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Adoption of ICT in a government organization in a developing country: An empirical study

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Abstract

eGovernment initiatives all over the world endeavor to integrate Information and Communication Technologies (ICT) to transform delivery of government services to their stakeholders by improving quality of services, accountability and efficiency. In this study we explore adoption of ICT to enhance government-to-employee interactions in a government organization in a developing country. We examine this adoption behavior by utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT) that provides an integrative view of user acceptance. We found that performance and effort expectancy, social influence and facilitating conditions all positively impact the use of the ICT. We did not find a significant moderating effect of gender on these relationships.

Keywords: Information and communication technology adoption; eGovernment; UTAUT model; Developing country; India

1. Introduction

In recent years, growth of the Information and Communication Technology (ICT) has had a substantial impact on the way local, state and national governments function. Information and Communication Technology (ICT) refer to technologies such as the Internet, Intranets, Extranets, ERP and other such technologies that cover the spectrum from basic infrastructure implementation to technologies that improve services and operations in an organization. Use of ICT in government, popularly known as eGovernment, is on the rise with 19% of all government organizations worldwide offering online services (West, 2005). eGovernment is described as the use of technology to enhance access to, and delivery of, government services to benefit citizens, business partners and employees at local, municipal, state and national levels (Grant and Chau, 2005; Gronlund and Horan, 2005; Ke and Wei, 2004; Turban et al., 2002). eGovernment has been defined using var-

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ious perspectives. Tung and Rieck (2005) defined it as the use of ICT to enhance public administration processes. Lee et al. (2005) described eGovernment with respect to mainly building better government-to-consumer (G2C) interactions, akin to the function of Customer Relationship Management (CRM) in the business sector. Ke and Wei (2004) described eGovernment as the use of Internet technology to enable greater interaction between government organizations and its citizens.

Digital government or eGovernment, often used interchangeably, is not just putting public services online – it is about government harnessing information technology in order to remain relevant in a more interactive and informational era (Tapscott and Agnew, 1999). Based on the interactions of a government organization with other stakeholders, eGovernment has been classified as interactions with internal clients and citizens (G2C), government-to-business (G2B), government-to-internal employees (G2E), government-to-other institutional government organizations (G2G) and citizen-to-citizen (C2C) (Carter and Belanger, 2003; Tan et al., 2005). Carter and Belanger (2003) emphasized the use of ICT to improve efficiency and access to government services across all stakeholders in G2C, G2E, G2G and G2B services.

eGovernment implementation can result in significant benefits such as improved efficiencies, greater access to services, greater accountability, transparency and citizen empowerment (Lam, 2005; Tung and Rieck, 2005), lowered costs and time for services (Bhatnagar, 2000; Gilbert et al., 2004), strategic advantages such as improved decision making through streamlining of information, enhanced knowledge sharing and organizational learning, improved interactions with citizens, other government organizations and businesses and industry, leveraging market forces for better relationships between government and private sectors, and greater ability to effect organizational change management (Grant and Chau, 2005; Tung and Rieck, 2005; Zhang et al., 2005). Tolbert and Mossberger (2006) reported that increased use of eGovernment by citizens also lead to increased trust in local government and also in positive attitudes towards eGovernment processes.

Thus eGovernment in a broader perspective encompasses all the key factors of governance – better delivery of government services to citizens, improved interaction with business and industry, employee and citizen empowerment through access to information, and more efficient management, i.e., the use of ICT to transform delivery of government services. ICT is an integral part of successful eGovernment implementation including G2G.

Prattipati (2003) reported that there is wide variance in the adoption of e-governance and use of online government services among countries. Highest use of government online services in 2002 was in Sweden (57% of the population) and lowest use country was Hungary (3%), while India was third lowest (5%). Singapore, which is currently rated as third among all nations in eGovernment ranking (Misra, 2006), is actualizing USD (US Dollars) 14.5 million savings in benefits (Ke and Wei, 2004; Lee et al., 2005).

Recent eGovernment research has focused more on economically developed countries than on developing countries. Most developing countries continue to have poverty alleviation and building of social and technological infrastructure as a priority (Bhatnagar, 2000). Also, developing countries typically have a larger percentage of rural population compared to economically developed countries which present additional difficulties in ICT infrastructure layouts and scaling up of eGovernment initiatives. Chen et al. (2006) noted that despite key differences in technological and social aspects of developed and developing countries, most developing countries have followed best practices and strategies used in eGovernment implementation in developed countries. They summarized the differences between eGovernment in economically developed and developing countries, developed a conceptual framework to analyze implementation strategies in each and demonstrated these using USA and China as a representative country from developed and developing countries, respectively. They highlighted that lessons learned from eGovernment implementations in developed countries could not be transposed to developing countries with complete success.

This study focuses on studying the factors that lead to adoption of ICT in a government organization in a economically developing country. We use India as a representative of developing country in the Southeast Asian region. As we note from Table 1, India's profile as a developing country is close to two other countries, Pakistan and Sri Lanka, in the region in terms of ICT use and Internet use penetration.

The National Association of Software and Services Companies (NASSCOM) in India estimated that the e-governance market in India in 2002 was USD 300 million (Giving e-Governance, 2003). In 2005, the market grew to USD 693 million and is expected to further grow to USD 935 million by the end of 2006 (http://www.digitalopportunity.org, 2006).

