Journal of Urban Management 9 (2020) 408–417

Contents lists available at ScienceDirect

Journal of Urban Management

journal homepage: www.elsevier.com/locate/jum

Drivers and barriers to e-government adoption in Indian cities

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ARTICLE INFO

Keywords:
e-Government
e-services
Municipal websites
Drivers
Barriers
Indian cities

ABSTRACT

This paper aims to understand the awareness and adoption levels of e-government services and identify the drivers and barriers to adoption of e-government services in a developing country. A technology adoption model is synthesized based on study of existent literature, and further empirically tested using field data from primary surveys in four Indian cities using suitable sampling strategy. In fulfilling the objectives, the approach also included capturing citizens' responses on awareness about online services, usage and satisfaction with select services for different modes, and perception of the e-government services to understand citizens' perspectives on e-government adoption. The primary finding of the study identifies drivers and barriers for adoption in a context of developing country. The study is limited to four cities in India. Technology adoption models require separate testing in different cultural contexts. The study findings have immense relevance for policy makers and implementers to strategize mechanisms of increasing the usage of e governance thereby making urban governance efficient and transparent. The research has its conceptual base in the theory of planned behavior and technology adoption model to derive a theoretical framework for e government adoption. The proposed technology adoption model introduces preference as a critical factor influencing e-government adoption in contrast to other previously known models.

1. Introduction

In the last decade or more, significant efforts have been put in by governments in creating an ecosystem, for e-government in India, and fostering it through policies and infrastructure provision. Significant amount of public money continues to be spent on it. The Gartner group forecasts an increase in e-government related expenditure, by the centre, state and local governments in India combined, to increase nearly 9% from $7billion in 2017 to $8billion in 2018. In fact, the union (central-government) budget for 2018 alone has earmarked $1billion for telecom-infrastructure and another $483million for various activities under the Digital India mission.[1] Despite such significant investments, e-government in India still has a long way to go. The recent 2018 e-government survey by United Nations ranked India 96th among the 193 member countries on their e-government development index (EGDI). India's EGDI index score of 0.5669 was marginally above the world average of 0.55; on the other hand, South Korea, the e-government

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[1] The Digital India Mission was launched by the Government of India in 2015, as an expanded version of the earlier National e-Governance Plan (NeGP) and included not only fostering e-government development but also the usage of digital technologies by everyone (Agrawal et al., 2007; Chaudhary, 2017; Mahajan, 2012; Narasimhan, Sharma, & Kaushal, 2012). and qualitative discourses on the generic challenges faced by e-government implementation (Dwivedi & Bharti, 2010; Fernandes & Shetty, 2016; Mittal & Kaur, 2013; Yadav & Singh, 2012). Apart from these, Bhatnagar and Singh (2010) have developed an assessment methodology to measure the impact of e-government services for the citizens, and Ojha and Pandey (2017) make various theoretical propositions for innovative PPP-based financing approaches for e-government projects.

https://doi.org/10.1016/j.jum.2020.05.002
Received 5 April 2019; Received in revised form 6 May 2020; Accepted 25 May 2020
Available online 26 August 2020
2226-5856/ © 2020 Published by Zhejiang University and Chinese Association of Urban Management.

leader in Asia scored 0.9010, quite near the world leader, Denmark's score of 0.9150 (United Nations, 2018).

It is well-acknowledged that e-government adoption in India is low despite its immense potential, but to the best of our knowledge, there limited study on the adoption levels. According to CISCO's 2017 Visual Networking Index report, the number of smart-phone users in India would double in five years from 400 million in 2017 to more than 820 million in 2022, making it the fastest growing smart-phone market in the world. Now, the most unique aspect about smart-phones is that it fosters digital literacy among those who do not own personal computers, and even among those who have not had adequate education; and more so when internet data prices in India have fallen by about 90% in the year 2018 (Moses, 2018), bringing the facility of internet-based services to a wider section of the citizens. This indicates the potential for e-government in India. Since the success of any e-government initiative depends on the adoption of its services by the citizens, there is a need to investigate the drivers and barriers to e-government adoption from the citizen's perspective. In the Indian context, Lal (2012) and (R. Kumar, Sachan, & Mukherjee, 2017) have proposed research models explaining technology adoption, but these models have not been tested practically. Other studies surrounding e-government research in the Indian context have focused on usability/service quality of the e-government websites.

