comprehensive research on the factors affecting the user's view of virtual devices and their impact on the practices associated with the use of virtual devices is limited. More specifically, there is a vacuum in the extant literature in the empirical quantification of the relationships between the drivers, perceptions and actual usage practice of virtual systems. This paper seeks to fill this gap in the literature by developing and empirically testing a theoretical model capturing the above variables in the context of individual users in the SMEs sector in an emerging economy.

Objectives and organization

The objective of this paper is to:
1) Identify the factors impacting on users' perceptions of, adoption of, and usage of, virtual devices in the context of SMEs in an emerging economy, Bangladesh.

Table 1 shows Bangladesh's profile in terms of technology usage vis-à-vis other developing nations in Asia such as Sri Lanka, Thailand and Malaysia.

Table 1: Technology usage in Bangladesh compared with other developing nations

Country	Population in 2013	GPD per capita In US$ (2012)	Tel main line In million	Mobile cellular (Million) 2011	Internet Users in 2009	Internet use by % of population 2012
Bangladesh	163,654,860	12,700	977,700	84.369	617,300	0.7
Pakistan	193,238,868	2,900	5.722	111	20.431	2.7
South Korea	48,955,203	32,800	29.468	52.507	39.4	3.7
Malaysia	29,628,392	17,200	4.243	36.661	15.355	1.6
India	1,220,800,359	3,900	32.685	893.862	61.338	11.4
Sri Lanka	21,675,648	6,200	3.608	18.319	1.777	0.3
Thailand	67,448,120	10,300	6.661	77.605	17.483	1.9
China	1,349,585,838	9,300	285.115	986.253	389	50

Source:www.cia.gov/library/publications/factbook and www.internetworldstats.com

The study uses an integrated model of technology adoption known as the unified theory of acceptance and use of technology (UTAUT) to evaluate user's views and acceptance of virtual devices.

The paper is organized as follows: The next section discusses the theoretical background, and then a research model is developed based on this theoretical framework. Next, hypotheses are developed, and then the literature review is followed by research methodology where the sample used, data collection techniques and data analysis methods ae discussed. Finally, the paper presents the results and discussion followed by the conclusion and implications.

2. Theory, Research Model and Hypothesis Development

This study used the unified theory of acceptance and use of technology (UTAUT) to lay the foundation of the proposed theoretical framework. The UTAUT was developed by Venkatesh, Morris, Davis and Davis (2003), and it integrates eight previously developed models and theories concerning the acceptance and use of technology. Based on an in-depth review of eight prominent theories of technology adoption, Venkatesh, Morris, Davis and Davis (2003) constructed the UTAUT model which became more popular to predict innovation usage behavior of individual employees. Venkatesh, Morris, Davis and Davis (2003) integrated the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), technology acceptance model (TAM) (Davis, 1989), motivational model (MM) (Davis, Bagozzi & Warshaw, 1992), theory of planned behavior (TPB) (Ajzen, 1991), combined TAM-TPB (C-TAM-TPB) (Taylor & Todd, 1995a), model of PC utilization (MPCU) (Thompson, Higgins & Howell, 1991), innovation diffusion theory (IDT) (Rogers, 1995), and social cognitive theory (SCT) (Compeau & Higgins, 1995). The UTAUT postulates that the behavioral intention to use technology is determined by performance expectancy, effort expectancy, and social influence. Facilitating conditions directly impact on usage behavior.

According to UTAUT, performance expectancy is the degree to which an individual believes that using a system will help the person to attain his or her goals in job performance, while effort expectancy is the degree of ease associated with the use of the system. "Social Influence" is the degree to which an individual perceives that important others believe individuals would use the new system, and "Facilitating Conduction" refers to the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of new system (Venkatesh, Morris, Davis & Davis, 2003; Balakrishnan & Raj, 2012). The theory is well known for testing the various categories of determinants of technology adoption and users' behavioral intention. UTAUT is directly relevant to the current paper, as we included and tested user social and individual facets in the conceptual model in the context of users' inclination to virtual devices in a developing economy. These social and individual facets are related to the social influence, performance expectancy, and effort expectancy in the UTAUT model.

