

Technology & Governance

What has been the impact of Mobile Apps: All City Services at one place in Indian Smart Cities (No. of Installations/ Subscribers/ Users)?

Indian Smart Cities Srinagar Jammu Amritsar Dehradun Chandigarh Bareilly Karnal Pasighat Gangtok Agra Lucknow Ajmer Guwahati Itanagar Jaipur Aligarh 💕 Kanpur Bhagalpur Kohima Agartala Jhansi Ahmedabad Bhopal Ranchi Sagar Biharsharif Imphal Dahod Gandhinagar Raipur Rajkot Aizawl Silvassa Ujjain Jabalpur Bhubaneswar Bilaspur Aurangabad Nashik Nagpur Pimpri Chinchwad 🔵 Pune Greater Warangal Belgaum Solapur Davanagere Existing SCMA Kakinada Bengaluru No SCMA Panaji 🤇 Tirupati Kavaratti Coimbatore Under development SCMA Chennai Erode Madurai Koch Thoothukudi Thiruvananthapuram 12024 Navinto @20

Impact Assessment Study by:



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SMART CITIES MISSION MINISTRY OF HOUSING AND URBAN AFFAIRS Impact Assessment Study: Indian Smart Cities

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FOREWORD

It has been a great privilege for Indian Institute of Management – Bangalore to partner with Smart Cities Mission (SCM), Ministry of Housing & Urban Affairs (MoHUA), Government of India, in its unique initiative under SAAR (Smart Cities & Academia towards Action & Research) - Sameeksha Series, aimed at offering an opportunity to the premier institutes of the country to undertake comprehensive, national level independent impact assessment studies. It comprises of 50 national level impact assessment studies by 29 premier institutes of India on various themes. It is focused to bridge the gap between academia and government to document and research new urban initiatives/ models/ projects under SCM, on one hand, and take the learnings to level next on the other.

IIM Bangalore undertook this study, titled "Ease of Convenience Brought to Citizens of Smart Cities by Smart City Mobile Applications", which examines the effectiveness of SCMA in enhancing convenience for citizens across India's smart cities. Through an in-depth exploration of Pimpri-Chinchwad Municipal Corporation, Indore Municipal Corporation, and New Delhi Municipal Council, as well as macro level data from a majority of smart cities, the study identifies roadblocks, addresses key concerns, and proposes actionable improvements to optimize SCMA as an administrative tool in the Indian context.

The project provides a holistic assessment of current usage levels, public sentiment, and successful initiatives, offering recommendations for administrative actions and prioritizing services to enhance the overall efficacy of Smart City Mobile Applications. Furthermore, it highlights sustainability considerations to ensure these applications remain impactful in the coming decades.

We extend our sincere gratitude to the Mission team at MoHUA for their invaluable support, including facilitating connections in the three cities where field data was collected, maintaining close coordination with our research team, and providing critical inputs. Their assistance in conducting a macro survey across all smart cities, the findings of which were shared with our research team, was instrumental to the study.

We also thank **Prof. Shubhabrata Das** for leading this important study. We trust that the outcomes of this impact assessment will significantly contribute to improving the standard of living for citizens. Lastly, we wish the Smart Cities Mission team at MOHUA continued success in all their future endeavours.

Inm

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Executive Summary

Smart city mobile applications have begun to make a positive impact on citizens in many smart cities across India. This progress signifies a step in the right direction, leading to improved services for citizens. However, there is significant room for improvement, and much work remains to be done before these initiatives can be considered as fully successful.

Current State and Potential for Improvement

Sixty-two (62) cities out of 100 have developed their city level mobile application, as new instruments for renewed urban governance in India under SCM. Of these forty-two (42) have also offered convenience of online payment to their citizens. Balance 38 cities might have either hooked up themselves in State level applications or might be in the process of taking it up, easing level of convenience to their inhabitants. There is a substantial demand for better citizen services, and SCMA have the potential to meet this demand effectively. While some initiatives have been launched with moderate success in different cities, awareness of their advantages is still limited among the broader population. The government has shown vision regarding the potential benefits of these applications, but this conviction needs to permeate all levels of administrative power with authority and commitment.

At the execution level, top management officials in municipal corporations and city administrations need to understand that these applications can enhance work culture, provide better services, reduce carbon & corruption due to reduced physical interface and improve time management. Currently, a significant amount of time and resources are wasted in providing documentary evidence for routine matters like issuing birth, death and marriage certificates, payment for various services, application or approval for municipality facilities which leads to corruption, inconvenience, and social discrimination. Efficient policies facilitated by SCMA not only benefit citizens but also enhance the efficiency of service providers.

Challenges in Data Management and Security

Data security remains a significant concern. Often, there is a lack of a robust system for maintaining current and accurate data. Difficulties in accessing data and uncertainties about data custodianship and responsibility are common. The absence of appropriate control mechanisms can result in unauthorized data access. Although misuse of data is rare, the sharing of private information leads to unsolicited calls and decreased productivity. There is an ardent need to strengthen these aspects and avoid any possibility of breach of data management & security.

Citizens' awareness and trust in the administration's commitment to these changes are critical. There is often scepticism about the administration's willingness to relinquish the power and authority that comes with automation.

Opportunities for Improved Service Delivery

Effective data management can enable the administration to provide better services and identify potential problems proactively. However, the current system often fails to utilize data effectively.

Lack of coordination between various departments and power centers within city administrations is a significant obstacle.

Recommendations for Smart City Mobile Applications

The study recommends that all SCMA include a set of common features with flexibility for local customization. Common features help raise awareness and ensure consistency in service delivery. Key features should include:

- 1. Grievance Redressal System
- 2. Service Applications and Bookings: For sewage connections, building permissions, trade licenses, water connections, etc.
- 3. Solid Waste Management and Garbage Collection Tracking
- 4. **Payment Portals:** For water/property tax, electricity, sewage and traffic fines.
- 5. Certificate and Document Issuance: For birth, death, and marriage certificates.
- 6. **Public Guidance and Information:** GIS data, hospital, bank, ATM locations, tourist information, blood banks, police stations, etc.
- 7. **Traffic and Parking Information:** City bus routes, metro/suburban train information, parking availability.
- 8. **Real-Time Updates:** Smart bus stops with arrival times and traffic congestion information.

SCMA should also include features that make them highly attractive to citizens, they need to agile, up to date, offering volumes of scale to city to respective authorities, offering rigorous citizens engagement and encouraging widespread adoption. Beyond basic municipal services, these applications can enhance crisis management (e.g., during the COVID-19 outbreak) and maximize citizen engagement in public policy, especially in promoting sustainability and environmental practices such as horticulture and rainwater harvesting.

Conclusion

While the development and adoption of SCMA will not eliminate conventional offline service delivery systems, they can greatly enhance efficiency by saving productive hours, reducing carbon emissions through decreased travel, improving transparency, and providing quality services free from societal bias. Citizens must see the value in using SCMA, but it is up to the administration to convincingly demonstrate the benefits and address concerns. By adhering to best practices and continuously evolving, SCMA can significantly improve urban living, making cities smarter, more efficient, and more sustainable. These SCMA would eventually become a crucial tool in the hands of city authorities in the direction of offering data driven governance, as envisaged under National Urban Digital Mission (NUDM), SCM, MOHUA, Government of India.

Keywords: Citizen-centric design, Citizen Engagement, Data analytics, Data Privacy and Security, Document issuance, Environmental Sustainability, Grievance redressal, Payment portal, Real-Time Information, Service Integration, Scalability and Flexibility, Technology, Urban Data Management.

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We thank the citizens of the three smart cities who responded to the survey conducted and participated in the focus group discussions. We also thank the officials of the smart cities who responded to the aggregated survey conducted by MoHUA.

I extend my thanks to Prof. Anupam Das-Purkaystha assistance in finding the suitable surveyor team and to Mr. Devanshu Saini, and Mr. Anmol Dewang for conducting the survey in Indore. Additionally, I appreciate the assistance provided by Ms. Vinita Sasi and Mr. Kingsuk Jana of IIM Bangalore in the project work.

List of Abbreviations

ABD:	Area Based Development			
App(s):	Application(s)			
C.I.:	Confidence Interval (estimate)			
GRS:	Grievance Redressal System			
MoHUA:	Ministry of Housing & Urban Affairs			
IMC:	Indore Municipal Corporation			
NDMC:	New Delhi Municipal Council			
PCMC:	Pimpri-Chinchwad Municipal Corporation			
PMAY:	Prime Minister Awas Yojana			
SC(s):	Smart City/ Cities			
SCM:	Smart Cities Mission			
SCMA:	Smart City Mobile Applications			
SD:	Standard Deviation			
SE:	Standard Error			
SPV:	Special Purpose Vehicle			
UD:	Under Development			
ULB:	Urban Local Body			
VAN:	Virtual Account Number			

Table of Contents

Ex	ecı	utive Summaryi	í
Lis	st o	f Abbreviations: v	i
1.		Introduction1	-
2.		Literature Review)
3.		International and National Case Studies2)
4.		Observations from SCM projects undertaken4	ŀ
5.		Methodology6	;
6.		Impact Assessment Inferences)
	6.2	L National Level Theme-based Impact Assessment)
	6.2	2 City Visits & Detailed Primary Assessment	,
	6.2	2.1 Pimpri-Chinchwad Municipal Corporation (PCMC)15	,
	6.2	2.2 Indore Municipal Corporation (IMC)19)
	6.2	2.3 New Delhi Municipal Council (NDMC)23	;
7		Study Outcome and Conclusions28	;
	7.:	L Critical Challenges	3
	7.2	2 Replicable Best Practices for Smart City Mobile Applications)
	7.3	3 Other Recommendations & Policy Directives for SCMA	-
8		References	3
9		Appendices)
	9.1	L Additional Details Related to SCMA in all (94) the Smart Cities)
	SC	MA assessment)
	Na	me of SCMA in all Smart Cities40)
	Со	ntent of Survey questionnaire that was sent to all the smart cities)
	9.2	2 PCMC: Survey questionnaires, summary of response and additional analyzed summary details49)
	Qı	estionnaire and summary of responses from survey for non-users of PCMC app)
	Qı	estionnaire and summary of responses from survey for Users of PCMC app)
	9.3	3 IMC: Survey questionnaires, summary of response and additional analyzed summary details 58	3
	Qı	estionnaire and summary of responses from survey for non-users of Indore 311 app)
	Qı	estionnaire and summary of responses from survey for Users of Indore 311 app60)
	9.4	4 NDMC: Questionnaire for NDMC 311 App users and Additional details	;
	9.5	5 Rainwater Harvesting (RWH) through SCMA:79)
	9.6	5 Horticulture Services through SCMA80)
	9.7	7 Few Testimonials for SCMA from the citizens81	L

1. Introduction

In India's rapidly urbanizing landscape, the emergence of smart cities epitomizes innovation and efficiency. As urban areas expand and technology advances, the integration of digital solutions becomes imperative for enhancing urban living. India's vision for sustainable urban development underscores the critical role of technology in city governance. During the Smart Cities Mission (SCM) period, numerous Indian smart cities have introduced the **'One City One App**' initiative, providing a comprehensive range of municipal and citizen-centric services to residents and tourists alike.

Smart City Mobile Applications (SCMA) function as digital gateways to urban services, converging information and communication technologies. These applications empower citizens by granting them access to municipal resources and facilitating efficient interactions with authorities. By leveraging smartphones and data analytics, SCMA promise to transform cities into vibrant, connected ecosystems.

Three fundamental principles guide the adoption of SCMA:

- 1. Placing citizens at the core is paramount and non-negotiable.
- 2. Modern governance extends beyond governmental boundaries to encompass comprehensive engagement with all stakeholders.
- 3. When deployed mindfully, technology can revolutionize governance.

This study seeks to answer the overarching research question: To what extent have the SCMA enhanced the convenience for citizens of smart cities? This report embarks on an exploration of the effectiveness of SCMA in bringing ease of convenience to citizens across India's smart cities. In addition to assessing the current situation, this document aims to identify roadblocks, address concerns, and suggest improvements for making SCMA an effective tool for administration in the Indian context.

Specifically, this report examines current usage levels, analyzes timescale data on app installations, downloads, and subscriber volumes for various frequently used services. It assesses public sentiment, identifies successful initiatives, recommends actions for administration, and prioritizes services to enhance the overall efficacy of Smart City Mobile Applications, addressing sustainability aspects for the coming decades.

