Public Administration and Policy

# An evaluation of factors affecting the acceptance of smart city ICT services in India

M.J. Hakeem
*Department of Political Science, Kerala University, Trivandrum, India, and*
M.M. Sulphey
*College of Business Administration, Prince Sattam bin Abdulaziz University, Al-Kharj, Saudi Arabia*

Received 21 July 2024
Revised 21 December 2024
23 January 2025
16 April 2025
Accepted 25 April 2025

## Abstract

**Purpose** – Information and communication technologies (ICTs) are essential to city administration, improving quality of life, promoting sustainability, and fostering innovation. The success of smart city projects depends on citizens' acceptance. This study evaluates the factors influencing citizens' acceptance of smart city services in India.

**Design/methodology/approach** – Based on the literature review, a framework was developed that integrates theories from Technology Acceptance Model, Theory of Reasoned Action, Social Cognitive Theory, and Trust, with six variables: perceived usefulness, perceived ease of use, self-efficacy, attitude, trust in e-government, and behavioural intention. A survey was conducted with 407 respondents in Kerala, India.

**Findings** – This study found that perceived usefulness, perceived ease of use, and self-efficacy positively impact citizens' attitudes toward smart city services, which in turn strongly influence their intention to use these services. Attitude plays a key role in the acceptance process by connecting these factors. While trust in e-government directly affects acceptance, its influence on attitude is weaker. Indian citizens tend to focus more on the ease of use and self-efficacy over trust, suggesting that increasing awareness and providing training could be more effective in encouraging acceptance.

**Originality/value** – This study employs structural equation modelling to explore the factors influencing citizens' acceptance of smart city services, addressing the underexplored area of smart public services in a developing country.

**Keywords** Smart city service, Self-efficacy, Citizen attitude, Trust in technology, Trust in government, India

**Paper type** Research paper

## Introduction

The rapid advancement of Information and Communication Technologies (ICTs) in the 21st century has revolutionised city-level administrations, encouraging policymakers to utilise smart tools and applications to improve citizens' quality of life and promote sustainability. Governments are increasingly required to be more responsive to citizens' needs and effective in delivering public services. City administrations, often the first point of contact for citizens, play a key role in driving smart initiatives. The concept of a smart city encompasses elements such as smart governance, e-government, digital governance, and mobile governance (Anthopoulos *et al.*, 2022). Its interpretation varies based on factors such as a city's level of development, readiness for reform, available resources, and the aspirations of its residents. Smart cities address urbanisation challenges by improving resource management and enhancing critical sectors like administration, healthcare, and transportation through



*Funding*: This study is supported by funding from Prince Sattam Bin Abdulaziz University's project number (PSAU/2024/R/1445).

Public Administration and Policy
Emerald Publishing Limited
e-ISSN: 2517-679X
p-ISSN: 1727-2645
DOI 10.1108/PAP-07-2024-0114

technology. These efforts help identify priority areas for smart city development and place potential solutions on the policy agenda (Clement and Crutzen, 2021).

Globally, there has been a rising trend in the development of smart cities. According to a report by the Korea Agency for Infrastructure Technology Advancement, many countries have actively established regulations for smart cities since the early 2010s. In 2010, Japan launched its "New Growth Strategy" and the "Environmental, Energy-wide Strategy by Green Innovation" to advance smart city initiatives. Similarly, in October 2013, the EU introduced its Smart Cities and Communities Innovation Partnership Strategy Implementation Plan, focusing on smart city advancements in energy, transport, and ICT sectors. China also made significant investments between 2011 and 2015, allocating approximately USD48.3 billion to develop 320 smart cities nationwide. This global shift towards smart cities is expected to continue, with the smart city market projected to expand by USD288.7 billion from 2022 to 2027, growing at a compound annual growth rate (CAGR) of 24.53 percent (Wirsbinna *et al.*, 2023).

In this context, the Smart Cities Mission, launched by the Indian government in 2015, aims to transform 100 cities into world-class urban hubs by integrating technology and big data to enhance public services and infrastructure (Praharaj *et al.*, 2018). The selection of cities for the Smart City Mission was conducted in three phases (Manazir, 2024). As part of a broader nation-building strategy, it aligns with initiatives like Digital India, BharatNet, and the promotion of cashless economies, focusing on digitalising governance, healthcare, and citizen engagement (Chatterji, 2017). Despite its ambitious goals, the rollout faces significant challenges, including inadequate infrastructure, connectivity gaps, low digital literacy, financial constraints, and slow technology acceptance, which hinder the effectiveness of smart solutions (Samuel *et al.*, 2020). This presents challenges for policymakers aspiring to make their cities 'smart', as they are confronted with varying needs and expectations of what a smart city should be (McDuie-Ra and Lai, 2019). However, the successful realisation of the smart city vision depends on the acceptance of its residents.

Kerala state leads in development indicators such as the SDG India Index, Health Index, and School Education Quality Index (Aayog, 2021). Thiruvananthapuram, Kochi, Kozhikode, and Thrissur are part of India's Smart Cities Mission (Hundert and Library, 2024). The Kerala Solution for Managing Administrative Reformation and Transformation (KSMART) platform provides multiple services through ten separate apps, allowing citizens to access information and services from municipal departments in one place. It facilitates efficient and timely services across various devices, including desktop computers, laptops, smartphones, and tablets, making these services an integral part of daily life. Moreover, KSMART streamlines processes reduces delays, and enhances transparency and efficiency. Despite this, K-SMART's availability on Google Play and the App Store underscores its potential as a model for efficient and inclusive governance (LSGD, 2024; Joseph, 2023). The city's commitment to smartness and extensive experience with smart projects make this case relevant to the study. Consequently, policymakers must understand this to craft strategies that ensure effective and transparent public service delivery.