Based on the underlying theoretical underpinnings of the above, three categories of dimensions have been developed. These are the independent dimensions, attitudinal dimension and behavioral dimension. A total of four boxes are developed to reflect these dimensions. The first two boxes, "individual" and "social" facets, represent the independent dimensions. The third box is concerned with individuals' "perceptions" of a virtual device as a dependent variable in relation to independent dimensions. At the same time, this box also serves as an independent variable to the fourth box which is concerned with the dependent variable representing users' practice of virtual devices. The proposed relationships of all the variables in the theoretical model are shown in Figure 1.
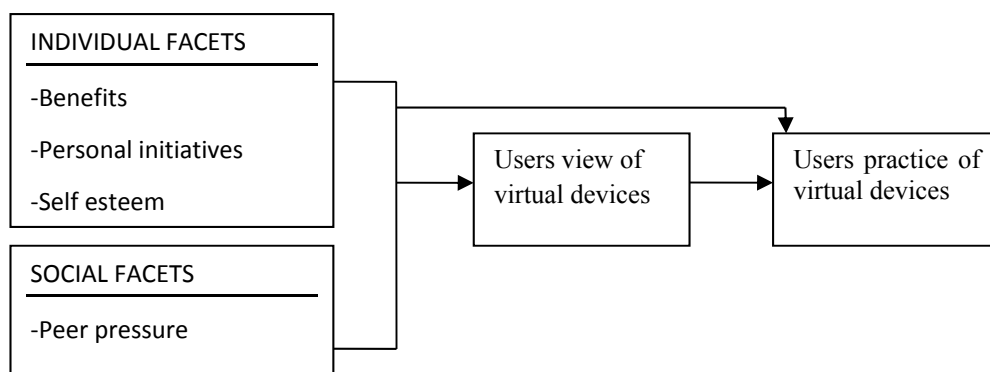
Figure 1: The conceptual research model

Hypothesis Development

Individual Facets

Benefits
Individuals tend to use innovative virtual devices to the extent that they think they will help them perform their job better. This variable is referred to as perceived benefits, which is defined as "the degree to which an individual feel that using a particular system would

enhance his or her job performance" (Davis, 1989, p.320). Benefit is also defined as the total value a user perceives from using an innovation (Kim, Chan, & Gupta, 2007). Davis (1989) states that a system high in perceived benefits is the one for which an individual user believes in the existence of a positive use-performance relationship. Davis (1989) also found that perceived benefits have a stronger and more consistent relationship with system use. Other studies have reported that benefits are positively associated with system usage (Chen & Granitz, 2012; Talukder, 2011; Al-Gahtani & King, 1999; Igbaria, 1993; Teng, Lu & Yu, 2009). Studies have shown a benefit is one of the strongest predictors and remains significant at all points of measurement (Wei & Zhang, 2008; Agarwal & Prasad, 1998; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis & Davis, 2003). When an individual perceives that an innovation offers a relative advantage over the firm's current practice, it is more likely to be adopted and implemented. Individuals evaluate the consequences of their behavior in terms of benefits and base their choice of behavior on the desirability of the usefulness (Kim, Chan & Gupta, 2007). If an individual thinks that the innovative system usage will enhance efficiency and effectiveness or offer greater control over the job, the innovation is more likely to be adopted (Lee, 2004). Therefore, the following hypothesis is proposed:

Hypothesis 1: Benefits has an impact on users' views of the virtual devices.

Personal initiatives

Personal initiatives refer to the willingness of an individual to try out any innovation (Agarwal & Prasad, 1998; Lewis, Agarwal, & Sambamurthy, 2003; Thatcher, Stepina, Srite, & Liu, 2003). According to Yi, Jackson, Park and Probst (2006) "some individuals are more willing to take a risk by trying out an innovation, whereas others are hesitant to change their practice" (p.356). Firms try to influence their employees' perception concerning the adoption of innovation; however, some individuals more readily adopt certain innovations while others do not. Agarwal and Prasad (1998) mention that the adoption of innovation by employees is influenced by each individual's personal innovativeness. Frambach and Schillewaert (2002) state that personal initiative is the innate tendency of a person to adopt a new device. Rogers (2003) defines it as the time at which an individual adopts an innovation during the diffusion process. According to Agarwal and Prasad (1998), personal initiative in the domain of innovation is an individual propensity that is associated with a more positive attitude toward innovation adoption and usage. According to Rogers' (2003) diffusion of innovation theory, individuals develop beliefs about new technology by synthesizing information from a variety of sources, including the mass media and interpersonal channels. Individuals with higher personal innovativeness are expected to develop a more positive perception toward innovation adoption (Lu, Yao & Yu, 2005; Agarwal & Prasad, 1998; Lewis, Agarwal, & Sambamurthy, 2003; Talukder & Quazi, 2010). Personal initiative or receptivity to change by an organization's employees is an important determinant of innovation success (Lee, Kim, Rhee, & Trimi, 2006). Thus, the following hypothesis is developed:

Hypothesis 2: Personal initiative has an impact on users' views of the virtual devices.