This paper aims to investigate the awareness and adoption of e-government services, identify the drivers and barriers to the adoption of e-government services in the Indian context; thereby also addressing the existing lacunae in the field of research in context of e-government in India.

2. Existent literature on factors influencing e-government adoption

From study of existent literature discussed by various researchers, we categorized various factors influencing e-government adoption into external factors and internal factors. External factors relate to the characteristics of the agency supplying the e-government service and internal factors relate to the characteristics of the citizens and the service quality of the e-government. External factors include organizational characteristics, leadership, and implementation/management strategy.

2.1. External factors

Organizational characteristics influencing e-government adoption discussed by researchers included red-tape/corruption and size of the civic body. Shifting government transactions online provides for cutting through the red-tape (Ntulo & Otike, 2013). Barki and Titah (2006) points out various studies illustrating that the presence of red tape is negatively associated with organizational adoption of e-government practices as well as the quality of information made available under its service. Cohen and Eimicke (2003) elaborate this phenomenon through what they term as 'politics of information' whereby there is low willingness among the government officials to place 'meaningful information' on the web. Size of the civic body is often cited to be one of the determinants of successful e-government casually, but it was established empirically in a 2000 International City/County Management Association (ICMA)[2] survey of all U.S. local governments to influence e-government adoption levels (Patel & Jacobson, 2008). About the role of leadership, it is argued that it is the most decisive of the organizational factors influencing e-government success since decision-making lay with them (Bonham & Seifert, 2003; Conklin, 2007). Also critical to e-government success is the implementation strategy for e-government initiatives; and these include political desire, vision, change management (process re-engineering) (Heeks, 2003; Hossan, Habib, & Kushchu, 2006), involvement of stakeholders (Ahmed Ibrahim & Hidayati Zakaria, 2016; Barki & Titah, 2006; V. Kumar, Mukerji, Butt, & Persaud, 2007), continuous evaluation (Almahamid, Mcadams, Kalaldeh, & Mo'taz, 2010), and strategy for awareness (Dimitrova & Chen, 2006; Lal, 2012).

2.2. Internal factors

2.2.1. Citizen characteristics

With regards to citizen characteristics that influence e-government adoption, there are a number of factors. The role of demographic factors had been summarized in Rogers' (1995) 'Diffusion of Innovation theory' where he empirically illustrated that the early adopters of technology were typically the young, young men in particular, the well-educated and those belonging to the higher-income categories. Subsequently a number of researchers have tested age (e.g. Abu-Shanab, 2015; Choudrie, Ghinea, & Weerakkody, 2004; Venkatesh, Morris, Davis, & Davis, 2003; Williams & Dwivedi, 2007), gender (e.g. Brahim Akman, Yazici, Mishra, & Arifoglu, 2005; Al-Hujran, Al-dalahmeh, & Aloudat, 2011; Brahim; Komba & Ngulube, 2014; Patel & Jacobson, 2008; Urbina & Abe, 2017; Venkatesh, Morris, & Ackerman, 2000), educational level (e.g. Brahim Akman et al., 2005; Burgess, 1986; Dimitrova & Chen, 2006; Jaeger, 2003; Rogers, 1995; Williams & Dwivedi, 2007) and economic class (e.g. Dimitrova & Chen, 2006; Jaeger, 2003; Komba & Ngulube, 2014; Susanto, 2013, pp. 334–342) empirically and found them to influence technology adoption. Venkatesh et al. (2000) explain the role of gender from the social/behavioural sciences perspective, through which they posit that men would be more likely to decide on e-government adoption from 'performance expectancy' perspective (*i.e. the degree to which an individual believes that using the system will help him/her to attain the gains in performance of his job*) whereas women are more likely to do so from 'effort expectancy' perspective (*i.e. the degree of ease associated with the use of the system*) as well as from the 'social influence' perspective (*i.e. the degree to which an individual perceives that others who are important to him/her will think that he/she should use the new system*). The role of gender

[2] ICMA is an organization of local government professionals across the world. Further information on them can be accessed on their web-page https://icma.org/.