When considering significant investments, it is essential to assess citizens' attitudes towards smart city projects (Zahid and Din, 2019). While smart cities can offer users easier and faster access to services around the clock, the implementation of these concepts encounters new challenges, notably trust concerns (Bélanger and Carter, 2008) and a lack of digital literacy (Sharma *et al.*, 2021). Moreover, the perceived usefulness of smart city technologies is critical; citizens are more inclined to support these initiatives when they recognise tangible benefits, such as increased convenience, improved safety, reduced costs, and heightened efficiency in their daily lives. Furthermore, the ease of using these technologies is pivotal in shaping behavioural intentions (Puthur *et al.*, 2020). Residents are more likely to embrace smart city solutions that are intuitive, user-friendly, and require minimal effort. Since citizens are the users of the services, it is vitally important that their ideas and perspectives are considered during the planning and management of such services. The more they use the

services, the higher their quality of life. Building on these concepts and drawing on a survey in Kerala, India, this research employs an empirical approach with SEM-PLS to address the significant questions below:

*RQ1:* Which factors most influence citizens' readiness to embrace smart city services?

*RQ2:* How do attitudes influence the acceptance of smart city services?

*RQ3:* How significantly does trust shape citizens' attitudes and the acceptance of smart services?

The paper outlines a theoretical framework, proposes a conceptual model and hypotheses, discusses the research methodology, and presents findings, recommendations, and a conclusion.

## Theoretical framework

This study uses an integrated theoretical framework to analyse the factors influencing the acceptance of smart services, building upon the Technology Acceptance Model (TAM) while incorporating elements from the Theory of Reasoned Action (TRA), Social Cognitive Theory (SCT), and Trust Theory. The proposed model, as illustrated above, aims to provide a comprehensive understanding of citizen acceptance of smart services by combining constructs from multiple theoretical perspectives. There are several reasons for using these theories. First, they address all the key factors affecting smart systems. Second, these are interconnected and under-utilised in smart services research, making it important to understand their relevance and effectiveness. Third, these theories provide insights into what drives citizens to accept new information systems, demonstrating their value in the context of smart services. Lastly, these theories are relevant because they focus on key principles like efficiency, accountability, capability, and performance (Pomeranz and Stedman, 2020) which are essential for good governance. Thus, the proposed research model hypothesises the following relationships.

## Conceptual model and hypotheses development

*Perceived Usefulness (PU)*: The construct is about the intention to use smart services, and it suggests that these must be useful and meet citizens' needs. It concerns how convenient, effective, accessible, and useful the services are and the time spent on processing (Davis, 1989; Susanto and Aljoza, 2015). Citizens utilise smart apps to access public services due to perceived tangible benefits like cost savings, effort, and time reduction. The theory of reasoned action and planned behaviour proposes that perceived usefulness (PU) and perceived ease of use (PEOU) influence a person's attitude toward technology, which in turn affects their intention to use it (Ajzen *et al.*, 1980; Ajzen, 1991; Cooke and French, 2008). In brief, research indicates that perceived usefulness (PU) influences citizens' willingness to use smart services. Hence, it has been suggested that:

H1. Perceived usefulness (PU) has a direct impact on citizen acceptance (CA) of smart city services.

*Perceived Ease of Use (PEOU):* Perceived ease of use (PEOU) refers to the extent to which people believe that using a smart service requires minimal effort. It is the first thing citizens consider when deciding whether to use new technology (Davis, 1989; Zhao *et al.*, 2019). When citizens find it easy to use smart service, their decisions regarding these services improve. Studies have found that PEOU positively influences attitudes (Dash and Mohanty, 2023). The hypothesis is:

H2. The PEOU and CA have a robust and positive relationship in the intention of smart services.

*Self-efficacy (SE)* is how confident a person feels about using a device for a service (Compeau and Higgins, 1995). For example, if citizens are confident in using smart services, they are likely to have a positive attitude and be more willing to use them. On the other hand, citizens with low self-efficacy may find it difficult to use smart services. This affects whether an individual decides to use smart services. The empirical research by Gudek (2019) investigated self-efficacy and attitudes towards digital technology. The study finds a strong link between self-efficacy and attitudes towards digital technology, suggesting that high self-efficacy can increase people's willingness to use smart services.

H3. The higher level of SE positively influences citizens' attitudes towards smart services

*Citizen attitude*

Individual attitudes greatly impact the intention to use something. Positive or negative feelings influence the decision. Attitude towards intention reflects how much a person values the behaviour (Ajzen, 1991). Attitude towards smart services is the user's positive or negative view of using them. Studies show the link between attitude and intention (Xin *et al.*, 2022). Scholars have debated whether attitude fully mediates beliefs (Taylor and Todd, 1995). Davis (1989) did not find that attitudes completely mediate the relationship between perceived usefulness, perceived ease of use, and users' intention to use technology. In the workplace, people may start using technology even if they do not hold a positive opinion. This study uses self-efficacy to shape attitudes toward local smart services. According to Roy *et al.* (2015), a user's attitude towards accepting a technology is influenced by both perceived usefulness (PU) and perceived ease of use (PEOU). Thus, these direct and mediation hypotheses are suggested:

H4. A direct and positive relationship exists between citizen attitude (CA) and the intention to accept smart services.

H4a. Citizen Attitude (CA) positively mediates the relationship between perceived usefulness (PU) and the intention to adopt smart city services.

H4b. Citizen Attitude (CA) enhances the effect of perceived ease of use (PEOU) on the decision to adopt smart city services.

H4c. Citizen Attitude (CA) strengthens the effect of self-efficacy (SE) on the decision to adopt smart city services.