2. Literature Review

Mutelo and Iyawa (2022) reviewed 289 SCMA and systematically examined 202 apps, focusing on 23 smart city apps available on the Google Play Store and App Store that met the inclusion criteria. These smart city apps were developed across various countries and continents. The study found that most apps cover information, tourism, public services, transportation, identification, government services, COVID-19 alerts, digital verification, service requests, e-waste collection bookings, resident ID, and reporting. India had the highest representation, with seven of these 23 apps originating from there. Among the seven Indian apps studied, three were specific to individual cities: Surat, PCMC, and Vijayawada. The fourth Indian app covers state-level services, specifically for the Government of Gujarat. The remaining following three apps are at the central government level.

MyGov: This app encourages citizen participation in policy formulation and program implementation, promoting direct participatory democracy.

UMANG India: This platform provides citizens with access to pan-India e-Gov services from the Central, State, and Local Bodies, and government agencies via app, web, SMS, and IVR.

COVA Chd: This app focuses on COVID-19 awareness and reporting.

Kunttu et al. (2019) present a comprehensive example of a smartphone application designed to offer essential everyday city services in an accessible manner. This application also serves as a communication platform between citizens and city authorities, promoting collaborative processes and digital participation within the smart city framework. The study highlights the importance of user-friendly interfaces and the integration of multiple services into a single platform, which can significantly enhance citizen engagement and satisfaction.

Namp et al. (2017) discuss the economic impacts of smart city initiatives in the Vijayawada city region. Their research illustrates how SCMA can drive economic growth by improving service delivery, increasing efficiency, and fostering a more dynamic urban economy. By examining the economic benefits, this study provides valuable insights into the broader implications of smart city technologies beyond mere convenience and accessibility.

The application of SCMA in improving transport services is a significant area of research, particularly in the Western world. Bubeliny et al. (2021) and Fong et al. (2019) have extensively discussed how these applications can enhance transport efficiency and convenience. These studies emphasize the role of SCMA in traffic management, real-time updates, and route optimization, which collectively contribute to a more efficient and user-friendly transport system. Improved transport services are highlighted as a critical component of smart city infrastructure, showcasing the potential for SCMA to transform urban mobility.

3. International and National Case Studies

We examine Singapore and New York City (NYC) as international case studies, with one representing modern Asia and the other the first world. NYC has a population of 8.5 million, which is about 3 million more than Singapore. NYC attracts 55 million tourists annually, over five times that of Singapore. The average salary in NYC is about 50% higher, but it also has higher unemployment and crime rates. According to Condé Nast Traveler, Singapore is a slightly better city to live in (source: Condé Nast Magazine, 2024).

Singapore:

Singapore's Smart Nation initiative led to various mobile applications enhancing urban living. The Municipal Services Office (MSO), in collaboration with GovTech, developed the OneService App, launched on January 25, 2015. This app provides residents a platform to alert government agencies and Town Councils about neighborhood issues without knowing which agency is responsible. Citizens can report issues like potholes, litter, and malfunctioning streetlights. This app streamlines communication between citizens and government agencies, resulting in quicker issue resolution and improved city maintenance. While some residents find the app useful, a significant number prefer dealing directly with different agencies' websites. Studies suggest around 25% of residents use the OneService app, with high satisfaction levels, handling about 1.7 million complaints annually.

New York City (NYC), United States:

NYC's NYC311 app allows residents to report non-emergency issues to city agencies, such as noise complaints, graffiti, and street maintenance. The app centralizes access to information and service requests, leading to quicker response times and better city maintenance. NYC 311 serves as a hub for accessing information and services from various city agencies. Common uses include reporting non-emergency issues, requesting city services like bulk item pickup and street cleaning, obtaining information on parking rules, public transportation, city events, and government programs, and making complaints about city services. The app also offers interpretation services in over 180 languages for non-English speakers. During emergencies, NYC 311 provides information and directs users to appropriate resources, making it a valuable resource for residents and visitors.

Other Global Examples of Smart City Apps:

Many major cities promote specific apps for various projects. Barcelona's "Bicing" app provides real-time information on the city's bike-sharing system, helping users locate available bikes and docking stations, plan routes, and track usage. This app promotes sustainable transportation and reduces traffic congestion and carbon emissions. It is available only to residents, not tourists.

Seoul's "Seoul Smart City" initiative includes the "Seoul Bus" app, offering real-time bus arrival information, route planning, and service alerts. This app improves the commuting experience for both residents and visitors, encouraging public transportation use and reducing reliance on private vehicles.

London's "Citymapper" app offers comprehensive transit information, including real-time public transportation schedules, bike-sharing availability, and walking routes. It incorporates data from various transportation providers, making city navigation and journey planning more efficient.

These international case studies highlight diverse approaches to using mobile applications for smart city initiatives, demonstrating the potential for technology to enhance urban living experiences and address urban challenges.

4. Observations from SCM projects undertaken

Examining the list of projects undertaken under the Smart Cities Mission (SCM), we identify 14 core projects integral to the SCMA, as detailed in in Table 4-1. All projects, except the fourth, have been completed. Except for projects listed as Sl. No. 4 and 9, all fall under the category of "Smart Solutions" and are focused on "IT connectivity and digitalization." These numbers suggest that most cities may not be prioritizing SCMA with urgency.

SI. City Name		Project Name	SCM	Exception Note
No			Funding	
•			(In Rs.Cr.)	
1	Udaipur	Providing and selection of Master system	21.93	
		integrator for the Udalpur city and		
		representation of 11 solutions including E-		
2	Dimori	City Mobile App and Social Modia Applytics	10.6	
Z	Chinchwad	City Mobile App and Social Media Analytics	10.0	
3	Amaravati	Mana Amaravati Citizen Card App	12.31	
4	Puducherry	City level application and smart dashboard	5.25	Category:
				Development of
				Core Infrastructure;
				work order issued
5	Srinagar	Discover Srinagar One Stop App and other	1.5	
		web works		
6	Surat	Mobile Apps, Mobile tickets – Procurement of	1.2	
		600 T ablets		
7	NDMC	Development of Mobile App, NDMC311 for NDMC	0.45	
8	Sagar	Nirbhaya Sagar App	0.43	Sector: (Impact)
	0	, , , , , , , , , , , , , , , , , , , ,		Safety and Security
9	Karnal	City Unified App reporting civic issues	0.33	Category:
				Development of
				Core Infrastructure
10	Ahmedabad	Ahmedabad 311 mobile Application	0.3	
11	Gwalior	One City One App	0.23	
12	Lucknow	311- Mobile App Solution	0.14	
13	Chennai	Mobile Grievance Redressal System- Namma	0.1	
		Chennai APP		
14	Thoothukud	Thoothkudi App	0.06	
	i			
		Total	62.83s	

Table 4-1. Projects	under SCM that	are core to SCMA
	under Sein unde	

Source: Data provided by 100 Smart Cities in Central GMIS.

However, there are several other projects under SCM that are closely or somewhat linked to SCMA. Specifically, there are nine additional projects that are closely linked to SCMA, along with several others that have a partial connection to SCMA.

5. Methodology

This study's methodology and research design aimed to provide a thorough understanding of smart city applications in India, focusing on user engagement, service effectiveness, and areas for improvement. The research findings aim to support the further development of an innovative and sustainable smart city mobile application tailored to the needs of Indian citizens.

Background Study

The project commenced with an extensive background study on integrative mobile applications, both globally and in India. This phase involved:

- 1. Literature Review: Investigating global best practices in smart city initiatives.
- 2. Current Situations: Examining the current state of smart city mobile applications in India through secondary sources.

Survey Design and Execution

The research institutes were asked to prepare and submit their respective thematic questions, which got compiled by Smart Cities Mission division, Ministry of Housing and Urban Affairs (MoHUA) in the form of a Question Bank. It was mailed to all 100 smart cities to which 94 cities filled the questionnaire and mailed back within the given timeline. These were then collated and facilitated to the respective institutes for analysis and inferences. The objectives of the survey were to:

- 1. Gather basic information about the existence of smart city mobile applications.
- 2. Identify key features and services offered, as prioritized by the respective smart city.
- 3. Assess broad usage levels of various services.

The survey data was analyzed alongside other available secondary information to assess:

- 1. The percentage of smart cities having functional smart city mobile applications.
- 2. The major services offered through these applications.
- 3. Best practices, with a focus on sustainability considerations.
- 4. Innovative steps for future development.

Selection of Smart Cities for Primary Research

Considering various factors, the Ministry of Housing and Urban Affairs (MoHUA) recommended selecting three smart cities from the following for the primary research:

- 1. Pimpri-Chinchwad Municipal Corporation (PCMC)
- 2. Kota
- 3. Thoothukudi
- 4. Rajkot
- 5. Thane
- 6. New Delhi Municipal Council (NDMC)

- 7. Indore
- 8. Jabalpur

Based on considerations such as geographical diversity, population, and importance, PCMC, Indore, and NDMC were ultimately selected for an in-depth primary study.

Engagement with City Officials

In the three selected cities, multiple engagements took place with city officials to know/obtain:

- 1. Priorities in service offerings via SCMA.
- 2. Usage patterns and overall downloads.
- 3. Service-specific data.

This data varied in depth, consistency, and duration. In PCMC, officials shared data with enthusiasm and transparency, while in the other cities, the process was time taking and less professional.

Citizen Surveys

Two separate surveys were designed for the three selected cities with the following broad goals:

- **1.** For users of the SCMA:
 - How they learned about the smart city mobile application.
 - Most frequently used facilities in the application.
 - Satisfaction levels and perceived improvements in convenience and time-saving.
 - Suggestions for additional services.
- **2.** For non-users of the SCMA:
 - Reasons for not using the service, including awareness levels.
 - Desired features and potential enhancements.

Execution of survey in Selected Cities

- PCMC: Both surveys were conducted enthusiastically by the officials of PCMC, and the detailed data was shared promptly.
- IMC: Initial communications were positive, but due to subsequent non-responses and logistical challenges, independent surveyor teams were employed to collect data directly from citizens.
- NDMC: Feedback surveys for app users were instituted within the NDMC 311 app, and reminder requests were sent via SMS. Despite many rounds of communication, survey responses are yet to be shared, possibly due to a low response rate. Small focus group discussions were conducted among the NDMC citizens to:
 - Understand the overall situation and possible reasons behind low adoption rates of the app.

• Gather qualitative insights on citizen preferences and challenges.

Sampling Framework:

For respondents using the SCMA, invitations and reminders were sent via SMS and the app. Additionally, limited campaigns were conducted through surveyors, who were instructed to ensure representation across different segments of the population, considering factors such as age, gender, and economic diversity. However, due to time constraints and low levels of enthusiasm to participate, the primary focus was on obtaining a moderate number of responses to gain a broad perspective, rather than striving for statistically valid conclusions based on random sampling. As a result, the sampling approach can be considered largely as convenience sampling, even though some attempts were made to get representative samples.

6. Impact Assessment Inferences

6.1 National Level Theme-based Impact Assessment

The MoHUA collated responses from 94 smart cities and shared this information with all project teams. Data from six smart cities—Amravati, Dharamshala, Hubbali-Dharwad, Jalandhar, Patna, and Port Blair—was not shared possibly due to non-response from these SCs. Secondary studies indicate that among the six, Dharamshala, and Jalandhar do not have a dedicated "One City One App" under the Smart Cities Mission (SCM).

As per SCM project sanctioned and completed, Amravati has Mana Amravati app which has features like GRS, Citizen services, interactive features etc. Hubballi-Dharwad appears to have a smart city app named "*HDMC Smart App*" which provides various services including property tax payment, water bill payment, lodging complaints, tracking complaint status, and accessing information on public amenities and events. Similarly, Patna has introduced an app named "*Patna Smart City*" which offers features such as real-time tracking of public transportation, information on city services, emergency contact numbers, and the ability to lodge and track complaints. Port Blair uses the "*PBMC eNagarSewa*" mobile application, which integrates municipal services such as property tax payments, water bill payments, and access to other civic services. The app also facilitates mobile ticketing for public transportation and provides real-time updates on bus routes and schedules.

Setting aside the above information, the analysis presented in this section is primarily based on information shared by the 94 smart cities, although some modifications were made based on additional information gathered. For example, discrepancies between city-reported selection rounds and official data were resolved by adhering to official data. In other cases, conflicts were resolved through judgment calls, considering various facts and factors.

