



PERCEPTION IN SMART CITY IMPLEMENTATION: A COMPARATIVE STUDY OF DAVANGERE AND BELAGAVI CITIES

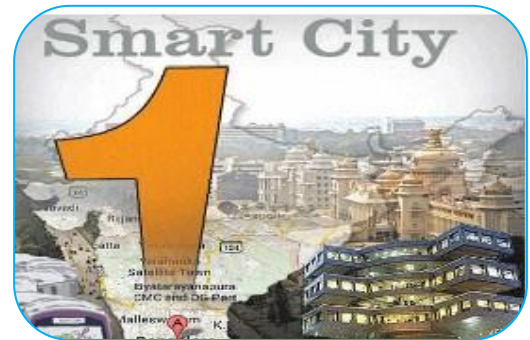
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ABSTRACT

This article presents a comparative analysis of the Smart City Mission implementation in Davanagere and Belagavi cities, focusing on stakeholder perception, engagement levels, and the barriers encountered. Utilizing empirical data collected from 435 respondents in Davanagere and 490 respondents in Belagavi, the study examines variations in awareness and attitudes toward smart city initiatives. The analysis reveals distinct differences in perception between the two cities, highlighting the impact of socio-economic factors on residents' involvement and views. Additionally, the study identifies key challenges impeding effective implementation. These insights aim to inform policymakers and practitioners in optimizing smart city strategies and ensuring equitable benefits for diverse urban populations.



KEYWORDS: Citizen Perception, Implementation Barriers Smart City Mission, Stakeholder Perception, Urban Development.

1. INTRODUCTION

Background of Smart City Mission in India

The Smart City Mission, launched by the Government of India in June 2015, represents a strategic initiative aimed at fostering sustainable and inclusive urban development across the country. This mission is a cornerstone of India's urban renewal strategy, envisioning a paradigm shift from conventional city planning to a more technologically integrated and citizen-centric approach (Ministry of Housing and Urban Affairs, 2015). The primary objectives of the Smart City Mission are to enhance urban infrastructure, improve the quality of life for residents, and promote efficient governance through the application of advanced technologies.

The mission targets the development of 100 cities across India, with a focus on upgrading infrastructure, improving service delivery, and creating robust and innovative urban environments. It emphasizes smart solutions in various domains, including transportation, energy management, waste management, and e-governance (Kumar & Aggarwal, 2018). By leveraging technology, the mission addresses the pressing challenges faced by urban areas such as congestion, pollution, and inadequate

public services, thereby fostering economic growth and enhancing the overall urban living experience (Sharma, 2019).

Davangere and Belagavi, two cities in the state of Karnataka, were selected for inclusion under the Smart City Mission due to their distinct urban characteristics and developmental needs. Davangere, with its growing industrial base and increasing urbanization, faces challenges related to infrastructure and service delivery, which the Smart City Mission aims to address through targeted interventions (Venkatesh & Murthy, 2021). Conversely, Belagavi, a historically significant city with a diverse economy, requires modernization of its infrastructure and enhancement of its urban management systems to support its expansion and improve the quality of life for its residents (Patil & Deshpande, 2022).

Both cities are engaged in implementing various smart solutions, ranging from digital governance platforms to smart transportation systems. This comparative focus on Davangere and Belagavi offers valuable insights into the effectiveness of the Smart City Mission's strategies and the specific impacts on urban development within these cities.

SIGNIFICANCE OF THE STUDY

Importance of understanding citizen perception in smart city projects

Understanding citizen perception and engagement is pivotal for the success of smart city projects. As these initiatives often involve significant changes to urban infrastructure and services, the way residents perceive and interact with these changes can greatly influence the outcomes of such projects (Linders, 2012). Positive citizen perception can foster greater support and participation, thereby enhancing the effectiveness of smart city interventions. Conversely, negative perceptions may lead to resistance and reduced cooperation, potentially undermining the success of the initiatives (Meijer & Bolívar, 2016).

OBJECTIVES OF THE STUDY

The success of smart city projects hinges not only on the implementation of advanced technologies but also on the comprehensive understanding of various factors influencing these initiatives. This section outlines the core objectives of our research, which aim to elucidate critical aspects of smart city development and barriers.