Table 1
ICT use in India compared with other economically developed and developing countries

	eGov. rank, 2006	GDP, per capita (USD) 2005	Telephone main lines, in millions	Mobile phones (in millions)	Internet users (in millions) 2005	Internet use by % of population, 2005
South Korea	1	20,400.00	265.9 (2004)	365.86 (2004)	33.9	67.0
Singapore	3	28,100.00	1.85 (2005)	4.26 (2005)	2.42	67.2
USA	4	41,800.00	268 (2003)	194.47 (2005)	203.8	68.1
Pakistan	72	2400.00	4.50 (2004)	5.02 (2004)	7.5	4.6
India	77	3300.00	49.7 (2005)	69 (2005)	50.6	4.5
Sri Lanka	88	4300.00	1.13 (2005)	3.08 (2005)	0.28	1.4

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

According to NASSCOM estimates, state governments and the Central government in India together spent USD 890 million towards e-governance in 2001–02, a number that is expected to reach USD 6 billion in 2007–08. There are some interesting experiments of e-governance being undertaken at the state level in India, which bear testimony as to how it is being conceived as an important agenda of public administration in India. According to a recently released report, India ranked 77th in the order of eGovernment rankings in 2006 compared to the 59th rank in 2002 despite an increase in its ratings score since 2002 (West, 2006). This indicates that other countries have been much more successful in implementing eGovernment over the last few years compared to India. India may be lagging behind due to poor infrastructure and the slow response to the emerging cyber-culture (Bagga, 2004).

In this research, we examine the factors that influence adoption of ICT by employees in a government organization (G2E) in India. We use an integrated model, the Unified Theory of Acceptance and Use of Technology, also known as the UTAUT model, to evaluate user acceptance of ICT.

The research paper is organized as follows: in the next section we present a review of literature on eGovernment and information technology adoption. Then, we propose a research model and hypotheses for this study. In the following section on research methodology, we describe the sample used, and data collection methods. Finally we present our results followed by discussion and conclusions.

2. Literature review

The objective of this study is to examine factors that influence acceptance of ICT by employees in a government organization in an economically developing country. To achieve this objective we reviewed literature in two areas: (1) research on eGovernment and (2) research on technology acceptance in government organizations in different parts of the world. We consider these two areas separately.

2.1. Research on eGovernment

In this section, we review literature on eGovernment in different parts of the world, and identify enablers and barriers to eGovernment. Although eGovernment has had a tremendous growth in last few years, there is a wide gap in the rate of growth among economically developed and developing countries (Chen et al., 2006).

Chen et al. (2006) compared eGovernment implementation in US and China and proposed a framework as a guideline for developing suitable eGovernment implementation strategy. Some of the key enablers for evolution of eGovernment services are: strategic alignment and focus, data and system integration, and security and privacy policies (Koh et al., 2005; Liu and Chetal, 2005). Siau and Long (2006) took a slightly different approach by using the theory of growth and development to understand eGovernment development differences among countries and reported that three key factors, namely, income-levels, development status and region could explain these differences on a global scale. Lee et al. (2005) conducted a cross country comparison of eGovernment practices in USA, EU, Singapore, Korea and Japan and found that eGovernment adoption mirrored levels of ICT diffusion in the country or region and government leadership.

A number of recent eGovernment studies have been conducted in economically developed countries and regions: Australia (Burn and Robins, 2003; Lam, 2005; Shackleton et al., 2004), China (Rayburn and Conrad,

2004), EU (Vassilakis et al., 2005), Hong Kong (Lam, 2005), New Zealand (Lam, 2005; Locke, 2006), Russia (McHenry and Borisoy, 2006), Singapore (Devadoss et al., 2002; Ke and Wei, 2004; Lam, 2005; Tan et al., 2005; Tung and Rieck, 2005), USA (Becker, 2005; Carter and Belanger, 2003; Koh et al., 2005; Schaupp and Carter, 2005; Tolbert and Mossberger, 2006; Zhang et al., 2005) and UK (Gilbert et al., 2004; Spacey et al., 2004).

Literature focusing on G2C, G2E, G2G and G2B issues of economically developed countries is still limited. There have been a few recent studies that look at eGovernment adoption in these countries/regions – study of G2C adoption in Middle East (Pons, 2004) and case study of G2C and G2G projects in rural India (Bhatnagar, 2000). Wagner et al. (2003) used Knowledge Management (KM) approach to study successful eGovernment implementations in six developing countries and recommended use of virtual communities to facilitate knowledge sharing among stakeholders in eGovernment initiatives. Mistry (2005) discussed the role of government in India in reducing the digital divide by leveraging ICT and developing close partnerships with private sector to launch various projects that further facilitate citizen's access and training to utilize ICT. Madon (2004) proposed an e-governance assessment model based on demand-side capabilities with measures such as range of ICT applications, functionalities enabled, reaction of people to eGovernment opportunities, and barriers.

Studies have also examined barriers to the adoption and diffusion of eGovernment. Ebrahim and Irani (2005) provided a review of the barriers to eGovernment adoption in literature using five dimensions: IT infrastructure, security and privacy, IT skills, and organizational and operational costs. Lam (2005) also identified these barriers and organized them in four categories: strategy, technology, policy and organizational. Vassilakis et al. (2005) study of stakeholders in G2E and G2C eGovernment categories documented five categories of barriers to eGovernment adoption and use, in order of perceived importance, as follows: legislative, user-related, administrative, technological and social barriers.