Self esteem

Self esteem refers to the degree to which the use of innovation enhances one's image or status within the organization (Moore & Benbasat, 1996). Individuals often respond to the factors that establish or maintain a favorable self image within a reference group (Venkatesh & Davis, 2000). In the typical work environment, with a high degree of interdependence with other employees in carrying out one's duties, increased image and status within the group is important to many individuals (Venkatesh & Davis, 2000). According to them "the increased

power and influence resulting from elevated status provides a general basis for greater productivity" (2000, p.189). An individual may thus perceive that using a system will lead to improvement in his or her image, regarding job performance (Venkatesh & Davis, 2000). Similarly, Yi, Jackson, Park and Probst (2006, p.355) state that "an individual may believe that a system is useful because the system enhances their image and social status". Teo and Pok (2003) found self esteem or image as a significant influence on behavioral intention. Therefore, following the hypothesis is worth testing:

Hypothesis 3: Self-esteem has an impact on users' views of the virtual devices.

Self-fulfillment
Self-fulfillment refers to the extent to which the activity of using the system is perceived to be enjoyable and satisfies the individual (Al-Gahtani & King, 1999). According to Venkatesh & Brown (2001), an individual adoption decision is influenced by hedonic outcomes. Research described hedonic outcomes as the pleasure driven from the consumption or use of innovation (Babin, Darden, & Griffin, 1994; Head & Ziolkowski, 2012). Entertainment potential is expected to have a strong influence on adoption decision and it provides an opportunity to escape reality and become absorbed in a new world (Van der Heijden, 2004). Motivation literature suggests that there are two main types of motivations: extrinsic and intrinsic. Extrinsic motivation refers to achievement of a specific goal whereas intrinsic motivation is the pleasure and satisfaction derived from a specific behavior (Vallerand, 1997; Venkatesh & Brown, 2001). According to Venkatesh and Brown (2001) extrinsic and intrinsic motivation are primary drivers of adoption and usage of innovation. Research suggests that individual employees with higher perceived productivity and hedonic outcomes are more likely to adopt, whereas the desire for social outcomes is more important for earlier adopters (Venkatesh & Brown, 2001; Talukder, Harris & Mapunda, 2008; Venkatesh & Davis, 2000; Balakrishnan & Raj, 2012). Thus, the following hypothesis is proposed:

Hypothesis 4: Self-fulfillment has an impact on users' views of the virtual devices.

Table 2: Root constructs, definition and scale

Construct/Sources	Definition	Items (VD: Virtual Device)
Benefits Davis (1989); Moore and Benbaset (1996), Al-Gahtani and King (1999).	Benefit is defined as the degree to which an individual believes that using a particular technology would enhance his or her job performance	Using VD enables me to accomplish tasks more quickly. Using VD improves the quality of the work I do. Using VD makes it easier to do my job. Using VD improves my job performance. Using VD enhances my effectiveness on the job. Using VD gives me greater control over my work. Using VD increases my productivity. Overall, I find using VD to be advantageous in my job.
Personal initiatives Lewis, Agarwal and Sambamurthy (2003).	This refers to the willingness of an individual to try out any new information technology.	I like to experiment with new technology I am usually the first to try out a new technology. I like to experiment with new technology. I am always enthusiastic to learn about new technology. I learn more about VD by my own initiatives.

Self-esteem Moore and Benbasat (1991); Venkatesh and Davis (2000); Al-Gahtani and King (1999).	The degree to which the use of the technology enhances one's image or status within the organization.	Using VD improves my image within the colleagues. Because of VD, I am seen as more organized. Colleagues who use VD are more efficient. High profile people in organizations are using VD. Using VD is a standardized operational symbol.
Self-fulfillment Al-Gahtani and King (1999).	This refers to the extent to which the activity of using the system is perceived to be enjoyable and satisfy the individual.	I believe using VD is enjoyable. I believe the actual process of using VD is pleasant. I believe while I use VD, I enjoy using the technology. I believe using VD is convenient. I believe using VD is interesting.