➤ *To explore the perceptions of various stakeholders and awareness regarding smart city development*

The objective of this study is to explore the perceptions of various stakeholders regarding smart city development. Understanding these perceptions can provide insights into the overall acceptance of the projects, highlight areas of concern, and identify opportunities for improving stakeholder satisfaction and involvement (Giffinger et al., 2007).

2. LITERATURE REVIEW

The concept of "smart cities" has evolved significantly over the past few decades, driven by advances in technology and the need for more sustainable urban environments. Smart cities are typically defined as urban areas that leverage digital technology and data analytics to enhance the quality of life for their residents, improve the efficiency of urban services, and promote sustainable development (Giffinger et al., 2007). These initiatives often involve the integration of Internet of Things (IoT) devices, big data analytics, and advanced communication networks to optimize city functions such as transportation, energy management and public safety. (Caragliu, Del Bo, & Nijkamp, 2011).

Globally, smart city initiatives vary in scope and implementation. In cities like Barcelona and Singapore, extensive smart infrastructure and data-driven policies have been implemented to improve urban living conditions and operational efficiency (Nam & Pardo, 2011). These cities have demonstrated how smart technologies can be harnessed to address urban challenges such as congestion, energy consumption, and environmental sustainability (Hashem et al., 2016). However,

despite these advancements, challenges such as data privacy, digital divide, and integration of new technologies continue to pose significant obstacles (Hollands, 2008).

Financial barriers can include high costs of technology deployment and maintenance, while social challenges may encompass resistance to change and concerns about data privacy (Vanolo, 2014). Understanding these challenges is crucial for developing strategies to address them and ensure the successful implementation of smart city projects (Janssen & Estevez, 2013).

The Smart City Mission's implementation in cities like Davangere and Belagavi provides valuable insights into the practical challenges and successes of smart city projects in India. Studies have highlighted that both cities have made significant progress in developing smart infrastructure, including smart traffic management systems and improved waste management practices (Sharma et al., 2020).

Research specific to Davangere and Belagavi indicates that while these cities have made strides in certain areas, there remains considerable room for improvement in terms of comprehensive planning and stakeholder participation (Reddy & Kumari, 2022). Addressing these issues is crucial for maximizing the benefits of the Smart City Mission and ensuring that the projects meet the needs and expectations of local residents (Singh & Singh, 2023).

The theoretical framework for understanding smart city initiatives encompasses several key concepts, including public perception, engagement theory, and barriers to implementation. Public perception refers to how residents and stakeholders view and respond to smart city technologies and initiatives. Positive perceptions can enhance support and participation, while negative perceptions can hinder the adoption and effectiveness of these projects (Linders, 2012).

3. METHODOLOGY

Research Design

This study employs a comparative research design to analyse and contrast the implementation and impact of the Smart City Mission in two distinct cities, Davangere and Belagavi. The comparative approach allows for an in-depth examination of the similarities and differences in smart city initiatives between these two urban areas, providing valuable insights into the effectiveness and challenges of the Smart City Mission across different contexts (Yin, 2014). By focusing on these two cities, the study aims to uncover how varying local conditions, stakeholder perceptions and challenges of smart city projects.

Data collection Methods: To gather comprehensive data, the study will utilize both surveys and interviews with key stakeholders, including citizens, government officials, and project managers. Surveys will be distributed to a representative sample of residents in Davangere and Belagavi to capture their perceptions, and experiences with smart city initiatives. These surveys will be designed to gather quantitative data on factors such as awareness, satisfaction, and perceived barriers (Dillman, Smyth, & Christian, 2014).

The study will incorporate both primary and secondary data sources to provide a well-rounded analysis. Primary data will be collected through the aforementioned surveys and interviews, offering firsthand information on stakeholder experiences and perspectives. Secondary data will be sourced from reports and documents related to the Smart City Mission, on developments in Davangere and Belagavi. This secondary data will help contextualize the primary findings and provide a broader understanding of the smart city landscape (Bryman, 2016).