Gilbert et al. (2004) reported eGovernment adoption barriers to be end users' attitudes towards online trust relationship establishment, security of financial data and quality of information provided, and time and money as adoption benefits factors in predicting potential use of eGovernment. Their model utilized constructs modified from Diffusion of Innovation (DOI), TAM and service quality theories. Zhang et al. (2005) also organized barriers to eGovernment inter-organizational (G2E) knowledge sharing as technological, organizational and legal and policy issues using Stakeholder Theory.

Similar to the studies that have identified barriers to eGovernment, there are others that have done just the opposite – identified enablers of eGovernment. Koh et al. (2005) used action research methodology to study enablers of eGovernment and reported three critical enablers as strategic alignment and focus, system and data integration and security and privacy policies. Tung and Rieck (2005) study of eGovernment services adoption by business (i.e., G2B) showed that increased awareness of eGovernment services, security and quality of services may lead to higher adoption rate. Similar results using TAM and DOI were reported in the study of e-voting among college students where perceived usefulness, compatibility and trust were found to be significant variables in explaining young voters intention to use G2C services, specifically, e-voting services (Schaupp and Carter, 2005). Gefen et al.'s (2005) study of relationship between cultural diversity and trust in e-voting in USA and South Africa illustrated that identifying with the same socio-cultural group as those involved in the eGovernment organization had strong effect on creating trust among citizens who were recipients of G2C services and in increasing perceived usefulness of IT in government organizations.

In this section we have reviewed literature on eGovernment in different countries. Next, we examine the literature on technology acceptance and eGovernment.

2.2. Technology acceptance and eGovernment

Information systems literature is filled with studies that have examined technology acceptance within an organization. The Technology Acceptance Model (TAM) (Davis, 1989; Davis et al., 1989), Theory of Reasoned Action (TRA) (Azjen and Fishbein, 1980), Theory of Planned Behavior (TPB) (Azjen, 1991), Innovation and Diffusion Theory (IDT) (Rogers, 1995), and recently, the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) have all identified factors that affect an individual's intention to use or the actual use of information technology. In the following paragraphs, we present a review of liter-

ature that examines technology acceptance in government organizations. Since our focus is on the adoption of ICT, we provide an extensive review of technology acceptance models, especially the TAM and integrated UTAUT models.

2.3. The Technology Acceptance Model (TAM)

TAM was adapted from Azjen and Fishbein's (1980) Theory of Reasoned Action (TRA), a theory in the field of social psychology, to model user acceptance of information systems. "The goal of TAM is to provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behavior across a broad range of end-user computing technologies and user populations..." (Davis, 1989, p. 985). The TAM uses variables from the TRA to explain an individual's voluntary use of information technology. In TAM, Davis proposed that perceived ease of use and perceived usefulness are the two factors that affect an individual's attitude towards using technology. Attitude towards using technology affects an individual's intention to use information technology, and this, in turn, influences actual use. After finding limited support in his original model, Davis (1989) dropped the attitude variable, revised the original TAM to include constructs perceived ease of use, perceived usefulness, behavioral intention to use, and actual system use (Szajna, 1996). Perceived Usefulness (PU) is defined as the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context. Perceived Ease of Use (PEOU) is defined as the degree to which a prospective user expects the target system to be free of effort (Davis et al., 1989). In short, TAM states that PU and PEOU affect behavioral intention to use a system, which in turn affects actual use.

Support for TAM in studies across the world has been mixed. A meta-analysis of 26 TAM research studies indicated that among the three constructs of TAM, PEOU, PU and technology acceptance, both the relationships between PEOU and PU, and between PU and technology acceptance are strong, while the relationship between PEOU and technology acceptance is weak (Ma and Liu, 2004).

2.4. TAM and eGovernment

There have also been some studies in recent years that have examined TAM in eGovernment. As governments embrace ICT to deliver their services, issues of privacy and security of information become critical. A recent study (Smith and Jamieson, 2006) looked at these key issues of Information System Security (ISS) and Business Continuity Planning (BCP) using Grounded Theory approach and ranked training, management support, budget/cost/resources, and awareness as the key drivers.

Gilbert et al. (2004) examined why citizens choose electronic delivery of government services over traditional means. In their work, the authors identified factors as reliable measures to characterize attitudes towards online public service delivery. Factors enabling positive attitude were less time, cost and avoiding personal interaction (categorized as relative benefits); and factors characterizing negative attitudes were experience, information quality, financial security, low stress, trust and visual appeal. Siau and Long (2006) used Growth Theory and Regional Development Theory to find support for their hypotheses that income level, development status, and region are three factors differentiating countries on eGovernment development.