*E-government Trust: trust in the government, trust in the smart app*

Governments worldwide are shifting services online to improve efficiency and accessibility. Trust in these platforms is crucial for the success of smart services. However, public trust is declining due to administration, politics, economics, and media. People's perceptions of policies, expectations, and influence in technology decision-making contribute to trust in smart cities (Bélanger and Carter, 2008). Therefore, several studies conclude that trust is essential for citizens to accept smart services (Zahid and Din, 2019; Hakeem and Sulphey, 2024). These scholars view trust as a measure of citizens' willingness to follow, cooperate with, adopt, and support government policies and new technologies. Hence, trust is hypothesised as follows:

H5. Greater trust in e-government leads to a more favourable decision to use smart app services.

H6. E-government positively influences the link between attitude and the decision to use smart services.

Testing this model, as shown in Figure 1, will demonstrate how attitude, trust, self-efficacy, and user beliefs affect the intention to use smart services.

*Intention to accept smart app services*

Behavioural intention measures the strength of a person's desire to engage in a specific behaviour. According to research by Ajzen (1991) and (Taylor and Todd, 1995), the intentions of citizens play a significant role in determining the acceptance of e-services. This measurement encompasses both the intention to use and the anticipated uptake of smart services. A strong intention (i.e., the decision to use the technology) indicates positive "acceptance". However, this study does not distinguish between "intentions to use", "acceptance", and "adoption". In short, intentions drive and influence citizens to engage in certain behaviours.

## Methodology

*Participant recruitment and survey administration*

The survey was conducted in urban and semi-urban areas of Kerala, India, where smart apps are increasingly being adopted. Participants included employees and citizen representatives from local agencies who are familiar with smart practices. The 19-question survey was divided into two sections: demographic information and measurement scales. Experts reviewed the survey for validity, and a pilot test with 25 participants helped refine the questions. Administered offline through municipal authorities for greater accessibility, participants were informed about the study's purpose and assured of confidentiality. Out of 800 questionnaires distributed, 407 were valid after excluding incomplete responses (Table 1). The sample was gender-balanced, with 47.97 male and 50.98 percent female participants and a median age of 40.41 years (range: 20-59). Since all participants were employed in the public sector, the findings are particularly relevant to their perspectives on smart app acceptance. The study measured perceived usefulness (PU), perceived ease of use (PEOU), self-efficacy (SE), citizen attitude (CA), e-government trust (EGT), and intention to use e-services (IAE), grounded in established theories like TAM, social cognitive theory, and trust theory. Responses were rated on a five-point Likert scale.

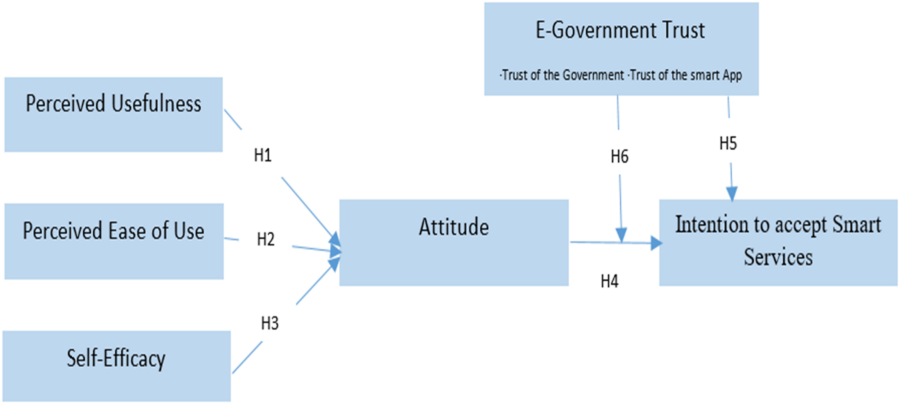


**Figure 1.** Research model
Source: By authors

**Table 1.** Profile of Respondents

| *Items* | *Characteristics* | *Frequency* | *Percentage (%)* |
|---|---|---|---|
| Gender | Male | 195 | 48 |
| | Female | 208 | 52 |
| Age | 18-28 | 37 | 9 |
| Distribution (years) | 29-40 | 166 | 41 |
| | 41-51 | 169 | 41 |
| | Above 52 | 35 | 9 |
| Organisation Category | Municipal Corporation | 152 | 38 |
| | Municipalities | 127 | 31 |
| | Zonal Offices | 42 | 10 |
| | Others | 86 | 21 |

Source: By authors

## Results

Data were analysed using Smart PLS version 4.1 with structural equation modelling (SEM). The study followed two phases. First, the reliability and validity of the measurement model were assessed. Then, the structural model and study hypotheses were tested.

### *Measurement model*

The measurement model was evaluated for reliability and validity and assessed the internal consistency, convergent validity, and discriminant validity of the constructs and their related items (Table 2).

### *Reliability and validity analysis*

The study evaluated the reliability of variables using Cronbach's alpha (α) and Composite Reliability (CR). According to Hair *et al.* (2021), a scale is considered reliable if both Cronbach's alpha and CR are above 0.7. All six constructs in this study demonstrated high

**Table 2.** Measures of Reliability and Validity

| Variable | Indicators | FL | Cronbach's α | CR | AVE |
|---|---|---|---|---|---|
| Perceived Usefulness (PU) | PU1 | 0.839 | 0.841 | 0.904 | 0.758 |
| | PU2 | 0.904 | | | |
| | PU3 | 0.868 | | | |
| Perceived Ease of Use (PEOU) | PEOU1 | 0.915 | 0.875 | 0.923 | 0.800 |
| | PEOU2 | 0.910 | | | |
| | PEOU3 | 0.857 | | | |
| Self-Efficacy (SE) | SE1 | 0.914 | 0.779 | 0.900 | 0.818 |
| | SE2 | 0.895 | | | |
| Citizen Attitude (CA) | CA1 | 0.879 | 0.869 | 0.920 | 0.792 |
| | CA2 | 0.900 | | | |
| | CA3 | 0.891 | | | |
| E-Governance Trust (EGT) | EGT1 | 0.932 | 0.851 | 0.931 | 0.870 |
| | EGT2 | 0.934 | | | |
| Intention to Accept E-Gov (IAE) | IAE1 | 0.840 | 0.859 | 0.914 | 0.780 |
| | IAE2 | 0.897 | | | |
| | IAE3 | 0.911 | | | |

Source: By authors

reliability, with Cronbach's alpha ranging from 0.779 to 0.875 and CR values between 0.90 and 0.93.