as an influencing factor in e-government adoption is also found to depend on cultural characteristics of the society (for instance Alawadhi & Morris, 2008; Patel & Jacobson, 2008); while statistically significant difference in e-government adoption among men and women was observed in Turkey and U.K., such disparity was not observed in the U.S. or Kuwait (Susanto, 2013, pp. 334–342). This indicates that digital literacy is eroding the gender disparity in the attitude for e-government adoption. While various researchers have indicated that the younger are more likely to use technology mainly because of the perceived complexity with technology (Viswanath Venkatesh, Michael G. Morris, Gordon B. Davis, & Fred D. Davis, 2003), Abu-Shanab (2015) find the intention to use online services to be higher for older people who have high perceived usefulness. Venkatesh et al. (2000) have also indicate that the role gender and age, along with digital literacy and voluntariness to use online service, is that of a moderator between independent variables such as 'performance expectancy', 'effort expectancy, social influence, and facilitating conditions with the behavioral intention to use online service. Individuals with higher education are more likely to adopt e-government services. Jaeger (2003) and Brahim Akman et al. (2005) observe that this is also because internet usage and ability to use information technology for diverse tasks is higher among such people. Williams and Dwivedi (2007) argue that if the e-government service is not really beneficial to the users, it is less likely that education would be able to explain adoption of the service. The relationship between income-levels and likeliness for e-government adoption has been found by various studies to be positive. Other citizen-centric factors influencing e-government adoption broadly include culture, digital literacy, attitude and beliefs, trust, and civic mindedness. Culture can be defined as 'patterns of thinking, feeling, and potential acting that were learned throughout the person's lifetime'; at the same time they also elaborate that 'it is shared with people who lived within the same environment' (Hofstede, 1997). Cultural factors influencing e-government adoption include 'Power-distance' (*i.e. the distance between the ruling class and the common citizens*) where 'citizens in societies with greater power distance are more likely to adopt' e-government services', 'Uncertainty avoidance' (*i.e. the tendency to avoid uncertain circumstances and hence be risk-averse*) and therefore 'individuals who may be more open to adoption first' (Warkentin, Pavlou, Gefen, & Rose, 2002), 'Individualism/Collectivism', where it is argued that cultures with 'strong individualistic culture would have a positive 'attitude toward implementing and using ICTs', and 'Masculinity/Feminity' where it is argued that in cultures with 'high masculinity there would also be a positive attitude toward implementing ICTs if these technologies improve performance, increase the chance of success and support competition, which are all key factors of a masculine culture (Kovacic, 2005). Tan, Pan, and Lim (2005)'s discuss public wariness towards the government establishments, in other-words lack of trust, as a '(deep-rooted) cultural' thing. Sarkar (2007) discuss the inertia among both the citizens as well as government personnel to adopt e-government technology as a cultural issue. The role of digital literacy on e-government is discussed through terms like 'self-efficacy' and 'previous experience', and positively influences technology adoption (Ahmed Ibrahim & Hidayati Zakaria, 2016; Carter, 2008; Compeau & Higgins, 1995; Jaeger, 2003; Reddick, 2005) as it leads to 'higher confidence' (Dimitrova & Chen, 2006; Wangpipatwong, Chutimaskul, & Papasratorn, 2008), and being 'motivated' (Alghamdi & Beloff, 2014) to adopt the e-services and also influences 'perceived behavioural control', 'perceived ease of use' and 'perceived usefulness' (e.g. Colesca & Dobrica, 2008; Venkatesh et al., 2000). V. Kumar et al. (2007) underline the significance of the satisfaction during the previous experience of using online services in order for it to positively influence future adoption of similar or other such online services.