Sampling Techniques: The sampling strategy for this study involves selecting a representative sample of participants from Davangere and Belagavi. For the survey component, a total of 435 respondents from Davangere and 490 from Belagavi will be targeted. These sample sizes are determined to ensure statistical reliability and the ability to draw meaningful comparisons between the two cities. The selection criteria for survey respondents will include age, gender, education level, and residence tenure to ensure a diverse and representative sample (Fink, 2013).

Quantitative data from surveys will be analysed using statistical methods to identify patterns and correlations related to stakeholder perceptions and engagement. Descriptive statistics is employed to summarize the data, while inferential statistics, such as t-test is used to compare responses between the two cities and assess the significance of observed differences (Field, 2013).

4. PERCEPTION OF SMART CITY MISSION

Citizen Awareness and Understanding

The Smart City Mission (SCM) in India has aimed to enhance urban living standards through the implementation of advanced technological solutions and infrastructure improvements. General awareness of the SCM among residents of Davangere and Belagavi reveals varying degrees of understanding and engagement with the mission. In Davangere, preliminary data suggests a moderate level of awareness, with residents recognizing basic aspects such as infrastructure upgrades and digital services. Conversely, in Belagavi, there appears to be a higher level of awareness, with residents demonstrating a more nuanced understanding of the mission's objectives and benefits (Kumar & Kumar, 2018).

Tables 1 provide insights into citizen awareness of Smart City initiatives in Davangere and Belagavi. Table 1 displays the group statistics for various statements regarding citizen awareness across these cities. These analyses are essential for understanding the level of awareness and engagement with Smart City projects and identifying areas that may require targeted interventions. Table 1 summarizes the group statistics on citizen awareness regarding Smart City initiatives in Davangere and Belagavi. The table includes the mean scores, standard deviations, and standard errors of the mean for each statement related to citizen awareness.

- **Statement 1:** "I am aware of the Smart City initiatives of this city" shows that Belagavi residents ($M = 3.46, SD = 1.349$) have higher awareness compared to Davangere residents ($M = 3.13, SD = 1.343$).
- **Statement 2:** "I have knowledge about the specific Smart City project" indicates that Belagavi residents ($M = 3.66, SD = 1.212$) also report more knowledge than their counterparts in Davangere ($M = 3.23, SD = 1.293$).
- **Statement 3:** "I am informed about the goals and objectives of Smart City project" reveals a greater disparity, with Belagavi residents ($M = 3.46, SD = 1.396$) being more informed than those in Davangere ($M = 2.84, SD = 1.487$).
- **Statement 4:** "I receive regular updates and information about Smart City developments of this city" shows a significant difference, with Belagavi residents ($M = 3.63, SD = 1.376$) receiving more regular updates compared to Davangere residents ($M = 2.57, SD = 1.287$).
- **Statement 5:** "I understand how Smart City initiatives can benefit residents of this city" indicates a moderate difference, with Belagavi residents ($M = 3.33, SD = 1.402$) having a slightly better understanding than those in Davangere ($M = 3.00, SD = 1.422$).

Table 1: Group statistics on citizen awareness across cities

Statements	City	N	Mean	Std. Dev.	Std. Error Mean
I am aware of the Smart City initiatives of this city	Davanagere	435	3.13	1.343	.064
	Belagavi	490	3.46	1.349	.061
I have knowledge about the specific Smart City project	Davanagere	435	3.23	1.293	.062
	Belagavi	490	3.66	1.212	.055
I am informed about the goals and objectives of Smart City project	Davanagere	435	2.84	1.487	.071
	Belagavi	490	3.46	1.396	.063
I receive regular updates and information about Smart City developments of this city	Davanagere	435	2.57	1.287	.062
	Belagavi	490	3.63	1.376	.062
I understand how Smart City initiatives can benefit residents of this city	Davanagere	435	3.00	1.422	.068
	Belagavi	490	3.33	1.402	.063

The data presented in Table 1 suggest a higher level of awareness and understanding of Smart City initiatives among residents of Belagavi compared to those in Davanagere. Belagavi shows consistently higher mean scores across all statements, indicating better overall awareness, knowledge, and engagement with Smart City projects. This disparity may reflect differences in local implementation strategies, communication efforts, or existing infrastructure between the two cities.