Roberts and Henderson (2000) replicated and validated the efficacy of TAM with two samples of government workers in Australia from heterogeneous work levels experienced in the use of computers. Hong et al. (2001/2002) study of intention to use digital library in the Open University of Hong Kong found perceived ease of use and perceived usefulness to be significant antecedents of the intention to use a digital library. Their result validated that users with higher computer self-efficacy were more likely to report higher ease of use and also were more likely to accept computing technology. Devadoss et al. (2002) reported that among the key requirements for transition to eGovernment in Singapore are organizational support for the new systems and end-user participation, which includes training users on systems and providing them with help tools for assistance. Carter and Belanger's (2003) pilot study of G2C adoption using Diffusion of Innovation Theory reported that perceived relative advantage, image and compatibility were significant factors in predicting citizens' intention to use eGovernment services. Their study found that higher levels of perceived ease of use were not significantly associated with increased intention to use eGovernment services. This somewhat counter-

intuitive result could perhaps be explained by the fact that their study used college students in USA who were experienced computer users, and therefore, their perception of perceived ease of use was different from the overall population of users of eGovernment services. Brown et al.'s (2004) study of Internet banking adoption in South Africa and Singapore found that there were significant differences in the national attitudes towards technology that explained difference in Internet banking adoption in these two countries.

Huang et al. (2002) apply TAM to explore adoption and usage of eGovernment in Australia found that only focusing on PU and PEOU of eGovernment may not be enough and other factors such as motivation mechanisms, social norms, and organizational culture should be considered in the model. Elbeltagi et al. (2005) successfully applied TAM to evaluate use of a DSS in a large organization in Egypt as part of its eGovernment initiatives. Their study suggested that top management support, decision maker characteristics, internal support, external support, and cultural characteristics, in order, were the most significant positive influences, while environment and task characteristics had a negative effect on DSS usage. Another study incorporated Hofstede's cultural dimensions in the TAM to empirically validate the role of culture in people's intention to use email in two countries, Uruguay and the USA (McCoy et al., 2005). Another study that examined mobile phone services' adoption and acceptance issues and culture in Turkey also found full support for TAM (Mao et al., 2005). Keat and Mohan (2004) provided a summary of studies that have focused on TAM constructs to explain electronic commerce acceptance by consumers with specific relation to consumer trust. Another study conducted in USA found strong support for the use of a modified TAM in e-commerce use for both information gathering and purchasing (Klopping and McKinney, 2004). Spacey et al. (2004) used TAM and found that employee attitudes of a public library in UK towards use of ICT in a G2E setting were strongly related to usefulness, intention and actual usage.

From the preceding discussion it is clear that TAM has been widely used to examine technology acceptance in eGovernment in many countries of the world. One of the limitations of TAM is that it is applicable only in situations where use of technology is voluntary. This limitation is overcome in the UTAUT model, a model that integrates additional components from theories such as TRA, TPB and IDT. Since in most cases individuals in organizations are required to use the ICT, that is, use is not voluntary, we believe the UTAUT model will better explain use of ICT in a government organization.

2.5. Unified Theory of Acceptance and Use of Technology

One of the latest models on technology acceptance, the Unified Theory of Acceptance and Use of Technology (UTAUT), synthesized elements across eight well known technology acceptance models: the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Motivational Model (MM), the Theory of Planned Behavior (TPB), the combined TAM and TPB, the Model of PC Utilization (MPTU), the Innovation Diffusion Theory (IDT) and the Social Cognitive Theory (SCT). The objective of the UTAUT was to achieve a unified view of user acceptance (Venkatesh et al., 2003). The resulting unified model consists of four core components or determinants of intention and usage (these are described later). The model is claimed to be a useful tool for managers to assess the likelihood of acceptance of a new technology within an organization. It also helps in understanding factors that drive acceptance of a new technology, so that appropriate features can be designed to facilitate acceptance of a new technology by users.

Since its inception in 2003, researchers are increasingly testing UTAUT to explain technology adoption. Recent work by Anderson et al. (2006) used UTAUT to find the drivers and modifiers of user acceptance of tablet PCs among business faculty in higher education. Their results validated UTAUT constructs with performance expectancy (UTPE) as the most important driver for PC tablet adoption. Carlsson et al. (2006) used UTAUT to explain acceptance of m-devices/services in Finland, and found that UTPE and effort expectancy (UTEE) were significant but not social influence (UTSI).

Li and Kishore (2006) validated UTAUT construct scales in the context of acceptance of an online community web log system, and found that UTPE and UTEE scales are comparable among different groups, UTSI scores may not be comparable among users with high or low frequency of using a web log. They recommend caution when interpreting results from studies conducted using UTAUT scales. Wang and Yang (2005) examined roles that personality traits play in UTAUT model under the context of online stock investments and found support for it.

3. Research model and hypotheses

In the previous sections we have provided a justification for research into adoption of ICT in a government organization in a developing country, and reviewed literature on models that are used to understand user acceptance and use of information technology. We propose the UTAUT model to explain acceptance and use of ICT in a government organization in a developing country. According to the UTAUT, four factors influence use of ICT: performance expectancy, effort expectancy, social influence and facilitating conditions. Venkatesh et al. (2003) defined the four factors as follows: performance expectancy is the degree to which an individual believes that using a system will help her attain gains in job performance, 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 she should use the new system, and facilitating conditions refer to the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.

Fig. 1 represents our research model. In our study, intention to use refers to the extent to which individuals would like to use ICT in a government organization. Gender, experience, age and voluntariness of use were identified as moderating variables in the original UTAUT; we have controlled for age, experience and voluntariness, and therefore, removed them from the model.

In our research, adoption of e-government Internet technologies in the government agency was not voluntary. Since we considered mandatory use of e-government technologies, we could not have variation in the variable, voluntariness. Therefore, we had to control for voluntariness in our model.