Table 9-5 in the Appendix 9.1 lists 62 apps along with the names of the corresponding smart cities. The SCMA is currently under development in four smart cities: Aizawl, Muzaffarpur, New Town Kolkata, and Tirupati. 28 other smart cities that responded do not have any SCMA; these SCs are: Amritsar, Coimbatore, Diu, Gandhinagar, Gangtok, Greater Warangal, Guwahati, Kakinada, Karnal, Kavaratti, Kohima, Kota, Ludhiana, Madurai, Nagpur, Namchi, Puducherry, Rourkela, Salem, Shillong, Silvassa, Solapur, Thane, Thanjavur, Tiruchirappalli, Tirunelveli, Tiruppur, and Vellore.

Overall, among the smart cities that responded, 66% (62 out of 94) have SCMA; 53% (50 out of 94) have a grievance redressal system (GRS) via SCMA, while 45% (42 out of 94) have a payment portal via SCMA. We analyzed these numbers according to population size, region, round of adoption as a smart city, and whether the CEO is also the Municipality Commissioner. These comparisons are depicted in Figure 1, Figure 2, Figure 3, and Figure 4, respectively. The corresponding numbers are reported in Table 9-1, Table 9-2, Table 9-3, and Table 9-4 of Appendix 9.1.

We observe that a slightly higher percentage of larger smart cities have SCMA in general, although medium-sized cities are marginally ahead of big cities (but much lower than tier-1 cities).

Region-wise, smart cities in the central region are ahead, while those in the eastern region are lagging in terms of having SCMA. Additionally, smart cities in the northeast and south have lower adoption rates for both GRS and payment portals via their SCMA. The reason for low adoption rates in northeast and south, could be that they might have been hooked to State level applications meant for municipal services of all ULBs.

Smart cities selected on fast-track and in rounds 1 and 3 have somewhat higher percentage of facilities on all three fronts.

Contrary to expectations, having the CEO of the smart city also serve as the chairperson of the municipality corporation does not appear to have made a positive difference. However, this is possibly due to changes in the status of the dual role over time. Otherwise, it was felt during the project that coordination between different administrative centres of the smart city is critical to the success of the mission.



Figure 1: Proportion of smart cities with SCMA by size of the city





Figure 2: % smart cities with SCMA by Region



Figure 3: Proportion of smart cities with SCMA by Round of selection as SC



Figure 4: Proportion of smart cities with SCMA on whether CEO is also the Municipality Chairperson

Out the 62 smart cities with reported SCMA, we received information on services being offered from 45 of these cities. (Several other cities, which do not have SCMA have responded by saying that they provide these services through the integrative mobile applications; we have ignored such responses for the analysis.) In collating the priority of various services and facilities within SCMA, we also considered the four SC which have their SCMA under development (UD). Including them, 47 SC indicated what they consider to be their top (at least) three focus in service via SCMA.

We can broadly categorize these services as follows:

A. Grievance Redressal System (GRS): (16 out of 47 SCMA list this as a top priority via app)

B. Various approval/applications for services: (18 SCMA list at least one of these as a top priority via app)

- ✓ Sewage connection application;
- ✓ Building permission;
- ✓ Trade license / shop registration;
- ✓ Water connection;
- ✓ Boring;
- ✓ Hoarding;
- C. Cleaning related: (11 SCMA list at least one of these as a top priority via app)
 - ✓ Solid waste management;
 - ✓ Garbage collection tracking/complaint;
- D. Payment portal: (28 SCMA list at least one of these as a top priority via app)
 - ✓ Water tax;
 - ✓ House / property tax;
 - Electricity payment;
 - ✓ Sewerage tax bill;
 - ✓ Traffic challan payment;

Impact Assessment Study: Indian Smart Cities

- E. Certificate & document issuance: (12 SCMA list at least one of these as a top priority)
 - ✓ Birth certificate;
 - ✓ Death certificate;
 - ✓ Marriage certificate;
- F. Traffic and parking related:
 - ✓ City bus routes;
 - ✓ Metro / suburban train related information;
 - ✓ Parking;
 - ✓ Reporting of Problems related to Street light, potholes;
- G. Public guidance and information (location, opening hours):
 - ✓ GIS;
 - ✓ Hospital; Blood bank;
 - ✓ Police; Safety/security;
 - ✓ Bank and ATMs;
 - ✓ Tourist attractions;
 - ✓ Panic button
 - ✓ Lost and found;
- H. Miscellaneous
 - ✓ Pet License
 - ✓ Right to Information (RTI), Right to service (RTS)
 - ✓ Tenders
 - ✓ Horticulture
 - ✓ Call centre
 - ✓ Rain water harvesting

Data gaps were present in responses shared by cities and inconsistent information was provided by many city officials, which points to need of better data management within ULBs. We tried to reconcile this to the extent possible from multiple sources. For example, the two smart cities covered under primary research in this study, contradictory information was provided by cities. Some of the confusions might have been attributed due to ownership issues, multiplicity of authority and whether they are under the smart city projects. However, given citizen focus, we have chosen to interpret the existence of SCMA liberally. The following summary numbers are on the basis of that. In particular, we have considered the following smart cities to be having SCMA (name of the app included within bracket), even though the direct response from the city officials was to the contrary: Agartala (My Agartala), Ahmedabad (AMC 311), Bareilly (Bareilly 311), Faridabad (MCF 311), Indore (Indore 311), Kochi (My Kochi), Shivamogga (Shivamogga Payana) and Udaipur (Smart City Udaipur), the actual status should be confirmed with further studies.

Success Stories from Other cities not included in Field Visits:

Multiple national as well as international research including Mutelo et al (2022), Namp et al (2017), discussed integrative mobile app in the city of Vijayawada. Because Vijayawada is not one of the 100 cities selected for smart city mission projects, nationally their funding and initiatives were beyond the immediate focus. Yet, because of broader impact for the Indian cities on the current theme and goal, we decided to explore the situation in this city as well. We note that "Smart VMC" and "Smart Vijayawada" refer to two related but distinct initiatives on this front which associated with the Vijayawada Municipal Corporation.

"Smart VMC" is typically the term used for the official municipal app provided by the Vijayawada Municipal Corporation. This app focuses on municipal services and civic management. Features of the Smart VMC app include:

- Utility Bill Payments: Pay electricity, water, and property taxes.
- Grievance Redressal: Report and track complaints related to civic issues.
- Service Requests: Apply for various municipal services.
- Real-Time Updates: Notifications about civic services and issues.

"Smart Vijayawada," on the other hand, seems to be more of an informational app designed for a broader audience, including both residents and visitors. This app provides comprehensive information about the city, such as:

- Tourist Information: Details on attractions and places to visit.
- Dining and Accommodation: Listings of restaurants, hotels, and more.
- Healthcare Services: Information on hospitals and pharmacies.
- Education: Details about schools and colleges.
- News and Events: Updates on local news and upcoming events.

While both apps aim to enhance the user experience in Vijayawada, "Smart VMC" is more focused on municipal services and civic engagement, whereas "Smart Vijayawada" provides a broader range of information about the city. They complement each other by covering different aspects of living in and visiting Vijayawada.

6.2 City Visits & Detailed Primary Assessment

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6.2.1 Pimpri-Chinchwad Municipal Corporation (PCMC)

Figure 5: PCMC Smart Sarathi application

The PCMC Smart Sarathi app was introduced on 23rd March in 2020. This app was launched by the PCMC to provide residents with easier access to a variety of municipal services and to improve the efficiency and transparency of service delivery.

Pimpri Chinchwad Municipal Corporation has performed incredibly well in waste management and sanitation services. PCMC also caught the eye for being swift and vigilant in their response to fighting against the COVID-19 pandemic.

A total of 22 projects have been taken up by PCMC out of total SCM budget of 929.54 crore rupees. Three of them are closely related with SCMA and have a total budget of 172.84 crore rupees, two of them have been completed. One of them is itself- City Mobile App and Social Media Analytics. One big important project - GIS Enabled ERP including Municipal Service Level Benchmarking, Unique Smart Addressing and Online Establishment Licensing with budget 132 crore rupees, which is underway is expected to make huge impact on digital governance including SCMA.



Figure 6: PCMC Smart Sarathi App - (daily) no. of downloads from inception till March 2024

Figure 6 shows the daily number of downloads of the app since the app was floated till 31st March 2024. The spike during March - April 2020 is attributed to the first lockdown due to COVID when the Smart Sarathi app was declared to be the only source of official information the citizens of PCMC regarding COVID. The spike during March 23 - 31, 2022 is attributed to the Swacch Sarvekshan feedback drive from the citizens via the app. The increase during December 15-20, 2022 is due to a central government initiative where a city wise feedback was required to be taken which included feedback from parents of school going children via the app.

Overall, 91.6% downloads are Android downloads, while the remaining 8.4% are IOS downloads. The summary of daily downloads – separately for Androids and IOS, as well as the total is given in Table 9-10 of Appendix 9.2. This shows on average there are about 168 Android downloads and 15 IOS downloads – but these are heavily influenced by outliers (driven by special campaigns); more indicative figure median values, which are 67 and 9 respectively. Altogether, there are almost 2.7 lakh downloads.

Google analytics has been integrated by PCMC since August 2023 which facilitates the administration to examine data separately for the different services. Earlier it used to be in aggregate form. The monthly averages from August 2023 to March 2024 has been summarized in Table 9-11 of the Appendix. The relative propensity of usage is depicted via Figure 7, which shows most of the utilization coming from property listing and payment, water bill payments. PCMC uses Google analytics to track its service performance.



Figure 7: PCMC Smart Sarathu Users in various service since August 2023 to March 2024

Two surveys were conducted among the citizens of PCMC – one for the subgroup who do not use the app and the second one among those who use PCMC Smart Sarathi app. The survey questionnaire and responses from 984 citizens are summarized in Table 9-7 of Appendix 9.2. Key points include:

- **1.** Awareness and Concerns:
 - More than 50% of the citizens who do not use the app are aware of it.
 - The primary concern for non-users is privacy and security.
 - A notable minority are uncomfortable with digital technology.
- **2.** Intended Use of Services:
 - Citizens who plan to use the app primarily intend to use it for:
 - Water and tax payments
 - Birth and death certificates
 - Waste collection
 - Grievance management
 - Smart parking services
 - Additional services desired include:
 - Metro ticket booking
 - Marriage registration
 - Drainage connection applications

The survey questionnaire and responses from 278 citizens who use the PCMC Smart Sarathi app are summarized in Table 9-8 of Appendix 9.2. Key findings include:

- 1. Awareness Sources:
 - The majority learned about the app from existing users.
 - A significant minority learned through PCMC events and social media.
- 2. Current Usage:
 - Most users utilize the app for:
 - Property tax payments
 - Water tax payments
 - Grievance reporting
 - A small but significant number of users take advantage of other services offered via SCMA.
- 3. Satisfaction and Service Improvement:
 - Overall satisfaction with the app is moderate.
 - Improvements in service times resulting from app usage are detailed in Table 9-9 and Table 6-1 below. This shows improvement in time in about 70% of cases.
- 4. Additional services desired include:
 - Metro ticket booking
 - PCMC infrastructure booking
 - Marriage registration
 - Ticketing system for amusement parks
 - Sport facilities booking
 - New water connection
 - Drainage connection
 - Shahari Gareeb Yojana Schemes

	Count	%	Standard error (SE)	Lower Limit	Upper limit
Faster	101	62%	3.8%	54.1%	69.0%
About the	46	28%	3 5%	21.2%	34 9%
same	40	2070	5.5%	21.270	54.570
Worse	17	10%	2.4%	5.7%	15.0%

Table 6-1: Time change in service by using PCMC smart app

Table 9-9 in the Appendix shows the detailed cross-tabulation of frequency of service -times before and after using the App. Using that Table 6-1 is constructed which shows that we can be 95% confident that between 54% to 69% users of PCMC Smart Sarathi feel improvement in service time because of using the app.

6.2.2 Indore Municipal Corporation (IMC)

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Figure 8: Indore 311 App

The Indore 311 App was launched on October 2, 2016. As per the information received from Indore coordinating office, as of now, the app has approximately 7,37,152 registered users and has received around 1,421,334 complaints, with 98% resolution rate within the Service Level Agreement (SLA). In July 2019, the app introduced a feature for issuing certificates.