Social Facets

Peer pressure

Individual employees are influenced by peers in the adoption of an innovation. Moral support, motivation and encouragement from peers can greatly influence employees in adopting virtual devices (Farr & Ford, 1990; Lewis, Agarwal, & Sambamurthy, 2003; Yuan et al., 2005). The adoption of an innovation by peers may signal its importance and certain advantages and thus eventually motivate an individual to adopt. Individuals normally imitate by looking at their peers (Frambach & Schillewaert, 2002). Social persuasion and communication from peers have been suggested as factors influencing the acceptance of an innovation (Davis, Bagozzi, & Warshaw, 1989; Mirvis, Sales, & Hackett, 1991). According to Brancheau and Wetherbe (1990), in the case of intra-firm adoption decisions of employees, interpersonal contacts were more important in all phases of the adoption decision process. They found that the adoption decision of employees within an organization has a significant impact on both management and peers. The greater the amount of communication among adopters within an organization, the greater the probability that potential employees will adopt innovation (van Everdingen & Wierenga, 2002). The following hypotheses are, therefore, presented:

Hypothesis 5: Peers pressure has an impact on users' views of the virtual devices.

Social pressure

Social pressure refers to the extent to which individual employees are influenced by members of other organizations (Lewis, Agarwal & Sambamurthy, 2003). Communication between members of a social network can enhance the speed of adoption of innovative virtual devices. The participation of employees in an organization in informal networks facilitates the spread of information about the innovation, which consequently, positively influences the probability of adoption. These informal networks connect members within the organization or organization in different industries (Frambach & Schillewaert, 2002). The opinions and positive attitude of important referents could be the basis for a person's feelings about the utility and functioning of the innovation (Yi, Jackson, Park, & Probst, 2006, p.355). The extent to which organizational members share information with other organizations is referred to as their degree of interconnectedness. The greater the level of informal information sharing, the more likely organizational members are exposed to new ideas and objects (Frambach & Schillewaert, 2002; Rogers, 2005). Members of an organization may adopt an innovation based on the information that other employees in the interrelated organization in their market environment have developed (Brown & Venkatesh, 2005; Katz

& Shapiro, 1994; Kraut, Rice, Cool, & Fish, 1998). Empirical evidence confirms that external influences are important factors for the adoption of innovation (Khoumbati, Themistocleous, & Irani, 2006; Standen, and Sinclair-Jones, 2004; Talukder & Quazi, 2011). Gupta, Dasgupta and Gupta (2008) found that social influence has a significant effect on behavioral intention to use a system. Therefore, the following hypotheses are worth testing:

Hypothesis 6: Social pressure has an impact on users' views of the virtual devices.

Table 3: Root constructs, definition and scale

Construct/Sources	Definition	Items (VD: Virtual Device)
Peer pressure Lewis, Agarwal and Sambamurthy (2003).	This refers to the influence, motivation and encouragement to an individual employee by peers in adopting a new technology.	Peers where I belong think using VD to be valuable. The opinions of my peers are important to me. I learned from my friends how to use VD. Communicating with my friends helped me to learn VD. Peers performing a task motivate me to use VD.
Social pressure Lewis, Agarwal and Sambamurthy (2003).	This refers to the extent to which individual employees are influenced by the members in other organizations.	People in my discipline think that using VD is valuable. The opinion of people in my discipline is important to me. I use VD as our interrelated organizations also use it. I use VD because many of my friends are using it. I use VD as other employees use similar technology.

Users' practice of virtual devices

Users' view refers to a pre-disposition to respond favorably or unfavorably to an object, person, event or institution (Ajzen & Fishbein, 1980). Ajzen and Fishbein (1980) state that users' perception is the function of behavioral beliefs and evaluation of outcomes. According to Lam, Cho and Qu (2007) behavioral belief is one's belief in performing a specific behavior that will lead to a specific consequence, and evaluation of outcome is one's assessment of that specific consequence. Liao and Landry (2000) assert that employees' views toward the acceptance of innovation would affect the intention of the innovation adoption (Lam, Cho, & Qu, 2007). According to Pavlou and Fygenson (2005) perception or attitude has been shown to influence behavioral intentions and this relationship has received substantial empirical support. Based on the work of Ajzen and Fishbein (1980), Davis (1989) developed a perceptual construct scale. The instruments ask individuals to rate five items according to how they felt about using the innovation on a five-point scale (Lam, Cho, & Qu, 2007; Taylor & Todd, 1995; Quazi & Talukder, 2011). Employees may behave differently when their view toward a certain type of behavior has changed. Specifically, employees are more likely to perform a behavior if they possess a positive perception and are more likely not to perform a behavior when they possess a negative perception (Kwok & Gao, 2006). A favorable user's view is likely to encourage individual employees to adopt and use an innovative virtual device. Therefore, it would be timely to test following hypothesis:

Hypothesis 7: Users' views of the virtual devices have an impact on users' practice of virtual systems.