The moderating variable experience was also controlled. We found that almost all employees of the organization, nearly 90%, were similar in their experience with computers and Internet technologies. Since most employees in this organization started using the technology around the same time, we did not find any significant variability in experience. Therefore, we believe that experience would not have a significant moderating effect.

We have considered the moderating effect of age in the context of a general adoption environment. The Theory of Planned Behavior (Venkatesh and Morris, 2000) and UTAUT (Venkatesh et al., 2003) found that age is a significant moderator, whereas other acceptance models such as TAM, TRA and others did not examine the role of age as a moderator. But this finding is limited to western contexts, such as adoption in the USA. The basic premise that information systems are adopted and accepted more easily by younger individuals since they have been exposed to computers and the computing environment at an early age, may be true in the developed world but not so in developing countries such as India. In India a significant portion of the population does not have access to computers. In the government agency considered for this study we do not believe that younger employees had a better understanding and exposure to information systems than their older counterparts. Therefore, we did not consider the moderating effect of age.

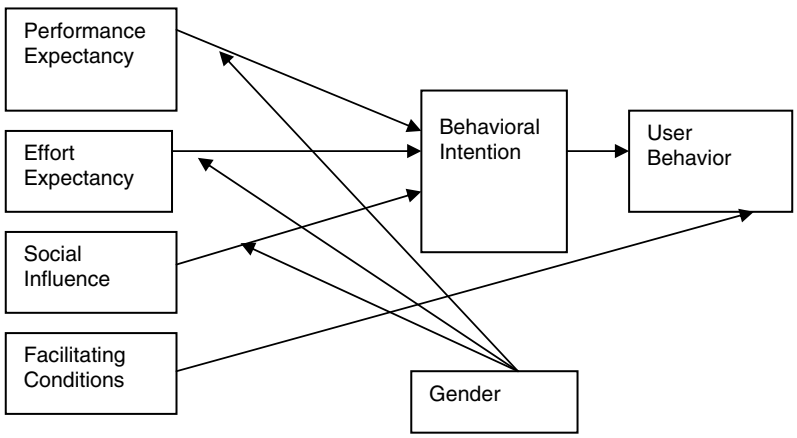

Fig. 1. The UTAUT Model for ICT adoption in government organization in India, a developing country.

We state our set of hypotheses for the UTAUT model, as follows:

H1: The influence of performance expectancy on behavioral intention will be moderated by gender.
H2: The influence of effort expectancy on behavioral intention will be moderated by gender.
H3: The influence of social influence on behavioral intention will be moderated by gender.
H4: Facilitating conditions will have an impact on usage of the system.
H5: Behavioral intention will have a significant positive effect on usage of the system.

As mentioned earlier, "system" here refers to information and communication technologies, specifically, the Internet, available to individuals in a government organization. In this section we have described our proposed model and hypotheses. In the next section we present our research methodology including details of our sample, data collection and analysis.

4. Methodology

4.1. Sample

This study focuses on understanding the factors that lead to adoption and use of the information and communication technologies such as the Internet by employees in a government organization in a G2E setting. We chose a government organization that is part of the Ministry of Environment and Forests under the Government of India. This organization has a mandate to provide training, research, advisory and technical services to various other government organizations in the areas of wildlife and ecosystem conservation and management, biodiversity and balanced land use management, ecological development, and management of socio-economic impacts on local populations. This organization thus provides services primarily as a government-to-government (G2G) entity. The organization also collaborates with international organizations such as the UNESCO, Food and Agricultural Organization, US Fish and Wildlife Service, and Southeast Asian countries of Nepal, Bhutan, China, Sri Lanka, Afghanistan, Cambodia, Laos and Vietnam. The organization is supported by the Central Ministry of India (equivalent to federal government in US) in its technology investments to facilitate its objectives.

The government organization in our study uses the Internet to facilitate inter- and intra-organizational interactions with employees (G2E) and other government organizations (G2G). It fits in with the definition of eGovernment as this organization uses ICT to enhance services provided, enhance interaction and collaboration with other agencies, and empower employees; and for more efficient management of its processes.

The sample in this study consisted of all full-time employees in the organization. Out of the 110 employees who were invited to participate in this study, 102 provided data about their use of Internet technologies. Study had a high response rate of 93% as two of the authors spent several weeks at the organization for data collection. Descriptive statistics regarding the sample are provided under the heading Sample descriptive statistics of Table 2.

Table 2A shows the work experience of individuals in the government organization who participated in this study. Nearly 43% had work experience of 10 years or more, followed by 29% with 1–5 years of experience. Our sample was 82% male and 17% female as shown in Table 2B. This is not unusual of the work environment in India where women enter the workforce in lesser numbers than in most western or developed countries, although it is important to note here that this trend is now changing. Table 2C shows the age distribution: 40% of individuals were in the 30–39 age group; this group was followed by two age groups, the 40–49 and 18–29 with about 20% each. In summary, the sample shows that individuals in this study were predominantly male, with the majority in their thirties and with more than 10 years of work experience.