The Indore 311 App offers a variety of features designed to enhance civic engagement and municipal services. These features include:

- 1. Complaint Redressal System: A streamlined system for citizens to report and track complaints.
- 2. Upcoming Events: Information on events happening in Indore.
- 3. Mayor Helpline: A toll-free number for direct communication with the mayor's office.
- 4. Indore Public Transport: Details on public transportation services.
- 5. PMAY Module: A module for booking flats under the Pradhan Mantri Awas Yojana.
- Swachhta Module: It covers (a) Live location tracking of door-to-door waste collection vehicles (b) Information on home composting (c)Details on the Bartan Bank initiative, (d) Rainwater harvesting information (e) Construction and Demolition (C&D) waste

collection (f) Safai Mitra Helpline (14420) (g) Reporting and managing yellow spots (h) Swachhta activities (i) Plastic ban helpline (j) RRR (Reduce, Reuse, Recycle) request and collection service (k) Red spot management.

- 7. Certificate Module: Facilitates the issuance of birth, death, and marriage certificates, which was introduced in July 2019, resulting in the issuance of approximately 80,581 birth certificates, 35,162 death certificates, and 4,001 marriage certificates.
 - IMC Other Services Module: It covers (a) Ward information lookup (b) Details of Indore Municipal Corporation (IMC) officials.
 - Parking information.
 - Boring permission and drilling registration.
 - 24/7 shop registration.
 - PNG (Piped Natural Gas) request service.
- 8. Food Safety Complaint: A system for reporting food safety issues.
- 9. All Emergency Numbers: Quick access to emergency numbers for police, fire, ambulance, etc.
- 10. What's Near Me: Locates nearby amenities such as ATMs, hospitals, blood banks, and public toilets.

These comprehensive features make the Indore 311 app potentially a vital resource for residents, enabling them to engage with and benefit from municipal services efficiently.

A total of 170 projects have been allotted to IMC out of SCM budget with the total budget of these projects being 940 crore rupees. Only 4 of them are closely related with SCMA; the total budget of them is 16.83 crore rupees, all of which has been completed. One of them is large in terms of budget - GPS Based -Human efficiency tracking system, imTrac soft solution -- which is worth 15.24 crore rupees.

We analyzed all 1,19,560 service request data from the Indore 311 app from the beginning of January until May 19, 2024 (with partial data on May 20), as forwarded by IMC officials. Of these, 38.80% of the cases are related to the drainage and sewerage department, 30.20% to the health department, and 15.35% to the light department, which oversees street lighting. The remaining 15.65% of the cases involve other departments. Figure 9 below shows the daily number of resolved cases in these major categories. Detailed information is provided in Table 9-15 of the appendix. Table 9-16 reports the mean and standard deviation of resolution times for the reported cases, segregated by category. Table 9-17 presents the frequency distribution of the designations of officers resolving these cases. However, according to the data shared, all 1,19,560 cases show complete customer satisfaction. This raises questions about the data's integrity, not only from a common-sense perspective but also given the reported 98% resolution rate by the office.



Figure 9. Indore 311 App – number of complaints and service requests in main categories – January 1 to May 19, 2024

The IMC office also provided data on service requests for Prime Minister Awas Yojana (PMAY) applications from January 12, 2024, to May 21, 2024. Additionally, data was provided for the daily number of service requests for birth and death certificates via the Indore 311 app between January and March 2024. While we analyzed the data depicted in Figure 19 and Figure 20, we found inconsistencies, both in format and figures. This is due to insufficient standards for collection, compilation and management of data at city level.

Survey from users and non-users of Indore 311 App

Survey responses were collected from 122 IMC citizens who are not currently using the Indore 311 app. In odd cases, the responses were incomplete. The questionnaire and a detailed summary of these responses are provided in Table 9-12 of Appendix 9.3. The key findings are as follows:

- We can be 95% confident that between 55% and 72% of the respondents are unaware of the Indore 311 app.
- Besides a lack of awareness, concerns about privacy and a preference for physical facility services are some of the reasons for not using the app.
- We can be 95% confident that between 38% and 56% of the respondents expressed willingness to use the app once they are made aware of it.
- Many respondents are currently visiting physical facilities for services that are already available through the Indore 311 app.

Survey responses were also collected from 74 IMC citizens who are currently using the Indore 311 app. Four of these responses were partial. The questionnaire and a detailed summary of these responses are provided in Table 9-13 of Appendix 9.3. The key findings are as follows:

- The majority of users learned about the app from existing users, with the 95% confidence interval estimate of the relevant proportion being between 47% and 70%. A significant minority, estimated to be between 13% and 32%, learned about it from IMC-organized events.
- The most commonly used services are GRS, "What's Near Me," helpline numbers, birth certificate services, and dustbin collection car information, in that order. The table lists confidence interval estimates of the proportion of users availing different services.
- About two-thirds of the app users are moderately to very satisfied.
- Highly demanded additions to the Indore 311 app include payment portals for property tax, water tax, applications for new water connections, COVID vaccination, bookings for sports facilities and other infrastructure, and applications for drainage connections.

Table 9-14 in the appendix shows the detailed cross-tabulation of the frequency of service times before and after using the app. Based on this, Table 6-2 is constructed from which we can be 95% confident that between 29% and 53% of Indore 311 users feel an improvement in service time as a result of using the app.

	Count	%	SE	Lower Limit	Upper limit
Faster	27	41%	6.1%	29.0%	52.8%
About the same	21	32%	5.7%	20.6%	43.1%
worse	18	27%	5.5%	16.5%	38.0%

 Table 6-2: Time change in service in using Indore 311 app

6.2.3 New Delhi Municipal Council (NDMC)



Figure 10: NDMC 311 App

The broad categories of features of the NDMC311 app are: (a) About NDMC (b) Connect with NDMC (c) Smart meter (payment portal) (d) Complaints (e) Helpline 24*7 (f) Important Information (g) E-hospital (h) All citizen services (i) OPD registration (j) Monitor water quality (k) Garbage vehicle tracking (l) Traffic and parking (m) Employee corner (n) What's near me (o) PTU dashboard (p) Tree in NDMC. The details under each of the categories are mentioned in Appendix 9.4.

A total of 121 projects have been allotted to NDMC out of SCM budget with a worth total of 749.75 crore rupees. Only about 7 of them are related with SCMA, even if indirectly; the total budget of them is 121.58 crore rupees, and all the projects are completed. One of them is the big project on *Unified Command and Control Centre* which is worth 111.15 crore rupees.

Some service requests in NDMC are processed via the NDMC 311 app, while others require online submission but still necessitate a physical visit to the office. For some services, the service numbers are stored in aggregate form without any analytics performed to improve administration. We collected data for different services in various formats and conducted a preliminary analysis. Figure 11 shows the monthly count of service requests in major categories—field inspection, M-challan (digital challan for payment of fines and services), and complaints—for the financial years 2022-23 and 2023-24. The summary statistics of these bookings, including those of the percentage increases is given in Table 9-18 of the Appendix 9.4.

Figure 21 in Appendix shows the percentage increase in the numbers in 2023-24 from the previous year. Figure 12 shows the same data for Barat Ghar (marriage hall) bookings under NDMC. Interestingly, the 2023-24 figures for Barat Ghar bookings are slightly inconsistent with NDMC's alternative reported documents. The number of bookings in nine individual marriage hall is shown in Figure 22 which can be analyzed for better management.





Figure 11: Monthly service request numbers in NDMC 311 app of major categories – April 2022 to March 2024

Figure 12: NDMC Barat Ghar booking numbers (monthly)

Figure 13 depicts the monthly number of yellow fever vaccinations in NDMC during the same two-year period. The dip in March 2023 brings out a potential problem faced administratively.



Figure 13: Number of Yellow fever vaccination in NDMC (combined app and portal)

We have also analyzed variation of service numbers across different days of the week. In Figure 14, we see this in terms of the average number of birth and death registration requests, while in Figure 15, we depict the same in terms of average water and electricity payments. The corresponding number of payments for water and electricity bill payments is depicted in Figure 23 of the Appendix. All these show that a truly online service, using the App will ensure better distribution and bring convenience to the citizens, as under the current (effectively offline mode) the Sundays are underutilized when the citizens do not have to take leave from office-work.



Figure 14: NDMC: Average no. of birth and death registration by the day of the week



Figure 15: Average electricity and water payment at NDMC – on different days of the week

ANOVA (p-value = 0.00057) on electricity payment shows significant differences across the different days of the week, with Turkey-HSD test establishing that on Mondays and Wednesdays, payments are on average significantly lower than Saturdays. Since, the electricity payment data is highly skewed as seen from Table 9-21 in Appendix 9.4, with average being over five times even the 75th percentile, we depict the comparatives across the day in logarithmic scale in the left pane of Figure 16. Similar analysis is also carried out for water payments and the corresponding boxplot is shown in the right pane of Figure 16. The corresponding numbers are reported in Table 9-22 of Appendix 9.4.



Figure 16: Box-plot of logarithm of electricity (left) & water (right) payment across different days of the week

We also analyzed weekly birth and death registration in 2023 as depicted in Figure 17. The slightly downward trend is possibly a matter of concern. The corresponding monthly portray is given via Figure 25 in Appendix 9.4.



Figure 17: NDMC weekly birth and death registration in 2023

Figure 24 depicts the corresponding weekly count of water and electricity payments at NDMC which show a slight increasing pattern with expected periodicity.

Table 9-19 on Appendix 9.4 provides comparative statistics of birth and death registrations at daily, weekly and monthly level which can provide useful analytic insight to the administrators.

7 Study Outcome and Conclusions

7.1 Critical Challenges

Data Privacy Concerns and Lack of Public Awareness:

One of the foremost challenges is the issue of data privacy. Smart city applications rely heavily on collecting and analyzing vast amounts of data from citizens. This raises concerns about how this data is stored, used, and protected. The lack of stringent data protection laws in India exacerbates these concerns, leading to public apprehension about privacy breaches and misuse of personal information. Even more important is the public perception or fear about data/ transaction privacy and security which must be addressed properly for the success of the mission.

Compounding this issue is the lack of public awareness and enthusiasm in SCMA. Many citizens remain unaware of the benefits of smart city applications, leading to low engagement levels. Without a clear understanding of how these technologies can improve their daily lives, people are less likely to adopt and support such initiatives. Therefore, extensive public awareness campaigns are needed to educate citizens about the advantages of smart city technologies and reassure them about data privacy measures.

Lack of Conviction, Commitment, and Coordination Among Administrative Divisions:

The implementation of smart city applications requires seamless coordination and commitment across various city administrative wings and government departments operational in a city. However, bureaucratic inertia and inter-departmental silos often hinder effective collaboration. Different city departments may have conflicting priorities, in combination with personal ego, resulting in a lack of unified vision and commitment to smart city projects.

Moreover, without a strong conviction in the potential of these technologies, officials may not fully invest in or support their development and integration. Ensuring that all stakeholders, including local governments, utility providers, and civic bodies, are on the same page is crucial for the success of smart city initiatives. Smart City SPVs/ SPV Boards are expected to take lead in this direction to ensure all agencies are onboarded and are in complete sink.

Technological and Infrastructure Barriers:

While smartphones are becoming increasingly common, a small yet non-negligible portion of the population still lacks access to these devices. Additionally, connectivity remains a concern in many areas and for the financially weakest section. Furthermore, some segments of the population—particularly the elderly and those from less educated backgrounds, are often sceptical or uncomfortable handling sensitive or financial matters online. As a result, while technological and infrastructure barriers are gradually diminishing, they still persist to some degree.

Additionally, there is a broader concern about the ability of city administrations to effectively use electronic data and analytical capabilities. Many officials may lack the necessary skills and mindset to leverage data-driven decision-making, resulting in suboptimal service delivery.
Financial Constraints and Sustainability:

Funding remains a critical challenge. Developing and maintaining smart city applications require significant financial investment. Securing sustained funding, especially in a developing economy, can be difficult. Moreover, ensuring that these initiatives are financially sustainable in the long term is crucial, and it has to be ensured through adopting innovative O&M financing practices.

Addressing these challenges requires a multifaceted approach involving robust data protection laws, public awareness campaigns, enhanced coordination among administrative bodies, and significant investment in technological infrastructure and capacity building. By tackling these issues head-on, Indian cities can fully realize the potential of smart city mobile applications, paving the way for more efficient, liveable, and sustainable urban environments.

Limitation of this Research:

The study's reliance on official data from city officials significantly affects its assessment of app usage and effectiveness. While the data for PCMC was reasonably validated, inconsistencies in data from other cities, such as Barat Ghar booking data in NDMC and reported resolution rates in IMDC, raise unresolved questions about their accuracy.