Table 4: Root constructs, definition and scale

Construct/Sources	Definition	Items (VD: Virtual Device)
User view of virtual device (Ajzen & Fishbein, 1980). Taylor and Todd (1995), Al-Gahtani and King (1999) and Lam, Cho and Qu (2007).	Users view refers to a pre-disposition to respond favorably or unfavorably to an object, person, event or institution.	Using VD is important to my job. Using VD is relevant to my job. Using VD is helpful. Using VD is practical. I like the idea of using VD.
User Practice of virtual device Igbaria, Zinatelli, Cragg and Cavaye, 1997; Al-Gahtani and King, 1999; Igbaria, Guimaraes, and Davis, 1995	User practice is measured with self-reported measures of actual usage. Five indicators were adopted for this study to measure usage behavior. They are: 1. Actual amount of time spent, 2. Frequency of use, 3. Usage of different applications, 4. Number of applications use and 5. Sophistication level of application used.	On average, how frequently do you use VD for job-related work? On average, how much time do you spend per week VD for job related work? Please indicate your level of usage of VD. How many different VD applications have you used? Do you use sophisticated elements of VD?

4. Method

The study used survey methods to collect data through a structured questionnaire. The questionnaire consists of three sections. The first section deals with the demographic questions; the second section is devoted to questions about the individual and social facets driving the user's view on the virtual devices such as smartphones, and the third section consists of questions relating to the user's practice of virtual devices. Data was collected from SMEs in Bangladesh in the district of Mymensingh. The study population comprised top level management and employees of SMEs listed in the database of SMEs Association. The questionnaire was sent to a randomly selected sample of 1350 employees. After two follow-ups, a total of 283 questionnaires was returned of which 269 were deemed usable, which yielded a return rate of 19.92 percent.

Constructs Measurement

The constructs used in the study have been previously validated in prior research in related areas of the current study. The following table 5 summarizes the sources of the constructs and their relevance to the current study.

Table 5: Sources of constructs

Construct	Items	Sources
Individual Facets	Benefits	Kim, Chan, & Gupta, 2007; Talukder, Harris & Mapunda, 2008; Venkatesh, Morris, Davis, & Davis, 2003
	Personal Initiatives	Lee, Kim, Rhee & Trimi, 2006
	Self-esteem	Venkatesh & Davis, 2000; Talukder & Quazi, 2010
	Self-fulfillment	Igbaria, Parasuraman & Baroudi,1996; Van der Heijden, 2004
Social Facets	Peer pressure	Venkatesh & Brown, 2001; Sledgianowski & Kulviwat, 2009; Lu & Yang, 2011, Talukder, 2011
	Social pressure	Lu & Yang, 2011; Sykes, Venkatesh & Gosain, 2009; Talukder & Quazi, 2011; Konana & Balasubramanian, 2005
Dependent Variables	Users perception	Sanchez-Franco, 2009; Cascio, Mariadoss & Mouri, 2010; Johnson, 2007
	Usage behavior	Al-Gahtani & King, 1999; Talukder, Harris & Mapunda, 2008; Fang & Chiu, 2010; Quazi & Talukder, 2011

Statistical techniques

A variety of statistical techniques were used that are deemed appropriate for the analyses of the study. The analysis includes frequency distribution, inter-correlation and regression analyses. The summary statistics provides the demographic characteristics of the respondents while correlation analysis was employed to explore the initial nexus between the variables concerning the drivers, perceptions to virtual devices and the usage level of smart devices. A regression analysis was used to ascertain the causal effects of independent variables on the dependent variables such as the impact of determinants on the perception to virtual devices and the impact of the perception on the usage level.

5. Data Analysis and Discussion

Demographic information about respondents
The demographic information identifies the basic characteristics of respondents in relation to the perception and practice of usage of the virtual devices. These include gender, age, academic qualification, income, and work experience. The males constitute 71.7%, whereas female respondents are 27.9%. About 42.8% of them belong to the 20-25 age group, and 21.9% to the 26-30 age groups. Those aged between 31 and 35 make up 19.7%, and those aged between 36 and 40 are 11.5% of the respondents, whereas respondents aged 41 and above make up only 4.1%. The survey results reveal that only 7.4% of respondents have a postgraduate degree and 14.5% are bachelor degree holders. The majority of the respondents (31.6%) have below secondary and 28.6% have higher secondary certificates. The results show that 36% are supervisor, 15% are top level managers, and about 20% are the owner. The distribution of respondents based on industry shows that 19% are in clothing and garments, 19% are telecommunication, 17% agribusiness, 16% are food related, nearly 17% are processing, 7.4% are retail and 4.5% others. Thus, demographic profiles of respondents show that most are young to middle aged, have moderate to lower education, top level manager to supervisor and are from several industries. Table 6 shows the demographic

distribution of the respondents.