Convergent validity was assessed using Composite Reliability (CR) and Factor Loadings (FL), which check how well items match their underlying constructs. All factor loadings were significant, and no items were removed. Additionally, the Average Variance Extracted (AVE) and FL values for all items exceeded the recommended thresholds of 0.5 and 0.7, respectively, according to Hair *et al.* (2016).

The discriminant validity was tested using the Fornell-Larcker criterion and cross-loadings, confirming that the measures were distinct (Table 3). Factor loadings were higher than cross-loadings, supporting the validity of the constructs and allowing further testing of the hypotheses.

*Structural model*

The structural model was assessed using several metrics, including $R^2$, $Q^2$, path coefficients (β), effect size ($f^2$), and SRMR. The variance inflation factor (VIF) was used to check for collinearity. VIF values between 1.689 and 2.54 showed no multicollinearity issues.

$R^2$ was used to evaluate the model's performance. Attitude (ATT) had an $R^2$ of 63.4, indicating a strong explanation of variance. Together, ATT and E-Government Trust (EGT) explained 60.8 percent of the variance in the intention to adopt smart services (IAE), demonstrating good predictive power.

$Q^2$ (Stone-Geisser test) assessed the model's predictive relevance. The model demonstrated strong predictive ability with $Q^2$ values of 0.627 for ATT and 0.615 for IAE.

Effect sizes ($f^2$) showed the impact of constructs on IAE. Most key constructs (PU, PEOU, SE, ATT, EGT) had significant effects on IAE. The model fit was evaluated using SRMR, with a value of 0.048, confirming a good fit.

*Hypotheses testing*

Table 4 highlights the direct relationships between variables in the model, with path coefficients indicating the strength and direction of these relationships. For instance, the path PU → ATT has a coefficient of 0.255, meaning PU (independent variable) explains 25.5% of the variation in ATT (dependent variable). The beta coefficients (β values) quantify the strength of these effects.

In the first analysis, PU ($\beta = 0.255$, $p < 0.001$), PEOU ($\beta = 0.256$, $p < 0.001$), and SE ($\beta = 0.400$, $p < 0.001$) all showed significant positive effects on ATT, collectively explaining 63.4% ($R^2 = 0.634$) of its variance. These results support hypotheses H1, H2, and H3. In the second analysis, ATT ($\beta = 0.524$, $p < 0.001$) and EGT ($\beta = 0.294$, $p < 0.001$) significantly

**Table 3.** Discriminant Validity

| Construct | PU | PEOU | SE | CA | EGT | IAE |
|---|---|---|---|---|---|---|
| PU | ***0.871*** | | | | | |
| PEOU | 0.767 | ***0.895*** | | | | |
| SE | 0.617 | 0.579 | ***0.905*** | | | |
| CA | 0.698 | 0.683 | 0.705 | ***0.890*** | | |
| EGT | 0.696 | 0.680 | 0.548 | 0.671 | ***0.933*** | |
| IAE | 0.702 | 0.641 | 0.709 | 0.746 | 0.663 | ***0.883*** |

Note: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Self-Efficacy (SE), Citizen Attitude (CA), E-Gov/Smart Gov Trust (EGT), Intention to Adopt E-Gov (IAE)
Source: By authors

**Table 4.** The Results of the PLS Structural Model

| H# Direct Relationship | Beta | SD | t Value | p-Value | Supported |
|---|---|---|---|---|---|
| ***H1***: PU → ATT | 0.255 | 0.061 | 4.213 | 0.000 | Yes |
| ***H2***: PEOU → ATT | 0.256 | 0.058 | 4.441 | 0.000 | Yes |
| ***H3***: SE → ATT | 0.400 | 0.052 | 7.638 | 0.000 | Yes |
| ***H4***: ATT → IAEG | 0.524 | 0.059 | 8.933 | 0.000 | Yes |
| ***H5***: EGT → IAEG | 0.294 | 0.057 | 5.149 | 0.000 | Yes |
| ***H6***: (ATT*EGT) -> IAE | -0.036 | 0.019 | 1.861 | 0.031 | No |
| Results of $R^2$, $Q^2$, and $f^2$ | Endogenous latent variables | | $R^2$ | $Q^2$ | $f^2$ |
| | Attitude (ATT) | | 0.634 | 0.627 | 0.351 |
| | Intention to Adopt Local E-Government (IAE) | | 0.608 | 0.615 | 0.009 |

Note: ATT = Attitude, EGT = E-Gov/Smart Gov Trust, IAE = Intention to Adopt E-Gov, DV = Dependent Variable, B = Beta Coefficient, SE = Standard Error, T = t-Statistics, P = Probability Value. * indicates significant relationships at P < 0.001.
Source: By authors

influenced IAE, supporting hypotheses H4 and H5. However, the trust in government factor (H6) showed a negligible negative effect (β = -0.036, p = 0.031), indicating that users' attitudes are shaped more by app-specific factors than by trust in governing institutions, thus rejecting H6.

These findings validate the structural model, as depicted in Figure 2, which presents the path coefficients, significance levels, and explained variances ($R^2$).