The citizen survey also faced challenges, including modest sample sizes. Given the context, especially paucity of time and scope, and lack of public interest, it was not possible to take random samples. Consequently, the survey results provide only indicative information rather than statistically valid inferences. Additionally, despite multiple communications, NDMC officials did not share their survey results. As a result, the field study for NDMC had to rely on focus group discussions and one-on-one interactions with a limited number of citizens.

7.2 Replicable Best Practices for Smart City Mobile Applications

In an era where urbanization is accelerating at an unprecedented rate, smart city initiatives have emerged as pivotal in enhancing the quality of urban life. Central to these initiatives are mobile applications, which serve as interfaces between citizens and smart city services. For these applications to be effective, scalable, and sustainable, certain best practices should be adopted. Here, we explore replicable best practices for smart city mobile applications.

Citizen-Centric Design:

A citizen-centric approach ensures that the mobile application is intuitive, accessible, agile, and meets the needs of diverse user groups. Conducting comprehensive user research and involving citizens in the design process through surveys, focus groups, and beta testing can lead to more user-friendly interfaces. SCMA should incorporate the following common features:

- Grievance Redressal System:
- *Platform for Applications and Bookings:* For services like sewage connection, building permission, trade license/shop registration, water connection, boring, and hoarding.
- Solid Waste Management and Garbage Collection Tracking:
- Payment Portal: For water/property tax, electricity, sewage, traffic challan payment, etc.
- Certificate and Document Issuance: For birth, death, and marriage certificates.

- *Public Guidance and Information:* GIS, hospital, bank, ATM, tourist info and ticketing, blood bank, police, etc.
- *Traffic and Parking Information:* City bus routes, metro/ suburban train information, and parking.

Additional features should be built in the SCMA to make it more attractive for citizens. These include smart bus stops with real-time updates on the arrival times of various bus routes and traffic updates providing real-time information on congestion at different locations.

Interoperability and Open Standards:

Smart city applications should adhere to open standards and promote interoperability with other systems and platforms including city/ municipal web portals. This approach allows for seamless data exchange and integration with various city services, enhancing the application's utility. Using APIs (Application Programming Interfaces) and ensuring compliance with standards like REST (Representational State Transfer) and SOAP (Simple Object Access Protocol) can facilitate this integration.

Data Privacy and Security:

Ensuring data privacy and security is paramount in smart city applications. Implementing robust encryption methods, secure authentication protocols, and compliance with data protection regulations (such as General Data Protection Regulation, GDPR, in Europe) can safeguard citizen data. Regular security audits, vulnerability assessments, and employing best practices in cybersecurity can mitigate risks of data breaches and cyber-attacks.

Scalability and Flexibility:

A scalable architecture is essential to accommodate the growing number of users and the increasing volume of data. Cloud-based solutions and microservices architecture can offer the necessary flexibility and scalability. Designing the application to handle high traffic loads and future expansions ensures long-term sustainability.

Data Processing and Analytics:

Real-time data processing capabilities are crucial for many smart city applications, such as traffic management, emergency services, and environmental monitoring. Leveraging technologies like IoT and edge computing can enable real-time data collection and analysis, providing timely information and enhancing the responsiveness of city services. Regular use of data analytics and forecasting can lead to improved services for citizens.

Citizen Engagement and Feedback Mechanisms:

Engaging citizens and incorporating their feedback is vital for the continuous improvement of the application. Features such as in-app surveys, feedback forms, and social media integration can facilitate active citizen participation. Transparent communication regarding updates, changes, and new features builds trust and encourages continued use of the application.

Sustainability and Green Practices:

Incorporating sustainability into the design and functionality of smart city applications is increasingly important. Features that promote eco-friendly practices, such as real-time information on public transportation, bike-sharing schemes, and energy-saving tips, can contribute to a greener city. Innovative solutions like rainwater harvesting and horticulture can also be integrated to enhance sustainability; specific details regarding these two have been included in Appendix 9.5 and 9.6.

Cross-Platform Compatibility:

Ensuring that the smart city mobile application is compatible with various operating systems (iOS, Android, etc.) and device types (smartphones, tablets) is essential for broad accessibility. Using cross-platform development tools like Flutter or React Native can streamline this process and ensure a consistent user experience across different platforms.

Partnerships and Collaboration:

Building partnerships with local businesses, tech companies, and other stakeholders can enhance the functionality and reach of the application. Collaborative efforts can lead to the development of innovative features, improve service delivery, and foster a sense of community ownership. This will also ensure its sustainable operations of SCMA in the long run.

Continuous Monitoring and Improvement:

Regular monitoring and evaluation of the application's performance are crucial for identifying areas of improvement. Implementing analytics tools to track usage patterns, performance metrics, and user feedback can provide valuable insights. Agile development methodologies, with iterative updates and improvements, ensure that SCMA evolves in response to changing needs and technological advancements.

In conclusion, the development of smart city mobile applications requires a holistic approach that considers the diverse needs of urban populations, leverages modern technologies, and fosters continuous engagement and improvement. By adhering to these replicable best practices, cities can create effective, scalable, and sustainable mobile solutions that significantly enhance urban living.

7.3 Other Recommendations & Policy Directives for SCMA

SCMA is essential for enhancing urban living by providing efficient, real-time services to citizens. To fully realize their potential, future directions and recommendations for SCMA should focus on targeted marketing, technological advancements, and improved coordination among city leadership and service providers.

Greater Coordination and Integrated Commitment:

Achieving the full potential of SCMA requires robust coordination and commitment from various city leadership teams and service providers. Collaborative efforts are essential for integrating different services and ensuring seamless operation across departments. Establishing a unified vision and shared goals among all stakeholders can drive the successful implementation and ongoing development of SCMA.

Targeted Marketing and Awareness Programs:

To ensure widespread adoption and engagement, it is crucial to launch targeted marketing and awareness programs. These campaigns should aim to educate citizens on the benefits and functionalities of SCMA, making them excited to use these tools. Annual awareness drives, coupled with incentives such as discounts on municipal services or recognition programs, can significantly boost user engagement and retention.

Standardization of Essential Services:

All SCMA should include a common, compulsory list of essential services to ensure consistency and reliability across different cities. These have been listed in Section 7.2. By providing these fundamental services, SCMA can become indispensable tools for urban residents, fostering a sense of enthusiasm and reliance on the app.

Technological Advancements:

The future of SCMA lies in leveraging cutting-edge technologies to enhance interoperability, user experience, and service functionalities. Key areas for future development include:

(a) Artificial Intelligence and Machine Learning (AI & ML) which can enable personalized services, such as tailored notifications and recommendations, and predictive analytics for better city planning and resource management.

(b) 5G and IoT Integration: which will enable more seamless and responsive smart city services. Faster data transmission and interconnected devices can enhance real-time monitoring and control of urban infrastructure.

(c) Blockchain Technology: which can ensure secure and transparent transactions within SCMA, fostering trust and reliability among users. This technology can be particularly useful for services requiring high levels of security, such as digital payments and identity verification.

(d) Enhanced User Interfaces: which can make app interfaces is crucial for making SCMA more user-friendly and accessible to a broader audience. Intuitive design and easy navigation can significantly enhance the user experience, encouraging more citizens to adopt these applications.

Utilizing Data for Better Decision-Making:

Harnessing data analytics is vital for making informed decisions and providing better services. By analyzing user data, city officials can gain insights into usage patterns, service demands, and areas needing improvement. This data-driven approach can lead to more effective urban planning and resource allocation, ultimately enhancing the quality of life for residents.

Indeed, SCMA can and should serve as a critical tool for Data-Driven Governance, a core principle envisioned under the National Urban Digital Mission (NUDM). By integrating SCMA into city operations, local governments can collect, analyze, and utilize real-time data to make informed decisions that enhance urban management and service delivery. The NUDM promotes the development of digital platforms that empower cities to manage resources efficiently and respond to citizen needs proactively. Leveraging successful implementations of SCMA—where data from multiple services and interactions is aggregated—makes immense sense, as these setups provide valuable insights for optimizing city functions, improving citizen engagement, and ensuring responsive governance. SCMA offers a scalable and adaptable framework for cities to align with NUDM goals, fostering a more transparent, accountable, and intelligent urban management ecosystem.

Setting target milestones for SCMA and incentivising good practice:

While it is unlikely that SCMA will completely replace offline services in the foreseeable future, it is crucial for all smart cities, particularly those lagging behind, to adopt SCMA for improved governance. This adoption necessitates a focused effort and commitment from senior management, including the initiation of specific projects.

We recommend MoHUA to issue guidelines/ advisories for developing such "Mobile Apps" for the remaining aspirant cities in order to make them new instruments for Urban Governance in India as they are agile, up to date, wider outreach to citizens due to its volume, scale and ease of convenience. Smart cities that have yet to develop SCMA should aim to implement it within a year. Those cities that have successfully integrated SCMA could be recognized by having their officials lead workshops to share best practices. The overarching goal should be that within the next five years, at least 25% of city services (or a suitable milestone specific to the services) are covered by SCMA.

Interoperability with Web Portals

Interoperability between SCMA and Web Portals for common services and features offered by ULBs and SPVs is essential for seamless citizen interaction. By ensuring that both platforms mobile apps and web portals—are fully integrated, citizens can switch between them effortlessly while accessing the same services, such as bill payments, grievance redressal, or service requests. This harmonization ensures consistency in data, user experience, and service delivery, regardless of the platform used. A unified backend infrastructure should support real-time data synchronization so that actions taken on one platform (e.g., submitting a request via a mobile app) are immediately reflected on the other (e.g., web portal). This not only simplifies operations for citizens but also enhances the efficiency of ULBs and SPVs by streamlining data management and service delivery across digital touchpoints. Interoperability is key to achieving a cohesive, user-friendly urban governance system, offering citizens flexibility while maintaining the integrity and continuity of services.

Strengthening Security and Privacy of Personal Data in Smart City Mobile Applications:

We recommend the following steps towards data security and privacy.

- Balanced Data Access for Service Improvement: Default denial of data access can hinder service improvement. Implement a data access protocol for controlled, monitored access, adhering to data minimization. For analytics purposes only the necessary fields may be retained. For example, there is no need to retain name, or address (locality is enough) or credit card/account information (enough to retain payment mechanism) for data analytics.
- Masking Personal and Sensitive Data: Full data access should be restricted to critical situations. Implement data masking for sensitive fields (e.g., phone numbers, IDs, credit/debit cards), showing only partial data (e.g., last four digits) in non-essential views.
- Strong Data Encryption: Use AES-256 for storage and TLS for data transmission to protect sensitive data. Encryption ensures that even unauthorized access results in unreadable data.
- Sensitize and Train Administrative Personnel: Sensitize and train all administrative personnel with data access to follow best practices and protocols for data privacy and security, ensuring they understand the importance of safeguarding sensitive information.
- Role-based Access Control (RBAC): Limit data access based on personnel roles using RBAC, ensuring only authorized personnel view or handle sensitive data.
- Multi-factor Authentication (MFA): Enforce MFA for administrators to reduce the risk of unauthorized access through compromised credentials.
- Regular Security Audits and Vulnerability Assessments: Conduct regular audits and vulnerability assessments to ensure that encryption, data access protocols, and overall security comply with standards and remain up to date.
- Data Minimization and Privacy by Design: Collect only essential data. Implement Privacy by Design, embedding privacy protection into the system architecture from the start.
- Compliance with Data Protection Regulations: Ensure compliance with regulations (e.g., GDPR, Personal Data Protection Bill). Establish clear protocols for data retention, anonymization, and privacy settings management.
- Data Breach Response Plan: Have a clear response plan to mitigate damage during data breaches. The plan should include containment, investigation, notification of affected parties, and coordination with authorities.
- Secure APIs and Data Integration: Ensure secure APIs with strong authentication and encryption for third-party service integrations to prevent unauthorized data access.

- Citizen Awareness and Data Responsibility: Educate users on securing personal data, recognizing phishing, and setting strong passwords. Empower citizens to protect their privacy.
- Continuous Monitoring and Incident Reporting: Establish a Security Operations Center to monitor usage, detect suspicious activities, and trigger real-time incident reporting to address potential threats swiftly.

By implementing these measures, user privacy can be protected, maintaining data security, and ensuring compliance with legal standards, fostering trust while enabling improved, data-driven services in smart cities.