Technology adoption theories and models such as Fishbein & Ajzen's (1975) Theory of Reasoned Action (TRA), Davis's (1989) Technology Adoption Model (TAM), Ajzen's (1991) Theory of Planned Behaviour (TPB), Rogers' (1995) Diffusion of Innovation Theory, and Venkatesh et al.'s (2003) Unified Theory of Acceptance and Use of Technology (UTAUT) that are among the earliest and even today the premise of most technology adoption literature, together largely explain that the process of technology adoption results from a 'behavioural intention' (*i.e. having made the decision to use the technology*), which is preceded by a decision making process where an 'attitude' is formed towards the adoption behaviour through an evaluation process that is guided by 'beliefs' regarding the use of such technology through various view-points, as various authors of the studies terms, such as 'Perceived Usefulness (PU)' (*the degree to using the technology would enhance job performance*), 'Perceived Ease of Use (PEOU)', 'Relative Advantage' (*degree to which the technology is perceived as being better than other alternatives*) (e.g. Hawaii, Carter, & Bélanger, 2005; Rogers, 1995),'Perceived Compatibility' (*the degree to which usage of the technology will be seen being compatible by the individual with his values*) (e.g. Hawaii et al., 2005; Rogers, 1995), and 'Perceived Behavioural Control (PBC)' (*i.e. the ability to exert more control over the delivery of the service*) (e.g. Fishbein & Ajzen, 1975; Warkentin et al., 2002). Also the role of social norms/influence has been empirically validated by various researchers showing that the opinion of peers or friends influences the adoption of these services for an individual (e.g. Ajzen, 1991; Hung, Chang, & Yu, 2006; Venkatesh et al., 2000). About trust – studies indicate three kinds of trust concerning e-government adoption decision; 'institution based trust' (*which specifically in our context means trust on the internet as a safe/reliable medium*), 'characteristic-based trust' (*which is socio-cultural*), and 'process-based trust' (*which is trust in the system followed in delivering the service*). Papadopoulou, Nikolaidou, and Martakos (2010) offer an extensive list of aspects within these broad categories of trust. Civic mindedness, defined as 'disposition to look after civic needs and interests' (*from the Marriam Websters Dictionary*), makes an individual more likely to adopt e-government services as such citizens are 'more engaged in civic affairs' (Dimitrova & Chen, 2006).

2.2.2. Service quality of the e-government service

The most often cited definition of service quality in e-government literature is Lewis & Booms' marketing definition which explains it as 'the gap between the expectations and the actual performance of the service' cited by Parasuraman, Zeithaml, and Berry (1985), whose service quality framework including the dimensions of Access, Communication, Competence, Credibility, Reliability, Responsiveness, Security, Tangibles, and Understanding/knowing the customer continue to be the premises of e-service quality measurement even today (e.g. Agrawal, Shah, & Wadhwa, 2007; Chaudhary, 2009; Nemati, Gazor, Mirashrafi, & Ameleh, 2012). The United Nations' E-government surveys also have a component on service quality measurement, which they term as 'online service

index', measured at national level as well as at the local government level (local online service index – LOSI (United Nations, 2018). These indices basically measure information from three perspectives: information of the service (such as that on government schemes, education, health, citizenship application, budget, policies, etc.), existence of certain features (such a search engine, site-map, open data, FAQs, etc.), and the ability to do various tasks offered by the online service (ability to submit online application, register vehicles/new businesses/licenses, apply for government jobs, etc.).

3. Research model

Based on the literature study above, a conceptual technology adoption model for e-gov services in cities was synthesized for the study context. This technology model follows that the adoption arises from behavioral intention that is arrived-at from a decision making process through which attitude is formed towards the usage of the technology. This decision making process involves evaluation of the outcomes of using the technology – primarily, *'whether it would be useful'* (PU), *'whether it would be easy to use'* (PEOU), *'what would others who are significant to me think of my using it?'* (i.e. Social Influence) (Ajzen, 1991; Davis, 1989; Fishbein & Ajzen, 1975; Venkatesh et al., 2003), and also in other instances, relative advantage (e.g. Hawaii et al., 2005; Viswanath Venkatesh et al., 2003), previous use (e.g.V. Kumar et al., 2007; Tan et al., 2005; Viswanath Venkatesh et al., 2003; Warkentin et al., 2002), computer self-efficacy/digital literacy (e.g. Compeau & Higgins, 1995; Venkatesh et al., 2000; Wangpipatwong et al., 2008), compatibility (e.g. Hawaii et al., 2005; Hung et al., 2006) also influence the decision making process. However, the significant difference in our proposed model, as compared to earlier such models, is the introduction of 'preference' as a critical factor in determining e-government adoption. It was observed during the pilot-survey under this study that while awareness about the existence of e-government service is a pre-requisite, it cannot alone translate into its usage; and that it is preference that does it. Some earlier research has touched upon this aspect in defining technology adoption. Lin (2003)and Dimitrova and Chen (2006)emphasize that while individuals decide on technology adoption based on their 'subjective perceptions of value of the innovation', 'certain individuals are more prone to adopting new services than others', indicating preference. Lin (2003)identifies these personal traits as 'novelty seeking drive or innovativeness and personal risk-tolerance. Rogers' (1995)much acclaimed study has empirically validated the variation in the propensity for technology adoption among different individuals to be influenced by their age, gender, educational level and economic status. We therefore hypothesize that preference for adopting an e-government service would be influenced by these socio-economic variables, (viz. age, gender, education, and economic class of the individual) referred to as 'social norms' in this context. We also hypothesize that this preference can also be determined by civic mindedness (that the civic minded are more likely to prefer online services) and that those who not aware about online services but are digitally literate would also be more likely to prefer services online as compared to others who are also aware about the e-services but do not prefer them due to any reason.