Figure 2 illustrates how various factors influence the acceptance of smart app services. Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Self-Efficacy (SE) positively affect Attitude (ATT), with path coefficients of 0.255, 0.256, and 0.400, respectively. Together, these factors explain 63.4 per cent ($R^2$ = 0.634) of the variation in attitude, showing their

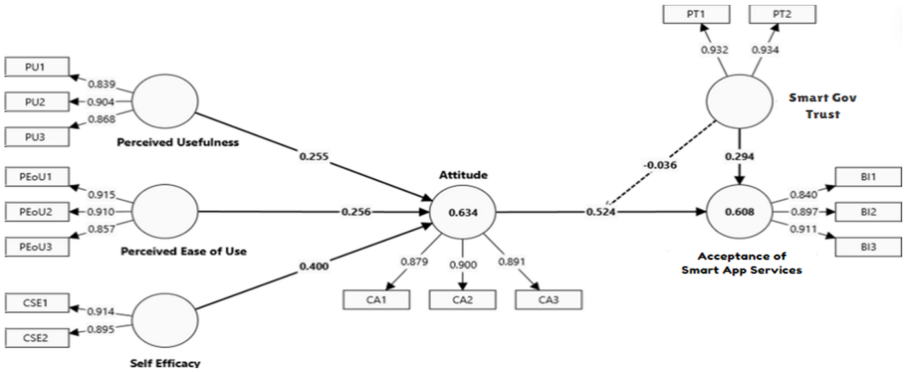


**Figure 2.** PLS structural model analysis
Notes: Path coefficients are denoted on the lines of the arrows, and significant values are enclosed within brackets. R-squared values are represented within circles on the arrows, with corresponding significant values enclosed in brackets. Single-lined Arrows: Indicate direct relationships between constructs (e.g., Perceived Usefulness → Attitude). Dashed Arrows: Represent interaction effects or moderating relationships (e.g., Smart Gov Trust moderates the relationship between Attitude and Acceptance of Smart App Services)
Source: By authors

strong impact. Attitude, in turn, significantly influences the acceptance of smart app services (IAE), with a path coefficient of 0.524, accounting for 60.8 per cent ($R^2 = 0.608$) of its variation. Additionally, Smart Government Trust has a direct positive effect on acceptance, with a path coefficient of 0.294, highlighting the key role trust in government plays in users' adoption intentions.

The overall model implications emphasise several key factors. First, the model identifies attitude as the central mediator between independent constructs, including perceived usefulness (PU), perceived ease of use (PEoU), computer self-efficacy (SE), and the dependent construct, which is the acceptance of smart app services. Notably, self-efficacy emerges as the most influential antecedent of attitude, indicating that empowering users with technical skills is crucial for enhancing their acceptance of these services. Trust also plays a significant role in user behaviour, as Smart Government Trust directly impacts acceptance; however, its moderating role appears negligible in shaping attitudes. This suggests that users may accept smart apps based on trust even when their attitude is neutral or indifferent. The robustness and validity of the model are supported by high factor loadings across all constructs and significant path coefficients, reinforcing the model's effectiveness. The strong $R^2$ values of 0.634 and 0.608 further confirm the robustness of the model as they indicate that the predictors explain a substantial portion of the variance in the dependent variables.

*Moderation effect*

This study explored whether Smart Government Trust influences the link between Attitude and E-Government Trust (ATT * EGT → IAE). The dashed arrow in the model represents this potential effect. However, the path coefficient (-0.036) is very small, indicating that trust has little to no impact as a moderator. Without considering this moderating role, the model showed that Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Self-Efficacy (SE) accounted for 63.4 percent of the variation in Attitude ($R^2 = 0.634$). Adding the interaction term slightly reduced this to 63.2 percent ($R^2 = 0.632$). The results suggest that higher trust in e-government slightly weakens the relationship between Attitude and the Intention to Adopt E-Government (IAE) ($\beta = -0.036$, $t = 1.861$, $p < 0.031$). According to Cohen's scale, the effect size ($f^2 = 0.009$) is negligible, indicating that trust has minimal influence on digital attitudes in India (Table 4).

*Mediation effect*

In Table 5, a mediation analysis was conducted to explore how Attitude (ATT) affects the relationship between other factors and the acceptance of smart app services (IAE). The indirect

**Table 5.** Mediation Analysis Results for H4a-H4c

| | Direct effect | | | Specific Indirect effects | | | Total effects | | | 95% CL Lower, Upper | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H | β | T | P | β | T | P | β | T | P | | Supported |
| H4a | 0.255 | 4.213 | 0.000 | 0.133 | 3.716 | 0.000 | 0.133 | 3.716 | 0.000 | (0.079, 0.197) | Yes |
| H4b | 0.256 | 4.441 | 0.000 | 0.134 | 3.836 | 0.000 | 0.134 | 3.836 | 0.000 | (0.083, 0.198) | Yes |
| H4c | 0.400 | 7.638 | 0.000 | 0.209 | 5.615 | 0.000 | 0.209 | 5.615 | 0.000 | (0.153, 0.277) | Yes |

*Note: Percentile bootstrap 95% confidence Interval, (n=5000), p<0.001, IV=PU, PEOU, SE, M=ATT DV= IAE*

Source: By authors

effect of Perceived Usefulness (PU) on IAE through ATT was measured using techniques from Preacher and Hayes (2008). The analysis showed that PU significantly influences IAE through ATT (H4a: $\beta = 0.133$, $t = 3.716$, $p < 0.001$).

ATT also has a direct positive effect on IAE ($\beta = 0.524$, $t = 8.933$, $p < 0.001$). Even with ATT as a mediator, PU still significantly impacts IAE ($\beta = 0.255$, $t = 4.213$, $p < 0.001$). Perceived Ease of Use (PEOU) and Self-Efficacy (SE) significantly predict IAE. This confirms that ATT partially mediates the effects of PU, PEOU, and SE on IAE, supporting hypotheses H4a, H4b, and H4c.