4.2. Data collection

A survey questionnaire was used to collect data regarding use of Internet technologies among employees in an eGovernment setting in India. In addition to demographic information, this paper-based questionnaire collected data from individual users of ICT on a number of constructs identified in the research model. Earlier

Table 2
Sample descriptive statistics

Categories	Frequency	Percentage
(*A*) *Work experience*		
Less than 1 year	12	12
1–5 years	30	29
6–10 years	15	15
More than 10 years	44	43
No response	1	1
Total sample size	102	
(*B*) *Gender*		
Male	84	82
Female	17	17
No response	1	1
Total sample size	102	
(*C*) *Age*		
18–29 years	25	25
30–39 years	41	40
40–49 years	26	25
50 years and above	10	10
No response	0	0
Total sample size	102	

research by Venkatesh et al. (2003) had validated measures for each of the constructs and we decided to include those validated items in our questionnaire. A list of validated items for each construct is provided in Table 3.

We pilot tested the questionnaire by distributing it to seven individuals in two similar, but different, government organizations. These organizations were similar in size and function to the organization we studied in

Table 3
Variable/constructs and questionnaire items

Variable/construct	Scaled variable	Questionnaire items
Performance expectancy	PE	PE1: I find the Internet useful in my job PE2: Using the Internet enables me to accomplish tasks quickly PE3: Using the Internet increases my productivity PE4: If I use the Internet I increase my chances of getting a salary increase or promotion
Effort expectancy	EE	EE1: My interaction with the Internet enables me to accomplish tasks more quickly EE2: It would be easy for me to become skillful at using the Internet EE3: I find the Internet easy to use EE4: Learning to use the Internet is easy for me
Social influence	SI	SI1: People who are important to me think that I should use the Internet SI2: People who influence my behavior think that I should use the Internet SI3: The senior management and staff of my organization have been helpful in the use of the Internet SI4: In general, my organization has supported use of the Internet
Facilitating conditions	FC	FC1: I have the knowledge necessary to use the Internet FC2: A specific person (or group) is available for assistance with Internet difficulties FC3: I have the resources necessary to use the Internet FC4: The Internet is not compatible with other systems I use
Behavioral intention	BI	BI1: I intend to use the Internet in the next 2 months BI2: I predict I would use the Internet in the 2 months BI3: I plan to use the Internet in the next 2 months

this research. These individuals recommended minor editorial changes to the questionnaire. After finalizing the survey instrument, we conducted the survey in a government organization in India. Data from 102 individuals was collected by distributing paper-based surveys to employees over several weeks.

4.3. Data analysis

Although the original UTAUT model used partial least-squares (PLS) as the data analysis technique, we used multiple regressions to test the model. PLS is recommended for analysis of data in small samples since it has the ability to use boot-strapping methods. We have a relatively large sample of 102 respondents in this study. Therefore, we did not see the need to use PLS in our data analysis.

A review of recent literature in the area of user acceptance of technology that used the UTAUT model indicates that a variety of data analysis techniques have been used. There is a marked difference between techniques used in studies using a survey methodology and those using experimental design. Carlsson et al. (2006) used multiple regression to analyze adoption of mobile devices and services. Wang and Yang (2005) study of the role of personality traits in the context of online stocking used multiple regression and hierarchical regressions to test the UTAUT with added individual personality traits. Other studies have used PLS analysis. Knutsen (2005) in a study that examined the relationship between expectancies and attitudes towards new mobile services, and Anderson et al. (2006) in an examination of drivers for faculty acceptance of tablet PCs used PLS analysis techniques such as PLS Graph and Smart PLS. This indicates that a variety of statistical techniques have been used in empirical studies utilizing a survey methodology.

Studies that have used the UTAUT model in experimental designs have analyzed data using *t*-tests, Wilcoxon–Mann–Whitney test and Wilcoxon's signed ranks test, tests that are popular within the experimental research domain. Biemans et al. (2005) examined the role of proper user involvement and behavioral theories in the design and acceptance of a medical teleconferencing application using the UTAUT model in an experimental design setting. They used *t*-tests to compare control and treatment groups. *t*-Tests were also used by Ristola et al. (2005) in their study on the effect of mobile device usage time on perceptions regarding mobile devices in general, and by Heerink et al. (2006) in their examination of human–robot interaction in nursing homes for the elderly. Saini et al. (2005) used the Wilcoxon–Mann–Whitney for data analysis.

We can conclude that UTAUT has been used in a variety of research contexts, and different data analysis techniques have been used to test the model. We have a relatively large sample. Therefore, use of multiple regressions to test the UTAUT model is appropriate methodology for this study.

5. Results

This study surveyed a sample of 102 employees in a government organization to gather quantitative data. Most employees had been using the computers (95%) and the Internet for more than 1 year (90%). Also, 25% of employees used Internet regularly for 4–8 h per day, while 72% indicated that they used the Internet daily for 1–3 h. There were employees who were not using the Internet at all (3%). Of the 97% employees who did use Internet, 70% used it to interact with other employees within the organization.

We first conducted a factor analysis on questionnaire items to check for construct validity. Table 3 provides a list of the constructs in this study and items used in the questionnaire to measure them. As mentioned earlier, Venkatesh et al. (2003) had validated these questionnaire items in their study. Fig. 2 provides the results of our confirmatory factor analysis. We found that almost all the items in the questionnaire are proper measures of the corresponding constructs. We had to drop some of the items, such as, PE4, SI2 and FC4 from our analysis because factor loadings for their respective constructs were very low.