The proposed model defines PU, PEOU, and Preference as dependent variables that depend on the relevant independent variables including – Trust, Civic Mindedness, Social Norms, Digital literacy, Infrastructure Quality, Website design, and Language, as indicated in below (Fig. 1).

4. Materials and methodology

Primary surveys were conducted in four Indian cities - Ahmedabad, Surat, Vadodara, and Rajkot (basic profile of these cities provided in Table 1) and the survey data was used for empirical validation of the hypotheses discussed in Section 3. Municipal governments of the selected cities are considered to be among the better implementers of e-government in India, and have been awarded for the same at various instances in the recent past; therefore justifying the choice of the cities so selected.

The sample population was determined to comprise only those citizens who are responsible for availing municipal services for their household; for this, the surveys were conducted at the municipal ward-offices/civic-centres (henceforth referred to as ward-offices) where such citizens come. Further, identification of the ward-offices for the surveys in each city was done by the municipal officials on the basis that citizens of various socio-economic backgrounds should be present at these locations. A sample size of 400 was calculated on the basis of 95% confidence-level and population in each city. Although after the pilot survey it was clear that some proportion of respondents from these ward-office surveys would have used at least some municipal service online, 50 additional

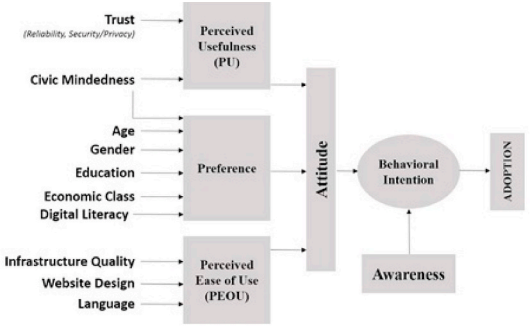

Fig. 1. Proposed technology adoption model

Table 1
Basic profile of the four cities.[a]

City	Population (millions)	Municipal Area (sq.km.)
Ahmedabad	5.58	467.2
Surat	4.46	326.5
Vadodara	1.67	159.9
Rajkot	1.29	157.4

[a] Population, area and administrative ward details of the cities pertain only to the municipal corporation jurisdiction limits in these cities.

respondents were surveyed who used municipal services online and did not visit the ward-offices. A list of such individuals was procured from the respective municipal IT/E-governance-department in each city. In total, there were 450 respondents in each of the four cities.

Four most commonly used citizen services viz. Complaint Registration, Payment of Property and Professional taxes, Birth & Death certification, and Shops license were chosen for this study.

The primary survey questionnaire was designed to capture information on the following broad aspects.

- Socio-economic profile, awareness that municipal services are now online, adoption of online/offline modes for availing various e-services including electricity payment and satisfaction with these modes, digital literacy (computer proficiency and smart-phone usage for internet surfing and online shopping), civic mindedness, preference to use services online, and perception of the service quality of the e-government service (measured on a 5-point Likert scale). For efficiency and to prevent error, the survey questionnaire was made digital by preparing it on Google Forms and converting it into a
- mobile-application by AppSheet.