Table 6: Demographic profile of participants

	Characteristics	Frequency	Percentage
Gender	Male	193	71.7
	Female	75	27.9
Age	20-25	115	42.8
	26-30	59	21.9
	31-35	53	19.7
	36-40	31	11.5
	41 and above	11	4.1
Education	Below secondary	85	31.6
	Secondary	48	17.8
	Higher secondary	77	28.6
	Bachelor	39	14.5
	Postgraduate	20	7.4
Position	Supervisor	98	36.4
	Mid-level manager	43	16.0
	Top-level manager	40	14.9
	CEO	35	13.0
	Owner	53	19.7
Industry	Food related	43	16.0
	Agribusiness	46	17.1
	Telecommunication	51	19.0
	Clothing and Garments	52	19.3
	Processing	45	16.7
	Retail	20	7.4
	Miscellaneous	12	4.5
	TOTAL	**269**	**100%**

Inter-Correlation among variables

The study used correlation analysis as the first step to identify the relationships between the variables in the research model, so that any primary evidence for relationships between study variables could be found. These results were then used as the basis of further analysis, such as hypothesis testing. Table 7 shows the construct measures' correlations. The Pearson's correlation matrix table shows that there is a significant (at a level of 0.01), positive correlation between dependent and independent variables. The table shows that users' views regarding virtual devices is significantly and positively related to benefits ($r=.191$, $p<.01$), personal initiatives ($r=.464$, $p<.01$), self esteem ($r=.387$, $p<.01$), self fulfillment ($r=.623$, $p<.01$), peer pressure ($r=.444$, $p<.01$) and social pressure ($r=.324$, $p<.01$). Users' view is also significantly and positively related to users' practice of virtual devices ($r=.400$, $p<.01$). Results of the multi-collinearity tests confirmed that there was no issue relating to multi-collinearity amongst the variables. The results of correlations coefficient indicate that no multicollinearity problems among the variables since correlations are below 0.9. Hair, Anderson, Tatham and Black (1998) state that the 'simplest and most obvious means of identifying collinearity is an examination of the correlation matrix for the independent variables and the presence of high correlations (generally .90 and above) is the first indication of substantial collinearity.

Table 7: Correlations among the research variables

	1	2	3	4	5	6	7	8
1. BEN	1	.277[a]	.511[a]	.147[a]	.171[a]	.443[a]	.191[a]	.475[a]
2. INI	.277[a]	1	.402[a]	.298[a]	.033	.194[a]	.464[a]	.616[a]
3. EST	.511[a]	.402[a]	1	.528[a]	.377[a]	.475[a]	.387[a]	.519[a]
4. FUL	.147[a]	.298[a]	.528[a]	1	.610[a]	.391[a]	.623[a]	.306[a]
5. PEE	.171[a]	.033	.377[a]	.610[a]	1	.577[a]	.444[a]	.137[a]
6. SOC	.443[a]	.194[a]	.475[a]	.391[a]	.577[a]	1	.324[a]	.351[a]
7. VIE	.191[a]	.464[a]	.387[a]	.623[a]	.444[a]	.324[a]	1	.400[a]
8. PRA	.475[a]	.616[a]	.519[a]	.306[a]	.137[a]	.351[a]	.400[a]	1

Legend: BEN=Benefits; INI=Personal initiatives; EST=Self esteem; FUL= Self fulfillment; PEE= Peer pressure; SOC= Social pressure; VIE= Users view; PRA=Users practice
[a] Correlation is significant at the 0.01 level

Hypothesis testing

Results of multiple regression analysis are presented in Table 8. In this model, users' view of the virtual devices is used as the dependant variable. The model explained 49.5% of the variance in perception and its associated F statistics indicated that it was significant at the $p<0.001$ level. Personal initiatives, self fulfillment and peer pressure were significant at the $p<0.01$ level. However, benefits, self esteem and social pressure did not show any significant relationship despite showing strong correlations with perception and practice level. The model implies that individual innovativeness, enjoyment and peer pressure are the most important determinants of an individual's view on the adoption of technological innovation.