Second, we examined correlation matrix and reliability measures for the variables provided in Table 4. We found that the Cronbach's α, or reliability, for all the variables was above 0.8, which suggests that the measures are reliable. An examination of the correlation matrix shows that none of the pairwise correlations are greater than 0.7, therefore, we conclude that there are no multicollinearity issues associated with the data.

We used regression models to test our hypotheses. We ran separate regressions to test the effect of performance expectancy, effort expectancy, social influence and facilitating conditions on the dependent variables: intention to use and actual use (see Table 5).

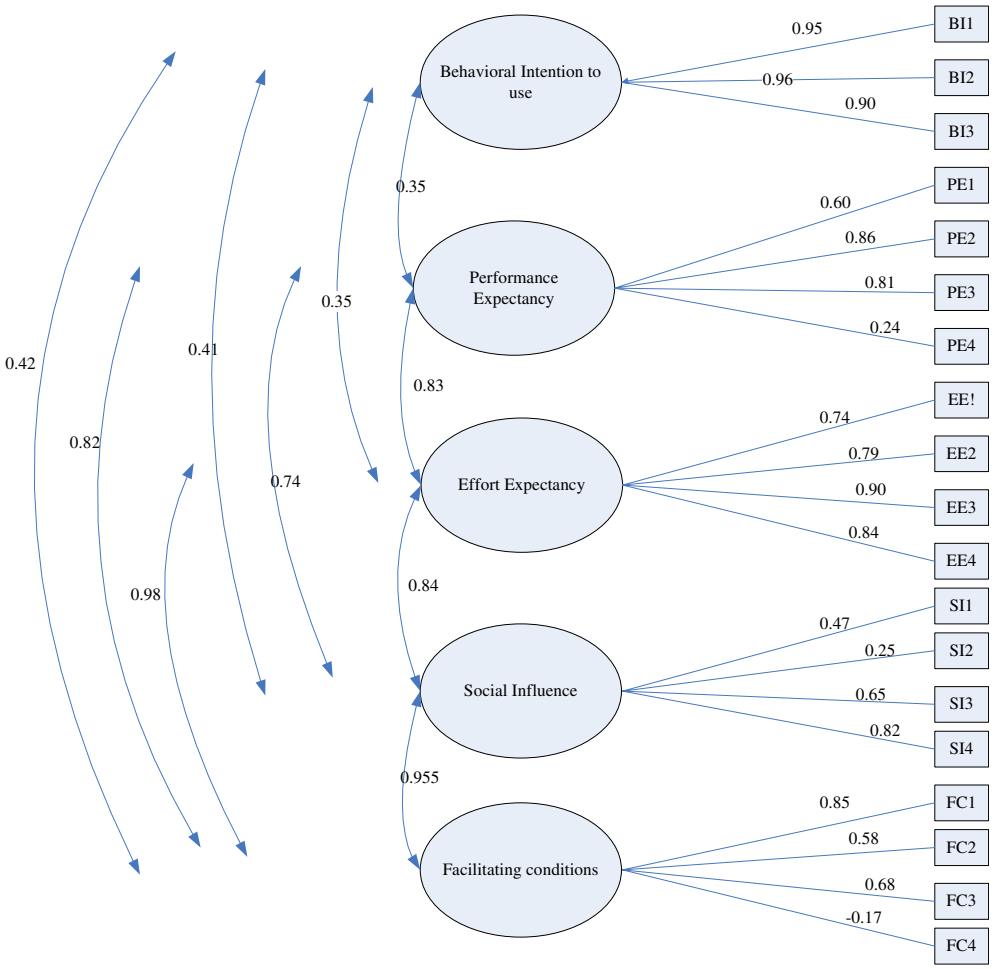

Fig. 2. Construct validity: results of a confirmatory factor analysis.

Table 4
Correlation matrix

	Mean	SD	Reliability	1	2	3	4	5	6
1. Performance expectancy	5.102	1.24	0.814	1.000					
2. Effort expectancy	5.702	1.15	0.812	0.644**	1.000				
3. Social influence	5.248	1.09	0.812	0.527**	0.531**	1.000			
4. Facilitating conditions	4.843	1.05	0.809	0.478**	0.543**	0.537**	1.000		
5. Intention to use	5.097	1.73	0.839	0.228*	0.330**	0.274**	0.330**	1.000	
6. Usage	2.677	1.62	0.839	0.376**	0.299**	0.136	0.185	0.462	1.000

* $p < 0.05$.
** $p < 0.01$.

Overall, we found support for the UTAUT. Our results show that hypotheses 1, 2 and 3 are supported. That is, performance expectancy, effort expectancy and social influence impact the behavioral intention to use the system. Facilitating conditions also positively influence usage (Hypothesis 4) but at a 90% level of statistical significance. But we did not find a relationship between intention to use and actual use (Hypothesis 5). We also did not find that gender had any significant effect in the model, i.e., there is no difference in the acceptance and use of the Internet technologies among men and women in the organization. Considering all the results, we can say that the UTAUT, which was originally proposed and tested in a developed country,

Table 5
Results of regression analysis – UTAUT variables

Hypothesis	Dependent variable	R^2	F value	Independent variable	Coefficient
H1	Behavioral intention	0.054	2.64*	Performance expectancy	0.317**
				Gender	0.192
H2	Behavioral intention	0.109	5.71**	Effort expectancy	0.487**
				Gender	0.124
H3	Behavioral intention	0.078	3.96**	Social influence	0.443**
				Gender	0.262
H4	Usage	0.034	3.44*	Facilitating conditions	0.154*
H5	Usage	0.006	0.54	Behavioral intention	0.071

* $p < 0.1$.
** $p < 0.05$.

can also explain ICT use in eGovernment in a developing country such as India. We discuss each of the results in detail in the paragraphs that follow.