Validation of the hypotheses was done utilizing statistical methods of Regression and ANOVA tests as applicable. The Central tendency of the dependent and independent variables in respective cities was determined by the use of mean values. All statistical analyses were performed using SPSS statistical software.

Salient independent and dependent variables hypothesized to influence technology adoption have been devised and measured through the survey questionnaire in manner indicated in Table 2 below.

Table 2
Details of independent and dependent variables of the adoption model.

Independent Variables	Measurement for hypotheses testing
Trust	Measured through two separate questions – trust that: • 'Personal information while transacting online is safe'; • The e-service 'is reliable'. For purpose of testing the hypothesis, Trust was measured as average score of the Likert-scale rating ascribed by the individual to the two component questions. This is a continuous variable.
Civic Mindedness	Captured as a category variable with 3 point Likert Scale Rating response options
Age	Captured as continuous variable and categorized into age groups
Gender	Captured as category variable: Male/Female
Education	Captured as continuous variables and categorized into educational level groups: Illiterate, Primary, Secondary, Higher secondary, Undergraduate, Postgraduate, and Doctorate/similar for data analyses.
Economic Class	Captured as continuous variable and then categorized into Low Income Group (LIG), Medium Income Group (MIG), and High Income Group (HIG) based on the classification by Ahalya and Bikas Paul (2017) for data analyses.
Digital literacy	Measured as the ability to use a digital device (computer/mobile) for any internet-based transactions including accessing any website and ability to make online payments. It is a category variable (yes/no).
Infrastructure Quality	Measured through three separate Likert-scale rating questions on the e- government platform- • Is it easy to navigate, • Making payment is easy, • Is it well-designed For purpose of testing the hypothesis, an individual's rating of Infrastructure quality was calculated as a category variable – Very good, Good, Average, and Poor based on individual's responses to the three questions
Website design	Captured as category/continuous variable: Likert-scale rating
Language	Captured as category variable (yes/no) through the question: Did you face language issue while using the e-government service.
Dependent Variables	Measurement for hypotheses testing
Perceived Usefulness	Is the e-government service useful? Captured as category variable on Likert-scale rating.
Perceived Ease of Use	Is the e-government service easy to use? Captured as category variable on Likert-scale rating.
Preference	How likely are you to use municipal service 'online'? Captured as category variable on basis of Likert Scale Rating-options

Table 3
Central tendency of salient variables across the case-cities.

Variable	Ahmedabad	Surat	Vadodara	Rajkot
Trust	1.900	1.705	2.043	1.704
Civic Mindedness	1.833	1.857	1.692	2.163
Perceived Usefulness	1.725	1.562	1.635	1.602
Preference	2.784	2.431	2.749	2.480
Perceived Ease of Use	1.683	1.619	1.548	1.541

5. Results and discussion

5.1. Central tendency of dependent and independent variables and significance of variation across the case-cities

Trust on e-government services for the citizens in all case cities appear to be centering about a fair agreement; however the ANOVA test results indicate there is a significant difference in variation of this tendency across the cities.

- The analysis reflected that there was a significant variation in trust factor amongst citizens in case cities
- Although the case cities were found to be characterized by lack of Civic mindedness during the survey and as indicated by a central tendency, the variation across the cities varied significantly too.
- Variance in the tendencies of citizen-groups across the cities on the parameters of PU and PEOU were found to have insignificant difference across the cities. Both PU and PEOU tended to be positioned around agreement indicating that those who already used or had the experience of using the e-government services in their cities found them to be useful and easy to use.
- The difference of online service preference across the cities was statistically significant.

Table 3 shows the central tendency of citizen-group on the given technology-adoption variables; Table 4 indicates ANOVA test results undertaken to test the significance of difference/variance of these variables across the case-cities.

Table 4 Significance of difference in central tendency of variables across the case-cities on basis of ANOVA test results indicates ANOVA test results undertaken to test the significance of difference/variance of these variables across the case-cities.