Financial Sustainability of SCMA:

To ensure the financial sustainability of Smart City Mobile Applications (SCMA), several strategic steps can be adopted. These measures will not only help secure funding but also enhance the app's utility for citizens, encouraging its widespread adoption. Key recommendations include:

- Build Partnerships with Local Businesses: SCMA can collaborate with local businesses that provide services aligned with the needs of the city's residents. These businesses can advertise their services within the SCMA platform at affordable rates, offering valuable information such as service availability, special offers, or new business launches in local neighbourhoods. Revenue generated from these advertisements can help secure a stable financial stream for the city administration, reducing dependence on public funding. This partnership model benefits both citizens, who gain access to timely, relevant information, and businesses, which gain visibility and engagement with their target audience.
- Implement a User Convenience Fee: In today's fast-paced world, citizens value their time. By offering city services through the SCMA, users can avoid the hassle of physical visits to ULB/ government offices, saving time and reducing the need to queue for services. For the convenience of accessing services online, the city can levy a reasonable user convenience fee. This fee should be kept low and affordable to encourage mass adoption and prevent the perception that the app is being used as a profit-making tool by the administration. Additionally, the fee structure should be transparent, and if a service issue arises due to system lapses or limitations, the convenience fee should be promptly refunded to maintain trust in the system.
- Budget for City Administration Support: As the use of SCMA grows, it will help reduce the workload associated with offline services. The city administration should account for a portion of SCMA expenses in their annual budgets, recognizing the app's role in streamlining operations, improving service efficiency, and reducing physical infrastructure needs. This investment not only sustains the app but also incentivizes citizens to use the digital platform, further reducing the strain on traditional service delivery channels. Encouraging citizens to shift towards SCMA will lead to long-term savings for the city and contribute to a more sustainable and digitally connected urban environment.

Monitoring Mechanism for O&M of Smart City Mobile Applications

To ensure the efficient operation and sustainability of smart city mobile applications, a comprehensive monitoring mechanism must be implemented. This mechanism should include the following key components:

- Real-time Performance Tracking: A robust system should be set up to continuously monitor the app's performance, including response time, uptime, and functionality across various devices and platforms. This ensures quick identification of any technical glitches or downtimes.
- User Engagement and Feedback: Regular collection and analysis of user feedback through inapp surveys and ratings will help identify user satisfaction levels and areas that require improvement. Monitoring active users, session duration, and app usage patterns can also provide valuable insights into app performance.
- Revenue Streams and Transactions: The app should have integrated systems to track and manage financial flows, such as user charges, convenience fees, and local advertisement revenues. Transparent and automated reporting will ensure that revenue generation meets the sustainability targets set for the application.
- Security and Data Privacy Compliance: A dedicated team should monitor the app's compliance with data security regulations and ensure that user data is protected. Regular audits and vulnerability assessments will help mitigate potential security risks.
- Regular Updates and Maintenance Logs: Ongoing updates and maintenance activities must be scheduled and monitored through a structured maintenance log. This log should track software updates, bug fixes, and feature enhancements to ensure that the app remains functional, secure, and user-friendly.
- Third-party Vendor Oversight: If any third-party services are involved (e.g., cloud services, payment gateways, or ad platforms), there should be a mechanism to monitor their performance and service level agreements (SLAs). This ensures that external partners deliver the expected service quality.
- Environmental and Social Impact Metrics: In line with sustainability goals, environmental and social impact metrics (e.g., carbon footprint reduction through paperless services, increased accessibility) should be tracked to measure the broader benefits of the app.
- Local Government and Community Integration: The success depends on its integration with local governance and the community. Regular meetings with stakeholders, including local government bodies and user communities, will provide valuable insights for improving and scaling the app.

By implementing these monitoring mechanisms, the app's operation and maintenance can be optimized for long-term sustainability, ensuring it remains relevant, reliable, and aligned with smart city objectives.

Conclusion:

Where effectively implemented, SCMA have played a pivotal role in transitioning cities from conventional e-governance to modern m-governance, empowering citizens by streamlining their interface with urban services and optimizing backend operations. Higher resolution rates in Grievance Redressal Systems (GRS) and increased adoption of mobile apps have strengthened citizen trust in city authorities.

The future success of SCMA depends on focused awareness programs, continuous technological innovation, and improved coordination among city leadership. By addressing these areas, SCMA can become transformative tools for creating more efficient, sustainable, and liveable urban environments.

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9 Appendices

9.1 Additional Details Related to SCMA in all (94) the Smart Cities.

SCMA assessment

Summary of count of smart cities (out of responses from 94 cities) in terms of having SCMA, having GRS and payment portal via SCMA:

Size	With SCMA	With GRS via SCMA	With payment portal in SCMA	No. of smart cities
Tier 1	5	4	3	5
Big	5	4	4	7
Medium	19	18	16	27
Small	28	21	16	46
Tiny	5	3	3	9
Grand Total	62 (66%)	50 (53%)	42 (45%)	94

Round of selection	With SCMA	With GRS via SCMA	With payment portal in SCMA	No. of smart cities
1	15	11	11	20
2	13	12	9	25
3	19	17	14	28
4	6	4	3	10
Fast Track	9	6	5	11
Grand				
Total	62	50	42	94

Table 9-1: Number of smart cities with SCMA, GRS, payment portal by size of the city

Table 9-2: Number of smart cities with SCMA, GRS, payment portal by Round of SCM selection

Region	With SCMA	With GRS via SCMA	With payment portal in SCMA	No. of smart cities
Central	11	11	10	11
East	4	4	3	9
North	14	10	11	17
North-East	6	4	2	10
South	13	10	6	26
West	14	11	10	21
Grand Total	62	50	42	94

Table 9-3: Number of smart cities with SCMA, GRS, payment portal by Region

Is CEO also Municipal Commissione r	With SCMA	With GRS via SCMA	With payment portal in SCMA	No. of smart cities
No	32	26	20	47
Yes	29	23	21	46
(blank)	1	1	1	1
	62	50	42	94

Table 9-4: Number of smart cities with SCMA, GRS, payment portal – by whether CEO is Municipal commissioner

Name of SCMA in all Smart Cities

Name of the City	Name of the app
Agartala	My Agartala
Agra	MERA AGRA
Ahmedabad	AMC 311
Ajmer	Ajmer Citizen App
Aligarh	Aligarh Nagar Seva
Atal Nagar Nava Raipur	Nava Raipur Atal Nagar
Bareilly	Bareilly 311
BELEGAVI SMART CITY	BELEGAVI SMART CITY
Bengaluru	Smart Bengaluru
Bhagalpur	Bhagalpur Smart city Limited
Bhopal	Bhopal Plus
Bhubaneswar	Bhubaneswar.me/Mo Bus/Mo Parking
Biharsharif	MY BIHARSHARIF
Bilaspur	Bilaspur Smart City
Chandigarh	ImChandigarh
Chennai	Namma Chennai
Chhatrapati Sambhajinagar (Aurangabad)	Smart Nagrik App
Dahod	Dahod Smart City
Davanagere	Dvg Smartcity One App
Dehradun Smart City Limited	DOON1
Erode	My Erode (?)
Faridabad	MCF 311
Gwalior Smart City	One City One App
Imphal	My Imphal

Name of the City	Name of the app
Indore	Indore311
Itanagar	My Itanagar
Jabalpur	Jan (Jabalpur apna nigam)
Jaipur	Jaipur Samadhan
Jammu	MyJammu
Jhansi	Jhansi Smart City
Kalyan Dombivli	KDMC 24*7
Kanpur	Kanpur Smart City
Karimnagar	Karimnagar Citizen Buddy
Kochi	My Kochi
Lucknow	Lucknow One
Mangaluru	MANGALURUONE
Moradabad	Moradabad-SC
Nashik	Nashik Smart city
New Delhi	NDMC311
Panaji	CITIZEN APP PANAJI
Pasighat	Smart Pasighat
Pimpri Chinchwad	PCMC Smart Sarthi
Prayagraj	Prayagraj smart city (?)
Pune	PMC CARE
Raipur	Mor Raipur App
Rajkot	Rajkot Municipal Corporation
Ranchi	Ranchi City App
Sagar	Sagar Smart City App
Saharanpur	SAHART
Satna	Maor Seva Satna
SHIMLA	Myshimla
Shivamogga	Shivamogga Payana
Srinagar Smart City Limited	My Srinagar
Surat	Surat Municipal Corporation
Thiruvananthapuram	CITY CONNECT (?); Smart Trivandrum
Thoothukudi	Thoothukudi corporation
Tumakuru	Smart Tumakuru
Udaipur	Smart City Udaipur

Name of the City	Name of the app		
Ujjain	UMC Seva		
Vadodara	MY Vadodara		
Varanasi	Kashi Darshan		
Visakhapatnam	Smart Vizag by GVMC		

Table 9-5: Name of the (SCMA) Apps in the Smart Cities

Content of Survey questionnaire that was sent to all the smart cities

Name of the City
State
Population (As per Census 2011)
ULB Area
Number of Wards in City
Number of Wards in ABD area
Area of ABD Area (in sq. km.)
Round of selection for Smart Cities Mission
Date of creation of SPV
Is the CEO also the Municipal Commissioner of ULB?
Contact Details of Head of the Smart City Mission: Name
Phone/ Mobile
email
Do you have a Smart City Website
Do you have a Smart City Mobile Application

Topic 8 specific questions:
Does the smart city have a Smart City Mobile Application (SCMA)
What is the name of the app on play store/Apple store
What is the total number of downloads of the application (*)
Does the application provide services for the following:
Payment portal for municipal payments (Bills, taxes, etc.)
Grievance Redressal System
Please list (at least) THREE municipal services, in order of importance starting from the most
important
What are the number of requests for these services mentioned above (**)
What are the number of requests except for complaint requests (**)

These are adapted from the questions and represent slightly modified version from what was submitted to MoHUA for circulation. In particular, the total number of downloads (in entire lifetime since floating was sought in *, while the latest monthly number was sought in **. Since

these questions were not communicated to the SC, we fail to conduct the relevant analysis. Also, in the version submitted to the centralized process, the information was sought regarding the actual or planned launch date of the SCMA and specific smart city projects linked with SCMA.

Smart City	Smart City Mobile Application	Grievance Redressal System	Payment portal for municipal payments (Bills, taxes, etc.)	Is the CEO also the Municipal Commissioner of ULB?	Does it have a Smart City Website	Three municipal services, in order of importance starting from the most important
Agartala	Yes	No	No	Yes	Yes	
Agra	Yes	Yes	Yes	Yes	Yes	Water Tax, House Tax, Complaints
Ahmedabad	Yes	Yes	Yes	No	Yes	
Aizawl	Under Development	No	No	No	Yes	
Ajmer	Yes	Yes	No	No	No	Sewerage connection application, City Bus route, trace the Garbage collection vehicle
Aligarh	Yes	Yes	Yes	Yes	Yes	Property Tax Payment, Water Charge Payment, Grievance Redressal System
Amritsar	No	No	No	Yes	Yes	
Atal Nagar Nava Raipur	Yes	Yes	Yes	No	Yes	Payment of Water Bills, Building Permission, Payment of Electricity Bill
Bareilly	Yes	No	No	Yes	Yes	
BELEGAVI SMART CITY	Yes	No	Yes	No	Yes	
Bengaluru	Yes	Yes	No	No	Yes	Grievances, Check Birth Certificate Status, Check Death Certificate Status
Bhagalpur	Yes	Yes	Yes	Yes	Yes	Property tax, Trade License, Building Plan approval
Bhopal	Yes	Yes	Yes	No	Yes	Electricity Bill Payment, Property & Water Tax Payment, Mayor Express, Waste Collection - Grievances Redressal
Bhubaneswar	Yes	Yes	Yes	No	Yes	Property Holding Tax, Trade License, Asset Booking