**Discussion**

This paper presents scholarly contributions to public administration and digital government literature. The study explores the factors influencing the acceptance of Indian smart city services. The model developed combines six variables, such as perceived usefulness, perceived ease of use, self-efficacy, attitude, e-government trust, and behavioural intention. The hypothesis results indicated that there are significant links between all relationships supporting the hypotheses, except H6.

The study finds that *perceived usefulness (PU), and perceived ease of use (PEOU),* positively influence citizens' attitudes toward accepting the smart system. Compared to the studies conducted by Davis (1989) which says that PU and PEOU affect an individual's intention to use a smart system, this study shows that perceived usefulness and perceived ease of use would positively influence their attitude or positive liking for the smart system.

*Self-efficacy* has a strong, positive relationship with attitudes, indicating that individuals comfortable with such technologies are more likely to use them. Similar to findings by Compeau and Higgins (1995) and Bandura (1999), this study confirms that computer self-efficacy significantly influences users' intention to reuse smart services. Those confident in using computers are more likely to continue using systems like the K-smart app. Since most respondents were computer and internet literate, this relationship was evident.

The positive and significant influence of *attitude* ($\beta = 0.524$) on behavioural intention indicates that users with a more positive attitude toward the smart service are likely to use the system. This shows that attitude strongly mediates beliefs (PU, PEOU), self-efficacy (SE), and the intention of smart services. The strong impact of attitude aligns with the Theory of Reasoned Action (Ajzen *et al.*, 1980) and the theory of planned behaviour (Taylor and Todd, 1995). The direct and strong role of attitudes as a determinant is consistent with prior empirical research on e-government adoption (Alarabiat *et al.*, 2021). A positive attitude significantly enhances the intention to use smart systems. This study found a strong link between attitude and behavioural intention, showing that positive attitudes toward the K-smart system lead to favourable usage intentions. Key factors influencing attitudes include perceived utility, ease of use, and self-efficacy, with attitude (ATT) partially mediating their impact on acceptance intentions. To improve smart services, Indian city administrations should raise awareness, provide training, and adapt IT systems to better meet citizens' needs, fostering greater acceptance and usage of these technologies.

*Trust in e-government directly* influences users' acceptance of smart services, as highlighted by the analysis ($\beta = 0.294$). Trust fosters confidence, motivating users to engage with these platforms, even when factors like attitude ($\beta = 0.524$) are stronger. This aligns with the foundational work of (Bélanger and Carter, 2008) which emphasises trust as a key enabler in reducing perceived risks and uncertainty. Without trust, Indians are less likely to use smart services, emphasising their importance as a direct driver of intention. Unlike traditional face-to-face interactions, where users can observe service providers' behaviour, trust in smart systems reassures users about ethical practices and data security (Chen and Aklikokou, 2020). While previous empirical studies (Hooda *et al.*, 2022; Zahid and Din, 2019), highlight the indirect impact of trust on intention, our study reveals that e-government Trust directly influences users' intention, addressing existing gaps and contributing to a deeper

understanding of this relationship. Trust not only boosts confidence but also strengthens relationships with users, ensuring sustained use and behavioural intention. Hence, Indian city governments should prioritize trust-building initiatives to enhance user engagement and long-term acceptance.

*E-government trust* has a minimal effect on the relationship between attitude and acceptance intention (β = -0.036). This contrasts with studies like (Xin *et al*., 2022), which highlight trust as a key factor influencing attitudes and intentions in e-government adoption in regions with higher levels of digital trust. This difference emphasizes the importance of adapting theoretical frameworks to specific sociocultural and technological contexts.

The weak moderating role of trust in this study is due to two main factors. First, Indian citizens prioritise factors like perceived usefulness (β = 0.255), perceived ease of use (β = 0.256), and computer self-efficacy (β = 0.400), which have a stronger influence on attitude and acceptance, diminishing the role of trust. Second, in India, trust often serves as a baseline expectation in well-established smart platforms rather than a decisive factor in acceptance decisions in India. Therefore, fostering positive attitudes toward the system may be more effective in increasing acceptance than relying only on trust.

## Recommendations

To improve smart service acceptance, policymakers should emphasise benefits like easier complaint filing and faster resolutions, especially in areas with frequent issues. Communication strategies must highlight these advantages while offering user-friendly designs with step-by-step guides, demo videos, and multilingual options. Public support centres, free training sessions, and outreach programs led by local champions can build user confidence. Establishing trust is critical to addressing security and privacy concerns, which can be achieved through transparent app development and citizen involvement. Reliable, secure, and user-friendly apps should prioritise data handling awareness, supported by online tutorials, public facilities, and demo sessions, fostering trust and long-term acceptance.

Self-efficacy is pivotal in shaping user attitudes and acceptance of smart systems. Citizens with higher self-efficacy find these systems easier to use, underscoring the importance of initiatives to enhance digital skills and confidence. Smart app designs must incorporate built-in help features and opportunities for hands-on experience. Targeting high self-efficacy groups can further encourage adoption, particularly of systems like K-smart.

Sharing success stories, improving services based on user feedback, and demonstrating responsiveness can cultivate positive attitudes toward smart apps. Ensuring data privacy, conducting independent audits, and implementing effective grievance mechanisms can strengthen trust in e-government services. Tailored app designs addressing specific community needs and localised outreach can resolve trust deficits in less digitally adept regions.

Digital literacy must be expanded through national campaigns in collaboration with schools, colleges, and NGOs, focusing on marginalised groups. Trust-building features like real-time status updates, feedback integration, and support from community leaders can further reinforce confidence and boost usage.