The multiple regression analysis was also carried out for the practice of the virtual devices as the dependent variable and the outcome is shown in Table 9. The result of the regression model explained 16% of the variance in practice (usage behavior), and its associated F statistics indicated that it was significant at the $p<0.001$ level. The model implies that the positive view on the virtual devices is a precondition for an individual to practice technological innovation in that person's daily life.

Table 8: Regression model study variables with users view as dependent variable

Variables	St. Coef. β	CR	R^2	F	*P*	Result
			.495	62.107	.000	Supported
Benefits	.038	.829			.408	Not supported
Personal initiatives	.346	8.309			.000	Supported
Self esteem	-.071	-1.372			.171	Not supported
Self fulfillment	.439	8.323			.000	Supported
Peer pressure	.189	3.497			.001	Supported
Social pressure	-.006	-.128			.898	Not supported

Dependent Variable: Users view of virtual devices

Table 9: Regression model of users' practice as dependent variable

Variables	St. Coef. β	CR	R^2	F	*P*	Result
			.160	73.328	.000	Supported
Users practice of virtual devices	.400	8.563			.000	Supported

Dependent Variable: Users practice of virtual devices

Direct Relations

The study then performed regression analysis with practice behavior (usage level) as the dependent variable. The results of the regression model are shown in Table 10. The model explained 51.5% of the variance in practice, and its associated F statistics indicated that it was significant at the p<0.001 level. Benefits, personal initiatives, and self-esteem are significant at one percent level (p<0.01) while and social pressure is significant at the level of their percent of variance. Self fulfillment and peer pressure are not found to be significant in this model.

Table 10: Regression model study variables with Usage as dependent variable

Variables	St. Coef. β	CR	R^2	F	*p*	Result
			.515	67.382	.000	Supported
Benefits	.217	4.863			.000	Supported
Personal Initiatives	.452	11.067			.000	Supported
Self esteem	.179	3.522			.000	Supported
Self fulfillment	.047	.910			.364	Not supported
Peer pressure	-.071	-1.340			.181	Not supported
Social pressure	.104	2.113			.035	Supported

Dependent Variable: Users' practice of virtual devices

Discussion of Results:

The discussion of the results of this study is organized in terms of testing the 7 hypotheses as follows.

Hypotheses 1, 2, 3 and 4

These four hypotheses are related to the impact of individual facets such as benefits, personal initiatives, self-esteem and self-fulfilling on users view of virtual devices. The findings show that personal initiative is the most important factors affecting users' perception and acceptance of the virtual devices. Users benefits also supported directly but not through the perception. This result is logical given the fact that individual users attach high importance to the perceived benefits of the system generated for their work and day-to-day lives. Self-esteem also significant directly indicating that individual employee having some skills in using a technology is seen by many as a capable and knowledgeable person which gives them a certain amount of prestige and status in the organization. Individual feel a sense of achievement and power. Employees feel good in that they have some skills that others do not have. Results also show that self-fulfillment is significant in that individual employees who

enjoy working with innovation tend to be the early adopters of technology. Individuals who enjoy working with technology are the first in line to adopt the system. Playfulness and having fun are important in adopting new devices. These results corroborate the outcomes of previous research that revealed similar predictors of technological innovation (Kim, Chan & Gupta, 2007; Lee, 2004; Bhattacherjee & Harris 2009; Pavlou, 2003; Talukder & Quazi 2010; Talukder 2011; Al-Gahtani and King 1999).

Hypotheses 5 and 6

Hypotheses 5 and 6 are concerned with social facets which are an important component of drivers of virtual devices that are currently attracting a great deal of attention from researchers and practitioners. These two hypotheses are supported in the model. The positive impact of the two variables peer and social pressure has been considered vital for users' perception towards virtual devices systems in the contemporary research on technological innovation adoption. The peer influence and social network influence on technology acceptance is consistent with that of previous studies (Venkatesh & Brown, 2001; Lu et al., 2005; Sykes Venkatesh, & Gosain, 2009; Yuan et al. 2005; Yi et al., 2006; Lewis, Agarwal, & Sambamurthy, 2003) which found a positive impact of peer pressure and social influence on technology acceptance behavior in the workplace. Individual users are most likely to be influenced by peers who motivate and encourage fellow users to become involved in virtual devices. These two factors are likely to drive the acceptance, continuous usage and diffusion of virtual devices in the future.