Smart City	Smart City Mobile Application	Grievance Redressal System	Payment portal for municipal payments (Bills, taxes, etc.)	Is the CEO also the Municipal Commissioner of ULB?	Does it have a Smart City Website	Three municipal services, in order of importance starting from the most important
Biharsharif	Yes	Yes	Yes	No	No	PROPERTY TAX, TRADE LICENCE, GRIEVANCE REDRESSAL SYSTEM
Bilaspur	Yes	Yes	No	Yes	Yes	Lost and Found related, Safety & Security, Traffic Related
Chandigarh	Yes	Yes	Yes	Yes	Yes	Online Building Plan approval, Water & sewer connection, Horticulture
Chennai	Yes	Yes	Yes		Yes	Grievance Redressal, Property Tax payment, Birth / Death Certificate,
Chhatrapati Sambhajinagar	Yes	Yes	Yes	Yes	Yes	Property Tax, Water Tax, Grievance
Coimbatore	No	No	No	Yes	Yes	Online Building Plan Approval, Utility Payment, Grievance Redressal
Dahod	Yes	Yes	Yes	No	Yes	
Davanagere	Yes	Yes	Yes	No	Yes	Jahita Lodge your grievance, Bhoomi, Birth/Death Certificate
Dehradun	Yes	Yes	Yes	No	Yes	Solid Waste Management, RTI, Property Tax
Diu	No	No	No	Yes	Yes	Bill Payment , Grievance Digital door Numbering
Erode	Yes	Yes	No	Yes	Yes	Payment bills, Property tax collection, Water tax collection, sewerage tax collection
Faridabad	Yes	No	No	No	Yes	
Gandhinagar	No	No	No	Yes	Yes	
Gangtok	No	No	No	No	Yes	
Greater Warangal	No	No	No	Yes	yes	
Guwahati	No	No	No	No	Yes	
Gwalior	Yes	Yes	Yes	No	Yes	Property tax, Water Tax, Building Permission
Imphal	Yes	Yes	No	No	Yes	Solid Waste Management

Smart City	Smart City Mobile Application	Grievance Redressal System	Payment portal for municipal payments (Bills, taxes, etc.)	Is the CEO also the Municipal Commissioner of ULB?	Does it have a Smart City Website	Three municipal services, in order of importance starting from the most important
Indore	Yes	Yes	Yes	No	Yes	Shop registration, Birth and death certificate, Boring, home composting and rainwater harvesting
Itanagar	Yes	Yes	No	No	Yes	
Jabalpur	Yes	Yes	Yes	No	Yes	Solid waste management, Water Supply, Street light
Jaipur	Yes	No	No	Yes	Yes	SWM Vehicle Monitoring Sewer Manhole level Sensor Smart Parking
Jammu	Yes	Yes	Yes	Yes	Yes	Grievance Redressal, Hoarding Booking
Jhansi	Yes	Yes	Yes	Yes	Yes	Property Tax, Grievance redressal system, Birth/Death Certificate
Kakinada	No	No	No	Yes	Yes	
Kalyan Dombivli	Yes	Yes	Yes	no	yes	property tax, water tax, grievance
Kanpur	Yes	Yes	Yes	Yes	Yes	Birth & Death Registration, Property Tax Payments, Grievance Redressal
Karimnagar	Yes	No	No	Yes	Yes	
Karnal	No	No	No	NO	YES	
Kavaratti	No	No	No	No	Yes	
Kochi	Yes	Yes	No	No	Yes	
Kohima	No	No	No	No	Yes	
Kota	No	No	No	No	No	
Lucknow	Yes	Yes	Yes	Yes	Yes	Attendance, m-challan, PGRS, Field Inspection
Ludhiana	No	No	No	Yes	No	
Madurai	No	No	No	Yes	No	
Mangaluru	Yes	Yes	No	No	Yes	WATER BILL, WASTE COLLECTION, DISASTER MANAGEMENT

Smart City	Smart City Mobile Application	Grievance Redressal System	Payment portal for municipal payments (Bills, taxes, etc.)	Is the CEO also the Municipal Commissioner of ULB?	Does it have a Smart City Website	Three municipal services, in order of importance starting from the most important
Moradabad	Yes	No	Yes	Yes	Yes	Tax Payment, Birth Certificate, Death Certificate
Muzaffarpur	Under Development	No	No	Yes	Yes	Property tax, Trade License, Building Permission
Nagpur	No	No	No	No	Yes	
Namchi	No	No	No	No	Yes	
Nashik	Yes	Yes	No	No	Yes	Property Tax, Water Tax, Building Plans
New Delhi	Yes	No	No	No	Yes	
New Town Kolkata	Under Development	No	No	No	Yes	Collection and disposal of Solid Waste, Maintenance of drainage and sewerage, Water supply
Panaji	Yes	No	Yes	No	Yes	Electricity Bill, water bill
Pasighat	Yes	No	No	No	Yes	
Pimpri Chinchwad	Yes	Yes	Yes	Yes	Yes	Property Tax, Water Tax, Grievance, Nagar Vasti schemes, Birth Certificate, death Certificate, SWM, Property KYC, Waste Collection, GIS for People, Pet License, Hording Permission, RTI, RTS, Tenders, Building Permission
Prayagraj	Yes	Yes	Yes	Yes	Yes	Property Bills, Pay Property Tax dues, Water Bills, Pay Lease dues, Pay water tax dues etc.
Puducherry	No	No	No	No	Yes	
Pune	Yes	Yes	Yes	No	Yes	Property Tax Bill, Water Bill, Birth & Death etc.
Raipur	Yes	Yes	Yes	Yes	Yes	Online Property Tax Payment System, Water Connection, Public

Smart City	Smart City Mobile Application	Grievance Redressal System	Payment portal for municipal payments (Bills, taxes, etc.)	Is the CEO also the Municipal Commissioner of ULB?	Does it have a Smart City Website	Three municipal services, in order of importance starting from the most important
						grievance redressal
						System
Rajkot	Yes	Yes	Yes	No	Yes	
Ranchi	Yes	Yes	No	No	Yes	
Rourkela	No	No	No	Yes	No	Solid Waste Management
Sagar	Yes	Yes	Yes	Yes	Yes	Water, Sanitation, Economic Development
Saharanpur	Yes	Yes	Yes	Yes	Yes	Tax, Sewer problem, Tax, Public Guidance, Birth & Death
Salem	No	No	No	Yes	Yes	Payment bills, Property tax collection, Water tax collection, sewerage tax collection
Satna	Yes	Yes	Yes	Yes	Yes	Certificates, Grievance, Traffic Challan Payment
Shillong	No	No	No	No	Yes	
SHIMLA	Yes	Yes	Yes	No	Yes	Water Connection, NOC of Electricity, Application for Permission of Canopy
Shivamogga	Yes	No	No	Yes	YES	
SILVASSA	No	No	No	No	Yes	
Solapur	No	No	No	Yes	No	
Srinagar	Yes	Yes	Yes	Yes	Yes	Water Bill, Birth and Death certificate, Municipal Tax, Tourism, Electricity Bil, Disaster Management related announcement, Grievance/Complaint
Surat	Yes	Yes	Yes	No	Yes	
Thane	No	No	No	No	Yes	Property tax, water tax and CFC
Thanjavur	No	No	No	Yes	Yes	
Thiruvananthapur am	Yes	Yes	Yes	NO	YES	
Thoothukudi	Yes	Yes	No	Yes	Yes	Grievances

Smart City	Smart City Mobile Application	Grievance Redressal System	Payment portal for municipal payments (Bills, taxes, etc.)	Is the CEO also the Municipal Commissioner of ULB?	Does it have a Smart City Website	Three municipal services, in order of importance starting from the most important
Tiruchirappalli	No	No	No	Yes	Yes	Water Supply, UGSS, Town Planning
Tirunelveli	No	No	No	No		
Tirupati	Under Development	No	No	Yes	No	Yes
Tiruppur	No	No	No	Yes	Yes	Payment bills, Property tax collection, Water tax collection, sewerage tax collection
Tumakuru	Yes	Yes	Yes	Yes	Yes	GPS Monitoring, Water logging, Illegal Banner Detection, UGD
Udaipur	Yes	No	No	No	Yes	
Ujjain	Yes	Yes	Yes	Yes	Yes	Grievance Redressal, Property Tax / Water Tax Payment, Birth / Death Certificate
Vadodara	Yes	Yes	Yes	NO	Yes	Call Center, Taxes, Panic button
Varanasi	Yes	Yes	Yes	Yes	Yes	Sanitation, Sewerage Maintenance, Water Supply Maintenance
Vellore	No	No	No	yes	yes	
Visakhapatnam	Yes	Yes	Yes	Yes	Yes	property tax, professional tax, arena booking,

Table 9-6: Broad summary table of SCMA features from 94 smart cities

9.2 PCMC: Survey questionnaires, summary of response and additional analyzed summary details

ſ	(a) 1	2 ma	
l		Pimpri Chinchwad Smart City PCMC Smart Sarathi App Citizen Feedback Form	
	1	Are you aware of the PCMC Smart Sarathi App?	
	2	If Yes, what is the reason for not using the PCMC Smart Sarathi App? Digitally novice Want to use physical services I don't have smart phone Concerns about privacy and security	
	3	Now that you are aware of the App, do you plan to use it in the future?	
	4	If Yes, which features of the App will you use? Mark all Unauthorised Construction Fine Property Tax Water Tax Smart Parking Covid 19 Vaccination Birth Certificate Navaratri Festival Permission Solid Waste Management Nasarvasti	
		Death Certificate Waste Collection GIS for People k. Departments Building Permission Near me Hoarding Permissions Citizens' Charter News/Blogs/Articles Audio/Video Events/Survey-Poll/Competition Pet License Tenders Grievance My Deals FAQ Offers RTS If no, what are the possible reasons or apprehensions of not using the	
	3	Smart Sarathi App? Non availability of internet Concerns of privacy Others (please specify)	
	6	Which more services would you like to be added to the Smart Sarathi App? (e.g. Ticketing System for Amusement Parks, Shahari Gareeb Yojana, Marriage Registration, RTI etc.) Ticketing System for Amusement Parks Shahari Gareeb Yojana Marriage Registration PCMC infrastructure booking New Water Connection Drainage connection Others (please specify)	
	Sca	If yet not downloaded the app n the QR code & Download the app	

Figure 18: Survey form adopted at PCMC for non-users of the App

Questionnaire and summary of re	esponses from survey for	non-users of PCMC app
---------------------------------	--------------------------	-----------------------

Questions	Count			95% CI (estimate
Were you Aware of the PCMC	08/	Estimated %	Std error	lower	upper
Smart Sarathi App?	504	(p)	р	limit	limit
Yes	548	55.69%	1.58%	52.6%	58.8%
No	436	44.31%	1.58%	41.2%	47.4%
If Yes, what is the reason for not					
using the PCMC Smart Sarathi					
App?					
Concerns about privacy and	514	52.24%	1.59%	49.1%	55.4%
security	214	24 750/	1.220/	10.20/	24.20/
Digitally novice	214	21.75%	1.32%	19.2%	24.3%
Want to use Physical services	217	22.05%	1.32%	19.5%	24.6%
I don't have a Smartphone	39	3.96%	0.62%	2.7%	5.2%
Now that are you aware of the					
App, do you plan to use it in					
		not possible			
	984	executed			
Yes	501	properly			
No					
	Count			95% CI (estimate
If Yes, which feature of the App		-	Std error	lower	upper
will you Use	984	Estimated p	р	limit	limit
Water Tax	318	32.32%	1.49%	29.4%	35.2%
Property Tax	228	23.17%	1.35%	20.5%	25.8%
Death Certificate	228	23.17%	1.35%	20.5%	25.8%
Birth Certificate	174	17.68%	1.22%	15.3%	20.1%
Waste Collection	159	16.16%	1.17%	13.9%	18.5%
Grievance Management	139	14.13%	1.11%	11.9%	16.3%
Smart Parking	120	12.20%	1.04%	10.2%	14.2%
Property Tax KYC	100	10.16%	0.96%	8.3%	12.1%
News/Blogs/Articles	62	6.30%	0.77%	4.8%	7.8%
Offers/ Deals	49	4.98%	0.69%	3.6%	6.3%
Nagarvasti Schemes	48	4.88%	0.69%	3.5%	6.2%
Building Permission Services	42	4.27%	0.64%	3.0%	5.5%
Solid Waste Management	32	3.25%	0.57%	2.1%	4.4%
Pet License	26	2.64%	0.51%	1.6%	3.6%
Departments Information	25	2.54%	0.50%	1.6%	3.5%
Near me	24	2.44%	0.49%	1.5%	3.4%
Events/Survey-Poll/Competition	10	1.02%	0.32%	0.4%	1.6%
Covid-19 Vaccination	9	0.91%	0.30%	0.3%	1.5%
GIS for People	7	0.71%	0.27%	0.2%	1.2%