## Conclusion

This study aims to examine the acceptance of smart services using the extended TAM. We added constructs of self-efficacy and trust to the proposed research model. The model hypothesised nine relationships among six selected constructs and was found to be significant. The empirical findings of the study are a step forward towards filling the research gap where any other research study on smart app acceptance has not performed the validation of this model. The proposed model was found to be ultimate and acceptable, following the measurement and structural model testing requirements. As governments at the state and

central levels have started spending to implement and maintain several smart government initiatives in the country, they must understand the factors explained above and make the necessary arrangements to enhance the acceptance of the smart system at their levels. This research also helps governments consider the anxiety levels of their citizens and explore all possible ways to minimise them, thereby enhancing the smart app system.

The findings emphasise the importance of self-efficacy, attitude, and perceived ease of use in encouraging the acceptance of smart city solutions. To ensure widespread acceptance, policymakers must focus on improving infrastructure and implementing public awareness campaigns that highlight these factors. Data and insights derived from smart services can steer urban planning and policy formulation, promoting sustainable and effective solutions. Initiatives for public education should be launched to develop positive attitudes towards smart services, thus creating a favourable environment for their acceptance and utilisation.

Attitude plays a significant role in shaping behavioural intentions, which necessitates that policymakers work to foster positive perceptions. This can be accomplished through user-centred designs, awareness initiatives, and educational programmes. Strengthening self-efficacy and nurturing positive attitudes are crucial for enhancing the effective use of smart services among citizens.

Smart systems have the transformative capacity to improve the lives of individuals living in poverty by promptly addressing their issues and ensuring justice. A free press is essential in revealing corruption and informing the public about legal actions against corrupt officials, which bolsters accountability and fosters trust in governance. A strong judicial system is also key to safeguarding journalists and prosecuting criminal activities, so as to maintain the integrity of smart systems.

In urban India, the integration of smart systems via common service centres should be a governmental priority. It is critical to raise awareness among marginalised groups whose issues are frequently overlooked to maximise the system's effectiveness. A nationwide campaign tackling widespread societal challenges could launch with considerable impact, demonstrating the government's commitment to addressing grievances and building public trust. Policymakers can promote inclusive and effective governance that benefits all citizens by confronting systemic challenges and utilising smart solutions.

This study developed and validated an extended Technology Acceptance Model (TAM) for smart service adoption. However, some limitations have to be noted. First, the research focused on Indian citizens using smart city services, limiting its applicability to other contexts, especially developed countries. Future studies should include developed nations to enable comparative analysis and broader generalisations. Second, the model explains 60.8 percent of the variance in behavioural intentions, leaving rooms for improvement. Future research could incorporate factors such as cultural, technological, and institutional influences, as well as demographic variables like gender, age, and income, to make the model more comprehensive. Third, trust had a weak moderating effect in this study, suggesting the need for further exploration. Researchers should examine how cultural, technological, and institutional contexts shape trust in similar settings. Additionally, studying the impact of different technologies with unique features on citizen acceptance could offer deeper insights. Lastly, the study used cross-sectional data from potential users, including employees and representatives from various Indian cities. Future research could test the model in specific cultural and geographical settings and employ longitudinal data to understand its effectiveness over time with ordinary citizens. This approach would provide a more detailed view of user behaviour across diverse contexts and extended periods.

**References**

Aayog (2021), *India National Multidimensional Poverty Index: Baseline Report Based on NGHS-4 (2015-16)*, NITI Aayog, New Delhi.

Ajzen, I. (1991), "The theory of planned behavior", *Organizational Behavior and Human Decision Processes*, Vol. 50 No. 2, pp. 179-211.

Ajzen, I., Fishbein, M., Heilbroner, R.L. and Thurow, L.C. (1980), *Understanding Attitudes and Predicting Social Behavior*, Prentice-Hall Inc, Hoboken, NJ, pp. 308-315.

Alarabiat, A., Soares, D. and Estevez, E. (2021), "Determinants of citizens' intention to engage in government-led electronic participation initiatives through Facebook", *Government Information Quarterly*, Vol. 38 No. 1, pp. 1-15.

Anthopoulos, L., Sirakoulis, K. and Reddick, C.G. (2022), "Conceptualizing smart government: interrelations and reciprocities with smart city", *Digital Government: Research and Practice*, Vol. 2 No 4, pp. 1-28.

Bandura, A. (1999), "A social cognitive theory of personality", Pervin, L. and John, O. (Eds.), *Handbook of Personality*, Guilford Publications, New York, NY, pp. 154-196.

Bélanger, F. and Carter, L. (2008), "Trust and risk in e-government adoption", *The Journal of Strategic Information Systems*, Vol. 17 No 2, pp. 165-176.

Chatterji, T. (2017), "Digital urbanism in a transitional economy–a review of India's municipal e-governance policy", *Journal of Asian Public Policy*, Vol. 11 No. 3, pp. 334-349.

Chen, L. and Aklikokou, A.K. (2020), "Determinants of e-government adoption: testing the mediating effects of perceived usefulness and perceived ease of use", *International Journal of Public Administration*, Vol. 43 No. 10, pp. 850-865.

Clement, D.J. and Crutzen, P.N. (2021), "How local policy priorities set the smart city agenda", *Technological Forecasting and Social Change*, Vol. 171, pp. 1-11.

Compeau, D.R. and Higgins, C.A. (1995), "Computer self-efficacy: development of a measure and initial test", *MIS Quarterly: Management Information Systems*, Vol. 19 No. 2, pp.189-210.

Cooke, R. and French, D.P. (2008), "How well do the theory of reasoned action and theory of planned behaviour predict intentions and attendance at screening programmes? A meta-analysis", *Psychology and Health*, Vol. 23 No. 7, pp. 745-765.