Hypothesis 7

This hypothesis is designed to if an individual employees' perception has any impact on usage behavior specific reference to virtual devices. The regression results confirm the validity of the hypothesis by revealing that users' perception towards virtual devices has significant impact on usage behavior of employees. These findings are consistent with the findings of prior studies indicating a significant association between attitude and usage behavior (Taylor & Todd, 1995; Lam et al. 2007; Kwok & Gao 2006; Al-Gahtani & King 1999; Davis 1989). Results suggest that in order to ensure the increasing usage of the system, the systems' positive attributes as perceived by the users along with the associated social aspects of virtual devices are enhanced. The summary for the results of the hypothesis testing are evident in Table 11.

Table 11: Results of hypothesis testing at a glance

Hypothesis	Results	Comments
H1: Benefit has a positive impact on users view on the virtual devices	Direct significant relationship established but not through perception	Benefits have direct relationship with system usage. However, not supported through perception.
H2: Personal initiative has a positive impact on users' views of the virtual devices	Significant relationship established with both direct and through perception.	Supported at one percent level of significance in both direct and indirect relationship
H3: Self-esteem has a positive impact on users' views of the virtual devices	Direct significant relationship is established	Not supported indirectly but direct relationship shown significant
H4: Self-fulfillment has a positive impact on users' views of the virtual devices	Significant relationship is found through perception	Supported at one percent level of significance. Not significant in

	direct relationship	
H5: Peers pressure has a positive impact on users' views of the virtual devices	Significant relationship is established using perception only.	Fully supported at one percent level of significance but not supported directly.
H6: Social pressure has a positive impact on users' views of the virtual devices	Significant relationship is established using direct connection only.	Not supported. However, found significant in direct relationship
H7: Users' view of the virtual devices has a positive impact on users' practice of virtual systems	Significant relationship is established	Fully supported at one percent level of significance

6. Conclusion and Implications

The findings of the study will facilitate the organizations and practitioners in formulating strategies and measures to improve the adoption of virtual devices. Virtual devices should be popularized as a lifestyle product rather than a technological innovation since the study revealed that compatibility with individual's self esteem, values, lifestyle and norms is positively related with the perception and usage of virtual devices. Organizations should not only focus on the functionality of the devices but also emphasize the compatibility of the virtual devices with one's lifestyle. Furthermore, organization should use top level management to propagate the technology diffusion, since self-esteem was found to have a significant impact on adoption decision. Portraying top level management as users of the device may improve the overall image of the virtual device concepts within the organization.

Organization and technology manufacturers have always taken every opportunity to promote the benefits of using virtual devices. This is essential, since our findings have shown that the benefits have significant influence on user's view and usage of virtual devices. Organizations and practitioners should strive to deliver good applications of the technology to improve adoption. The application of virtual devices must be flexible enough to be personalized to suit individual's needs and provide convenience to users.

The findings of the study revealed that potential users of virtual devices rely on reference groups for information. The importance of cyber reference groups to facilitate the adoption of virtual devices should be emphasized. Cyber reference groups are crucial in disseminating technology related information to individuals. In many cases these social groups are more tech savvy than their peers. Their opinions may have strong impacts in shaping the adoption behavior to individuals. It is essential for organizations and practitioners to monitor such groups to provide them enough information about the technology, correct any misconceptions, and gather feedback from them, to enhance the diffusion and adoption process.

Implications for Government

The findings suggest that providing support by private enterprises in the telecommunication sector rather than government bureaucrats may be a positive step towards narrowing the digital divide in developing countries such as Bangladesh. Due to the corruption within the government controlled organization, privately owned firms, unless they are monopolistic in nature, may provide a boosting effect on the diffusion and adoption of technology in the

developing country. Deregulation and de-politicization in the telecommunication sector will have a positive impact on the usage level of technological innovation, as the model of the study shows how individual and social facets drives the perception and practice of virtual technology.

Implication for SMEs

The major implication for SMEs is that the management needs to work with its employees to create a congenial environment that enables the smooth implementation and ongoing practice of technological innovations. SMEs need to inform employees as to the benefits of using virtual devices in everyday business operations. Implementing training in innovation adoption and providing support to peers for engagement in technological innovation take-up is important for the maximum enjoyment of the benefits of new technologies in SMEs.

7. Limitations and Future study

The limitation of the study lies in the sample being drawn from one district in Bangladesh. This limited sample has affected the generalizability of the findings across the whole of the country, which needs to be taken into account when interpreting the results. Future research can follow the stratified sampling technique and develop more representative and nation-wide samples that reflect the virtual device adoption behavior. The findings from a future and more broad-based survey would also make it possible to compare situations prevailing in different parts of the country. Since virtual mobile technology is a constantly changing and expanding area, a future study could use the longitudinal approach to examine the changing predictors and outcomes of virtual device usage behavior.

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