Perception of Benefits

Citizens in both cities generally perceive the Smart City Mission as a transformative initiative with the potential to bring substantial benefits. In Davanagere, residents anticipate improvements in urban infrastructure such as better roads, enhanced public transportation, and more efficient waste management systems. Additionally, there is an expectation that the mission will lead to better governance through the implementation of smart technologies that streamline municipal services and increase transparency (Singh, 2019).

In Belagavi, the perception of benefits is somewhat broader, with residents recognizing the potential for enhanced quality of life through integrated smart solutions. This includes advanced traffic management systems, smart water and energy management, and improved safety measures. The higher level of awareness and more active involvement in SCM projects in Belagavi have likely contributed to these more optimistic views on the mission’s benefits (Jha, 2021).

Tables 2 and 3 offer a detailed comparison of perceptions regarding Smart City initiatives between the cities of Davanagere and Belagavi. Table 2 presents group statistics for various statements on the impact of Smart City projects, including infrastructure, quality of life, economic opportunities, environmental sustainability, and public services. Table 3 provides results from independent sample t-tests to evaluate significant differences in perceptions between the two cities.

Table 2: Group statistics on perception on smart city initiatives across cities

Statements	City	N	Mean	Std. Dev.	Std. Error Mean
Smart City initiatives have positively impacted the infrastructure of the city	Davanagere	435	3.06	1.315	.063
	Belagavi	490	3.36	1.277	.058
The quality of life in this city has improved due to Smart City projects	Davanagere	435	3.18	1.353	.065
	Belagavi	490	3.48	1.270	.057
Smart City developments have enhanced economic opportunities in this city	Davanagere	435	2.95	1.371	.066
	Belagavi	490	3.42	1.320	.060
I believe that Smart City initiatives have made this city more environmentally sustainable	Davanagere	435	3.04	1.422	.068
	Belagavi	490	3.37	1.349	.061
Smart City projects have positively influenced the availability of public services in this city	Davanagere	435	3.41	1.319	.063
	Belagavi	490	3.36	1.287	.058

Table 3 illustrates the group statistics for perceptions about Smart City initiatives across Davangere and Belagavi. The table includes mean scores, standard deviations, and standard errors of the mean for each statement related to the impact of Smart City projects.

- **Statement 1:** "Smart City initiatives have positively impacted the infrastructure of the city" shows a mean score of 3.06 (SD = 1.315) for Davangere and 3.36 (SD = 1.277) for Belagavi.
- **Statement 2:** "The quality of life in this city has improved due to Smart City projects" reveals a mean score of 3.18 (SD = 1.353) for Davangere and 3.48 (SD = 1.270) for Belagavi.
- **Statement 3:** "Smart City developments have enhanced economic opportunities in this city" indicates a mean score of 2.95 (SD = 1.371) for Davangere and 3.42 (SD = 1.320) for Belagavi.
- **Statement 4:** "I believe that Smart City initiatives have made this city more environmentally sustainable" shows a mean score of 3.04 (SD = 1.422) for Davangere and 3.37 (SD = 1.349) for Belagavi.
- **Statement 5:** "Smart City projects have positively influenced the availability of public services in this city" reveals a mean score of 3.41 (SD = 1.319) for Davangere and 3.36 (SD = 1.287) for Belagavi.

The data in Table 2 indicate that residents of Belagavi generally perceive greater positive impacts from Smart City initiatives compared to residents of Davangere. Belagavi scores higher on all statements, reflecting more favorable perceptions of infrastructure improvements, quality of life, economic opportunities, and environmental sustainability. The exception is in the perception of public service availability, where the mean scores are almost equal between the two cities. These differences may highlight variations in project implementation effectiveness, public engagement strategies, or infrastructure development between the cities.