5.2. Survey results on awareness and adoption levels of e-services in the case-cities

Vital information on awareness, usage, satisfaction and preference for online services is presented in Table 6 and Table 7. There is a reasonable level of awareness about presence of e-government services were observed in Ahmedabad and Surat as compared to Vadodara and Rajkot; yet there is a significant lot to be done on this front across the cities. It is also observed that higher awareness about the online service in a city does not necessarily result into a higher usage or adoption level. This statistical fact corroborates the argument of this paper for highlighting the need for focusing on 'preference' as a critical factor in determining adoption of the e-government services. Reasons for not preferring online municipal services as reported by the survey respondents also provide insight into this issue. Majority of these respondents across all cities reported not knowing how to use them as the primary reason for not preferring municipal services online. But it was also found from data analysis that many of these respondents had reported using their smart-phones for internet-based activities. Amongst other reasons for not preferring municipal services online, a considerable proportion of respondents reported simply being not interested which signifies that they are not amply motivated to do civic services in an online mode; however, it can be observed that all the reported reasons can be addressed and resolved with suitable strategy.

5.3. Hypotheses testing to validate the proposed model

The proposed model was tested through the following three hypotheses:

$[H_0]_1$: Perceived Usefulness (PU) for an individual regarding an e-government service does not depends on his/her Trust on the service and his/her Civic mindedness.
$[H_0]_2$: Preference for availing municipal service online for an individual does not depend on the Social Norms in context of the

Table 4
Significance of difference in central tendency of variables across the case-cities on basis of ANOVA test results.

Variable	ANOVA test results	Verdict
Trust	$F(3, 423) = 5.65, p < 0.05$	Significant
Civic Mindedness	$F(3, 423) = 6.76, p < 0.05$	Significant
Perceived Usefulness	$F(3, 423) = 0.991, p > 0.05$	Not significant
Preference	$F(3, 1797) = 15.689, p < 0.05$	Significant
Perceived Ease of Use	$F(3, 423) = 1.233, p > 0.05$	Not significant

Table 5
Awareness, adoption, preference and Digital literacy among the respondents of the case cities.

Indicators	Ahmedabad		Surat		Vadodara		Rajkot	
	Freq.	%age	Freq.	%age	Freq.	%age	Freq.	%age
Awareness	292	73.0	300	75.0	245	61.3	171	42.8
Usage	70	17.5	55	13.8	54	13.5	50	12.5
Preference	176	44.0	241	60.3	162	40.5	193	48.3
Computer literacy	183	45.8	121	30.3	139	34.8	98	24.5
Digital literacy	307	76.8	350	87.5	324	81.0	366	91.5

Note: Figures are calculated on the basis of responses from the 400 ward-office survey respondents in each city.

Table 6
Reasons for not preferring online services reported in the case cities.

Reasons for not preferring municipal services online	Ahmedabad		Surat		Vadodara		Rajkot	
	Freq.	%age	Freq.	%age	Freq.	%age	Freq.	%age
Don't know how to use it	142	42.8	52	35.6	105	42.9	38	48.1
It may be useful but I am not interested	63	19.0	29	19.9	28	11.4	16	20.3
Need Receipts	48	14.5	30	20.5	21	8.6	16	20.3
I don't have a computer/a smartphone	34	10.2	11	7.5	26	10.6	7	8.9
Tried once, It is not useful	17	5.1	14	9.6	37	15.1	0	0.0
Sharing data for financial transactions is not safe	16	4.8	8	5.5	20	8.2	1	1.3
Tried once but it is complicated/problematic	12	3.6	2	1.4	8	3.3	1	1.3
Total	332		146		245		79	

Table 7
Hypotheses analyses summary.

Null hypotheses dependencies	Test result	Verdict
F (2, 424) = 143.57, with R^2 of 0.404		
PU with Trust	$p < 0.05$	Rejected
PU with Civic Mindedness	$p > 0.05$	Accepted
Preference with Age	$F(5, 1794) = 19.497$, $p < 0.05$	Rejected
Preference with Gender	$F(1, 1798) = 0.617$, $p > 0.05$	Rejected
Preference with Education	$F(6, 1793) = 60.261$, $p < 0.05$	Rejected
Preference with Economic class	$F(2, 1619) = 60.261$, $p < 0.05$	Rejected
Preference with Civic Mindedness	$F(2, 1797) = 16.622$, $p < 0.05$	Rejected
Preference with Digital literacy	$F(2, 1798) = 411.916$, $p < 0.05$	Rejected
PEOU with Infrastructure Quality	$F(3, 423) = 4.577$, $p < 0.05$	Rejected
PEOU with Website Design	$F(3, 423) = 20.674$, $p < 0.05$	Rejected
PEOU with Language	**	**

individual comprising Age, Gender, Education, and Economic class, as well as on Civic Mindedness and Digital Literacy.
$[H_0]_3$: Perceived Ease of Use for an individual regarding the e-government service does not depend on Infrastructure Quality, Website Design, Language of the content in it, and on the individual's Digital literacy.