6. Discussion of results

Performance expectancy is defined as the degree to which an individual believes that use of the system will help improve her job performance (Venkatesh et al., 2003). In our analysis we found partial support for Hypothesis 1, which states that the influence of performance expectancy on behavioral intention to use Internet technologies is moderated by gender. Our results did not find a significant moderating influence of gender. Let us first consider the direct effect of the independent variable on the dependent variable, behavioral intention to use. Our result that performance expectancy influences behavioral intention to use Internet technologies, supports the UTAUT model (Venkatesh et al., 2003). Since performance expectancy is theoretically derived from other constructs such as perceived usefulness, extrinsic motivation, and outcome expectations from TAM and these constructs impact a user's intention to use a technology, we can say that our findings support the existing literature. Venkatesh et al. (2003) found that the effect of performance expectancy was higher in men than in women. Since the moderator effect was not significant in our study, we conclude that the impact of performance expectancy on intention to use Internet technologies is not different in men and women in our study. It is important for us to qualify the previous statement by saying that it is possible that we were unable to detect a moderating effect of gender since our sample was predominantly male (82% of the whole sample).

Effort expectancy is the degree of ease associated with use of the system (Venkatesh et al., 2003). This construct parallels constructs such as perceived ease of use in TAM (Davis, 1989; Davis et al., 1992) and ease of use in IDT (Rogers, 1995). In our study we found that effort expectancy influences a user's intention to use Internet technologies. This supports the existing literature on the topic that use of a system is dependent on how easy it is to use it. Once again we did not find any difference between men and women. This is contrary to Venkatesh et al.'s (2003) original UTAUT findings. Once again, it is possible that we were unable to detect the moderating role of gender in this relationship since women constituted only 17% of the sample. Another reason for our result could be that men and women in the organization we studied are professionals with similar educational backgrounds, degrees and training.

Social influence is the degree to which an individual perceives that important others believe she should use the new system. Once again we found that social influence positively affects intention to use the system, but there is no difference between the genders. Social influence in UTAUT is represented as subjective norm in other models such as TRA, TPB, and image in IDT (Venkatesh et al., 2003). Our findings support existing literature on the topic that states that social influence has a significant effect on behavioral intention to use a system. Since we did not find a difference between men and women, based on the definition of social influ-

ence we can say that both men and women think alike when it comes to the perception of how important others believe they should use the new system.

Our results show that facilitating conditions have a significant impact on system usage, but at a lower level of statistical significance. Facilitating conditions refer to the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system (Venkatesh et al., 2003). The construct, facilitating conditions, is derived from perceived behavioral control from TAM and TPB, and compatibility from IDT, and is considered to be an important determinant of use of a system. Our findings supported the UTAUT results that found facilitating conditions to be an important determinant of system use.

In our study we did not find a significant relationship between behavioral intention to use Internet technologies and actual use. This does not support existing literature on technology acceptance. One of the reasons for this could be the fact that Internet technology had already been implemented in the organization when we conducted this study. Intention to use is relevant in situations where the technology is new and the users have not used it, which was not the case here.

In summary, our findings show that performance expectancy, effort expectancy and social influence have a significant positive impact on the intention to use ICT, and facilitating conditions affect actual use in a government organization in India, a developing country. This shows that individuals will intend to use ICT that they believe will improve their job performance, are easy to use, and that people want (and expect) them to use. Moreover, facilitating conditions such as appropriate hardware, software, training and support should be in place, since facilitating conditions positively impact use of ICT.

7. Conclusions

Our results show that UTAUT is a valid model to understand the adoption and successful use of ICT in government organizations in developing countries. Information systems analysts and designers should design ICT that are easy to use and directly impact individual and organizational performance. Government organizations also need to pay special attention to providing adequate training and support during implementation and use of such systems. Managers need to provide a facilitating environment where employees are encouraged to use new technologies by clarifying expectations and possible impact on employee job description and workload.

This study has its limitations. In this research we investigated the adoption of ICT in a government organization. While eGovernment can include a number of technologies and services, our study is restricted to use of Internet and to one setting – government-to-employee (G2E). We do not explore those services in eGovernment that come under the umbrella of government-to-citizen services. We also did not consider the role of other exogenous factors that could impact the behavioral intention to use and actual use of the system. Despite some of these limitations, we believe this study makes a significant contribution to knowledge in the areas of eGovernment and technology acceptance and adds to the understanding of enabling factors in these areas in developing countries.

We can identify some areas of future research. Additional research in government and non-government organizations in different developing countries is required to further examine acceptance and use of Internet technologies. Future research can extend our study to other sectors of governments and see if the factors that we found to be significant in our study are important determinants of Internet technology use in other government organizations. Future research can also examine role of ICT in government-to-citizen (G2C), government-to-business (G2B), and government-to-government (G2G) environments.

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