Table 3: Independent sample t-test on perception on smart city initiatives across cities

Statements	Assumptions on variances	Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Smart City initiatives have positively impacted the infrastructure of the city	Equal	.600	.439	-3.480	923	.001	-.297
	Unequal			-3.474	903.083	.001	-.297
The quality of life in this city has improved due to Smart City projects	Equal	3.981	.046	-3.407	923	.001	-.294
	Unequal			-3.394	893.232	.001	-.294
Smart City developments have enhanced economic opportunities in this city	Equal	.045	.833	-5.293	923	.000	-.469
	Unequal			-5.281	900.657	.000	-.469
I believe that Smart City initiatives have made this city more environmentally sustainable	Equal	.615	.433	-3.604	923	.000	-.329
	Unequal			-3.593	896.566	.000	-.329
Smart City projects have positively influenced the availability of public services in this city	Equal	.684	.408	.607	923	.544	.052
	Unequal			.606	904.383	.545	.052

Table 3 presents the results of independent sample t-tests used to compare perceptions of Smart City initiatives between Davangere and Belagavi. The table includes Levene's test for equality of variances, t-test results, and mean differences for each statement.

- **Statement 1:** The t-test indicates a significant difference in perceptions of infrastructure impact ($t = -3.480, p = .001$), with Belagavi showing a higher mean.
- **Statement 2:** The t-test reveals a significant difference in the perceived improvement in quality of life ($t = -3.407, p = .001$), favoring Belagavi.
- **Statement 3:** There is a significant difference in perceptions of economic opportunities ($t = -5.293, p < .001$), with Belagavi scoring higher.
- **Statement 4:** The analysis shows a significant difference in environmental sustainability perceptions ($t = -3.604, p < .001$), with Belagavi residents perceiving greater benefits.
- **Statement 5:** The t-test for the influence on public services shows no significant difference ($t = .607, p = .544$), indicating similar perceptions between the two cities.

The results from Table 4 confirm that significant differences exist in perceptions of Smart City initiatives between Davangere and Belagavi. Belagavi residents generally have more positive perceptions regarding the impact on infrastructure, quality of life, economic opportunities, and environmental sustainability. The lack of significant difference in the perception of public services suggests that this aspect of the Smart City initiatives may be similarly valued in both cities. These findings underscore the need for further investigation into the factors contributing to these perception differences and their implications for policy and project management.

6. DISCUSSION

Interpretation of Findings

The findings from the comparative analysis of Davangere and Belagavi reveal crucial insights into the dynamics of smart city projects. The differences in citizen awareness and engagement between the two cities highlight the variable impacts of these initiatives. In Davangere, lower levels of awareness and engagement were observed compared to Belagavi. This discrepancy can be attributed to varying degrees of information dissemination and public involvement strategies employed in the two cities.

Belagavi's higher mean scores in awareness, knowledge, and receipt of updates suggest a more effective communication strategy and greater public involvement.

Social and cultural barriers, such as resistance from local communities and the digital divide, were also significant. The greater resistance in Belagavi underscores the need for more inclusive planning processes that consider local cultural contexts and community concerns (Hollands, 2008). Administrative barriers, including bureaucratic delays and coordination issues, were prevalent in both cities but were more acute in Belagavi. These challenges point to a need for streamlined administrative procedures and improved inter-agency collaboration.

The experiences from Davangere and Belagavi offer valuable lessons for other smart city projects. Implementing best practices such as inclusive planning, transparent communication, and efficient administrative processes can help overcome common barriers and promote the successful implementation of smart city initiatives.

7. CONCLUSION

The comparative analysis of smart city initiatives in Davangere and Belagavi provides a comprehensive understanding of the perception, engagement, and barriers associated with these projects. Key findings indicate that Belagavi exhibits higher levels of citizen awareness and engagement compared to Davangere. This is reflected in the greater mean scores for awareness, knowledge, and information receipt in Belagavi, suggesting that more effective communication and engagement strategies are in place (Giffinger et al., 2007). Conversely, Davangere's lower scores highlight a need for enhanced outreach and public involvement mechanisms.

The study also identifies significant barriers impeding the successful implementation of smart city projects. Technical issues, including inadequate infrastructure and slow technology adoption, were prominent in both cities, aligning with previous research that underscores these as common challenges (Batty et al., 2012). Financial constraints and administrative inefficiencies were particularly pronounced in Belagavi, indicating that more robust financial planning and streamlined administrative processes are necessary. Social and cultural barriers, including community resistance and digital divide issues, were observed, emphasizing the need for inclusive planning and stakeholder engagement (Hollands, 2008).

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