Dependencies of the hypotheses variables are summarized in Table 5 below. While Regression was used to test the first null hypothesis, ANOVA was used for the other two.

The first null hypothesis was partly accepted and partly rejected; dependency of PU on Trust tested significantly and not in case of civic mindedness. This was a significant finding indicating that civic mindedness was not a salient determinant for adoption of e-government services in the given context; usefulness was majorly determined by one's trust on the reliability and safety/privacy of the said service.

In the second hypothesis, excluding gender, all chosen parameters tested significantly with Preference indicating the strong relevance of these social norms in determining an individual's preference. Analysis of the data on central tendency for various categories in each of the social-norm variables in context of likeliness to avail municipal services online revealed that this preference generally increased with higher education, higher income level, tendency to be civic minded and with being digitally literate. There was no significant difference between tendencies for online-preference between either gender. This indicates that gender is no more a salient barrier in technology adoption in the urban Indian context.

In the third hypothesis the infrastructure quality and website design tested significantly with Perceived ease of use (PEOU), however it was observed during field survey and from captured information that the digitally literate and the existent users of e-

government services rarely reported (English) language of the e-government portals as a hindrance to their usage or adoption of the said service. Only three such cases were reported in Ahmedabad; and one each in Vadodara and Surat. Due to in sufficient responses, we have not been able to test this part of the hypothesis, however the authors argue that language of the e-government platform remains one of the significant factors determining how easy someone finds its usage and therefore cannot be excluded from the model.

6. Implications

This research attempted at expanding the Technology Acceptance Model (TAM) introduced by Davis in 1989 to e-governance services in the public domain. A conceptual model involving a third factor identified as preference was introduced in the study. The factor was studied with variables of social norms (such as age, gender, economic class and education) civic mindedness and digital literacy. Since e-governance services can be used for citizens own benefit but also has a public value it was prudent to include aspect of civic mindedness. As India is a country where literacy levels are not very encouraging it was important to take cognizance of the digital literacy variable. The results clearly indicate that preference plays a statistically significant influence on the acceptance and adoption of e-governanace services. Majority of the respondents reported non-preference for online services because they believed that they did not know how to use them, even while they use other online services on their smart-phones/computers. Digital literacy among those who were unaware about online services tested positively with preference. Both of these indicate that induced-trials (*making smart-phone owners coming to municipal offices use the online version of the services by the help of a designated municipal personnel*) among such citizens can significantly drive up e-government adoption. Since age, education and economic-class were found to influence preference for the e-services, the study encourages the local governments to devise their awareness strategies for e-government specifically for these social groups.

It can be said that while technology acceptance model can be used for online government services the inclusion of preference to study the drivers and barriers play a significant role. It would also lead towards decoding the measure to be used to encourage a widespread use of e –governance services initiated by the governments which ensures transparency, accountability and validates the service requests for efficient delivery of government services to the citizens.

The limitation of the research study was that it was conducted only in one state with four major cities in the state. However as these cities were selected to become smart cities under the smart city mission of the central government there were reasonable levels of services being implemented in e-mode. India still needs to reach a significant level of delivering its city services completely via online mode. For wide spread acceptance future researches can be conducted to test the model in more states and cities of the country.

Funding

This study was funded by Indian Council of Social Sciences (ICSSR) [Grant No. G-21/2016- 17/ICSSR/RP] under the research project titled: ‘Awareness and Adoption of e-government - a study of drivers and barriers’. The views expressed herein are those of the authors and not of ICSSR.

Declaration of competing interest

All the authors wish to declare that there is no competing interest that may be perceived to influence the results and discussions reported in the paper.

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