Dash, A. and Mohanty, S.K. (2023), "Technology readiness and the older citizens' acceptance of m-health services in India digital policy", *Regulation and Governance*, Vol. 25 No. 2, pp. 169-183.

Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly: Management Information Systems*, Vol. 13 No. 3, pp. 319-339.

Gudek, B. (2019), "Computer self-efficacy perceptions of music teacher candidates and their attitudes towards digital technology", *European Journal of Educational Research*, Vol. 8 No. 3, pp. 683-696.

Hair, J.F., Sarstedt, M., Matthews, L.M. and Ringle, C.M. (2016), "Identifying and treating unobserved heterogeneity with FIMIX-PLS: part I – method", *European Business Review*, Vol. 28 No. 1, pp. 63-76.

Hair, J.F., Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2021), *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, Sage Publications, Los Angeles, CA.

Hakeem, M.J. and Sulphey, M.M. (2024), "Investigating the adoption of smart local government services: the impact of service quality, trust, and social influence", *Transforming Government: People, Process and Policy*, Vol. 18 No. 4, pp. 785-802.

Hooda, A., Gupta, P., Jeyaraj, A., Giannakis, M. and Dwivedi, Y.K. (2022), "The effects of trust on behavioral intention and use behavior within e-government contexts", *International Journal of Information Management*, Vol. 67, pp. 1-13.

Hundert, H. and Library, C. (2024), "Ensuring sustainable urban governance: insights from service delivery in Kerala", *Kerala Economy*, Vol. 5 No. 2, pp. 28-47.

Joseph, M. (2023), *Kerala Municipal e-Governance Study, Field Report*, eGov Foundation, Kerala, pp. 1-25.

Local Self Government Department (LSGD) (2024), "Ksmart - delivering digital happiness", available at: https://ksmart.lsgkerala.gov.in/ui/web-portal (accessed 10 April 2025).

Manazir, S.H. (2024), "Abstruse characteristics of people participation: an analysis of the smart city campaign over myGov platform in India", *International Journal of Public Administration*, Vol. 47 No. 16, pp. 1091-1109.

McDuie-Ra, D. and Lai, L. (2019), "Smart cities, backward frontiers: digital urbanism in India's north-east", *Contemporary South Asia*, Vol. 27 No. 3, pp. 358-372.

Pomeranz, E.F. and Stedman, R.C. (2020), "Measuring good governance: piloting an instrument for evaluating good governance principles", *Journal of Environmental Policy and Planning*, Vol. 22 No. 3, pp. 428-440.

Praharaj, S., Han, J.H. and Hawken, S. (2018), "Towards the right model of smart city governance in India", *International Journal of Sustainable Development and Planning*, Vol. 13 No. 2, pp. 171-186.

Preacher, K.J. and Hayes, A.F. (2008), "Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models", *Behaviour Research Methods*, Vol. 40 No. 3, pp. 879-891.

Puthur, J.K., George, A.P. and Mahadevan, L. (2020), "Understanding citizen's continuance intention to use e-government services: the case of the Indian railway e-ticket booking site", *International Journal of Business Information Systems*, Vol. 34 No. 2, pp. 183-203.

Roy, M.C., Chartier, A., Crête, J. and Poulin, D. (2015), "Factors influencing e-government use in non-urban areas", *Electronic Commerce Research*, Vol. 15 No. 3, pp. 349-363.

Samuel, M., Doctor, G., Christian, P. and Baradi, M. (2020), "Drivers and barriers to e-government adoption in Indian cities", *Journal of Urban Management*, Vol. 9 No. 4, pp. 408-417.

Sharma, S.K., Metri, B., Dwivedi, Y.K. and Rana, N.P. (2021), "Challenges common service centers (CSCs) face in delivering e-government services in rural India", *Government Information Quarterly Journal*, Vol. 38, pp. 1-14.

Susanto, T.D. and Aljoza, M. (2015), "Individual acceptance of e-Government services in a developing country: dimensions of perceived usefulness and perceived ease of use and the importance of trust and social influence", *Procedia Computer Science*, Vol. 72, pp. 622-629.

Taylor, S. and Todd, P.A. (1995), "Understanding information technology usage: a test of competing models", *Information System Research*, Vol. 6 No. 2, pp. 144-176.

Wirsbinna, A., Grega, L. and Juenger, M. (2023), "Assessing factors influencing citizens' behavioral intention towards smart city living", *Smart Cities*, Vol. 6 No. 6, pp. 3093-3111.

Xin, Y., Dilanchiev, A., Ali, M., Irfan, M. and Hong, Y. (2022), "Assessing citizens' attitudes and intentions to adopt e-government services: a roadmap toward sustainable development", *Sustainability*, Vol. 14 No. 22, pp. 1-15.

Zahid, H. and Din, B.H. (2019), "Determinants of intention to adopt e-government services in Pakistan: an imperative for sustainable development", *Resources*, Vol. 8 No. 3, pp. 1-25.

Zhao, F., Naidu, S. and Wallis, J. (2019), "An empirical study of e-government adoption in the United Arab Emirates: a social cognitive perspective", *Information Polity*, Vol. 24 No. 1, pp. 91-109.

**About the authors**

M.J. Hakeem is a final year PhD student at the Public Administration Section of the Department of Political Science, Kerala University, India. His research interests are e-governance, public administration, and the environment. He holds a BA in Economics and an MBA from Indian universities. He has varied work experience in teaching and leading projects. M.J. Hakeem is the corresponding author and can be contacted at: muffaker.hakim@gmail.com

M.M. Sulphey is a Professor at the College of Business Administration, Prince Sattam Bin Abdulaziz University, Al-Kharj, Saudi Arabia. With ample experience in the industry and academics, he has published over a hundred research papers in national and international journals on various topics on human resources, business ethics, and business administration.