Questions	Count			95% CI (estimate
RTI	7	0.71%	0.27%	0.2%	1.2%
Unauthorised Construction Fine	7	0.71%	0.27%	0.2%	1.2%
Audio/Video Calling	6	0.61%	0.25%	0.1%	1.1%
Pandal Permission	4	0.41%	0.20%	0.0%	0.8%
Hoarding Permissions	3	0.30%	0.18%	0.0%	0.6%
RTS	3	0.30%	0.18%	0.0%	0.6%
Tenders	2	0.20%	0.14%	-0.1%	0.5%
eFAQ/	2	0.20%	0.14%	-0.1%	0.5%
Citizens' Charter	0	0.00%	0.00%	0.0%	0.0%
If No, what are the possible					
reasons for apprehensions of not	362				
using Smart Sarathi App?					
Non-availability of Internet	15	4.1%	1.05%	2.1%	6.2%
Concerns of privacy	294	81.2%	2.05%	77.2%	85.2%
Others	53	14.6%	1.86%	11.0%	18.3%
	Count			95% CI (estimate
Which more services would you			Std error	lower	unner
like to added in the Smart Sarathi	767	Estimated p	n	limit	limit
App?			4		
Metro Ticket Booking	309	40.3%	1.77%	36.8%	43.8%
Marriage Registration	128	16.7%	1.35%	14.0%	19.3%
Drainage connection	127	16.6%	1.34%	13.9%	19.2%
New Water Connection	54	7.0%	0.92%	5.2%	8.9%
Sport Facilities booking	47	6.1%	0.87%	4.4%	7.8%
Ticketing System for Amusement	27	3.5%	0.67%	2.2%	4.8%
Parks		/			
PCMC infrastructure booking	25	3.3%	0.64%	2.0%	4.5%
Shahari Gareeb Yojana Schemes	20	2.6%	0.58%	1.5%	3.7%
Other (please specify)	30	3.9%	0.70%	2.5%	5.3%
What is your Gender?	984				
Male	618	62.8%	1.54%	59.8%	65.8%
Female	363	36.9%	1.54%	33.9%	39.9%
Transgender	3	0.3%	0.18%	0.0%	0.6%
What is your Age?	969				
<35	129	13.3%	1.09%	11.2%	15.5%
35 -45	713	73.6%	1.42%	70.8%	76.4%
46-55	119	12.3%	1.05%	10.2%	14.3%
56-65	8	0.8%	0.29%	0.3%	1.4%
> 65	0				

Table 9-7: Questionnaire and Summary of responses of Survey from non-users of PCMC Smart Sarathi App

Questions	# Responses			95% estir	6 CI nate
Q1 How did you come to know about the PCMC Smart Sarathi App?आपल्याला पीसीएमसी स्मार्ट सारथी ॲपविषयी कोणत्या माध्यमातून माहिती मिळाली?		Estimat e p (%)	Std error of p	lower limit	upper limit
Existing Users/ सध्याचे वापरकर्ते	152	57.8%	3.05%	51.8%	63.8%
PCMC Smart Sarathi Event/ पीसीएमसी स्मार्ट सारथी उपक्रम	73	27.8%	2.76%	22.3%	33.2%
Ward Offices/ प्रभाग कार्यालय	9	3.4%	1.12%	1.2%	5.6%
Others (social media)	29	11.0%	1.93%	7.2%	14.8%
total	263				
Q2 Which services of the App are you using more? [Select up to 5 of these services]आपण ॲपमधील खालीलपैकी कोणती सुविधा जास्त प्रमाणात सुविधा वापरता?(जास्तीत जास्त पाच पर्याय निवडा)	279	Estimate p (%)	Std error of p	lower limit	upper limit
Property Tax/ मिळकत कर	170	60.9%	2.92%	55.2%	66.7%
Grievance Management/ तक्रार निवारण	125	44.8%	2.98%	39.0%	50.6%
Water Tax/ पाणी पट्टी	78	28.0%	2.69%	22.7%	33.2%
News/Blogs/Articles/ बातम्या/ब्लॉग/लेख	42	15.1%	2.14%	10.9%	19.2%
Near me/ माझ्या जवळपास	40	14.3%	2.10%	10.2%	18.4%
Events/Survey-Poll/Competition/ कार्यक्रम/सर्वेक्षण- पोल/स्पर्धा	40	14.3%	2.10%	10.2%	18.4%
eFAQ/ सामान्य प्रश्न	39	14.0%	2.08%	9.9%	18.0%
Covid-19 Vaccination/ कोविड-१९ लसीकरण	34	12.2%	1.96%	8.3%	16.0%
Property Tax KYC/ मिळकत कर केवायसी	31	11.1%	1.88%	7.4%	14.8%
Departments Information/ विभागांची माहिती	30	10.8%	1.85%	7.1%	14.4%
RTI/ माहितीचा अधिकार	26	9.3%	1.74%	5.9%	12.7%
Birth Certificate/ जन्म प्रमाणपत्र	24	8.6%	1.68%	5.3%	11.9%
Waste Collection/ कचरा संकलन	24	8.6%	1.68%	5.3%	11.9%
Nagarvasti Schemes/ नागरवस्ती योजना	23	8.2%	1.65%	5.0%	11.5%
Solid Waste Management/ घनकचरा व्यवस्थापन	22	7.9%	1.61%	4.7%	11.0%
Citizens' Charter/ नागरिकांची सनद	16	5.7%	1.39%	3.0%	8.5%
RTS/ सेवा हक्क	16	5.7%	1.39%	3.0%	8.5%
Death Certificate/ मृत्यू प्रमाणपत्र	15	5.4%	1.35%	2.7%	8.0%
Building Permission Services/ इमारत मान्यता सेवा	12	4.3%	1.21%	1.9%	6.7%

Questionnaire and summary of responses from survey for Users of PCMC app

Questions	# Responses			95% estir	% CI nate
Smart Parking/ स्मार्ट पार्किंग	11	3.9%	1.17%	1.7%	6.2%
Pet License/ पाळीव प्राणी परवाना	10	3.6%	1.11%	1.4%	5.8%
GIS for People/ नागरिकांसाठी जीआयएस	9	3.2%	1.06%	1.2%	5.3%
Hoarding Permissions/ होर्डिंग मान्यता	7	2.5%	0.94%	0.7%	4.3%
Tenders/ निविदा	7	2.5%	0.94%	0.7%	4.3%
Audio/Video Calling/ ऑडीओ/व्हिडीओ कॉलिंग	6	2.2%	0.87%	0.4%	3.9%
Unauthorised Construction Fine/ अनधिकृत	6	2.2%	0 97%	0.4%	2.0%
बांधकामांना दंड	O	2.2%	0.87%	0.4%	3.9%
Offers/ Deals/ ऑफर्स/डील्स	5	1.8%	0.79%	0.2%	3.3%
Pandal Permission/ मंडप परवानगी	4	1.4%	0.71%	0.0%	2.8%
Q3 How satisfied are you with the utilization & effectiveness of the features in PCMC Smart Sarathi App? (1 = have been least satisfied & 5= have been most satisfied)पीसीएमसी स्मार्ट सारथी ॲपमधील सुविधांचा वापर आणि परिणामकारकता याविषयी आपण कितपत समाधानी आहात?(१=सर्वांत कसी समाधानी आणि ७=सर्वांत जास्त समाधानी)	278	Estimate p (%)	Std error of p	lower limit	upper limit
	49	17.6%	2 29%	13.1%	22.1%
2	34	12.2%	1.97%	8.4%	16.1%
3	68	24.5%	2.58%	19.4%	29.5%
4	52	18.7%	2.34%	14.1%	23.3%
5	51	18.3%	2.32%	13.8%	22.9%
Blank	24	8.6%	1.68%	5.3%	11.9%
Q4 Select a service that you avail frequently in App and you are very satisfied with.ॲपमधील अशी एक सेवा निवडा जी तुम्ही सर्वांत जास्त वापरता आणि ज्या सेवेबद्दल तुम्ही सर्वांत जास्त समाधानी आहात.	215	Estimate p (%)	Std error of p	lower limit	upper limit
Property Tax/ मिळकत कर	90	41.9%	3.36%	35.3%	48.5%
Grievance Management/ तक्रार निवारण	61	28.4%	3.07%	22.3%	34.4%
Water Tax/ पाणी पट्टी	16	7.4%	1.79%	3.9%	11.0%
News/Blogs/Articles/ बातम्या/ब्लॉग/लेख	11	5.1%	1.50%	2.2%	8.1%
eFAQ/ सामान्य प्रश्न	9	4.2%	1.37%	1.5%	6.9%
Nagarvasti Schemes/ नागरवस्ती योजना	6	2.8%	1.12%	0.6%	5.0%
Departments Information/ विभागांची माहिती	3	1.4%	0.80%	-0.2%	3.0%

Questions	# Responses			95% ostir	6 CI
				estii	liate
Events/Survey-Poll/Competition/ कायक्रम/सवद्यण- पोल/स्पर्धा	3	1.4%	0.80%	-0.2%	3.0%
Near me/ माझ्या जवळपास	3	1.4%	0.80%	-0.2%	3.0%
RTI/ माहितीचा अधिकार	3	1.4%	0.80%	-0.2%	3.0%
Waste Collection/ कचरा संकलन	3	1.4%	0.80%	-0.2%	3.0%
Property Tax KYC/ मिळकत कर केवायसी	2	0.9%	0.65%	-0.4%	2.2%
Unauthorised Construction Fine/ अनधिकृत बांधकामांना दंड	2	0.9%	0.65%	-0.4%	2.2%
Covid-19 Vaccination/ कोविड-१९ लसीकरण	1	0.5%	0.46%	-0.4%	1.4%
GIS for People/ नागरिकांसाठी जीआयएस	1	0.5%	0.46%	-0.4%	1.4%
RTS/ सेवा हक्क	1	0.5%	0.46%	-0.4%	1.4%
Q5 What is the typical turnaround time to get that (The one you have marked in Q4) service completed via App?आपण वरील प्रश्न क्रमांक ४मध्ये निवडलेली सुविधा ॲपच्या माध्यमातून पूर्ण होण्यास किती कालावधी लागतो?	242	Estimate p (%)	Std error of p	lower limit	upper limit
<10 min	76	31.4%	2.98%	25.6%	37.3%
10 min - 1 hour	35	14.5%	2.26%	10.0%	18.9%
1 hour to 1 day	17	7.0%	1.64%	3.8%	10.2%
1 day - 3 day	22	9.1%	1.85%	5.5%	12.7%
4 days - 7 days	19	7.9%	1.73%	4.5%	11.2%
More than 7 Days	29	12.0%	2.09%	7.9%	16.1%
Not Resolved	44	18.2%	2.48%	13.3%	23.0%
Blank	36				
Q6 Before using App, how much time did you have to spend to get that service (The one you have marked in Q4)आपण वरील प्रश्न क्रमांक ४मध्ये निवडलेली सुविधा ॲप उपलब्ध नसताना पूर्ण होण्यास किती कालावधी लागत असे?	241	Estimate p (%)	Std error of p	lower limit	upper limit
<10 min	21	8.7%	1.82%	5.2%	12.3%
10 min - 1 hour	36	14.9%	2.30%	10.4%	19.4%
1 hour to 1 day	43	17.8%	2.47%	13.0%	22.7%
1 day - 3 day	33	13.7%	2.21%	9.4%	18.0%
4 days - 7 days	15	6.2%	1.56%	3.2%	9.3%
More than 7 Days	49	20.3%	2.59%	15.3%	25.4%
Not Resolved	44	18.3%	2.49%	13.4%	23.1%

Questions	# Responses			95%	6 CI
				estir	nate
Blank	37	15.4%	2.32%	10.8%	19.9%
		-			
Q7. What more services would you like to be			Chal		
added to the Smart Sarathi App?परिएमसी स्मार्ट	278	Estimate	Sta	lower	upper
सारथी ॲपमध्ये आणखी कोणत्या सेवा समाविष्ट	270	p (%)	ofp	limit	limit
करण्यात याव्यात असे आपल्याला वाटते?					
Metro Ticket Booking/ मेट्रो तिकीट काढण्याची सुविधा	116	41.7%	2.96%	35.9%	47.5%
PCMC infrastructure booking/ महापालिकेच्या वतीने	100	20.4%	2.04%	22.49/	42.00/
प्रवण्यात येणाऱ्या पायाभूत स्विधांचे बुकिंग	106	38.1%	2.91%	32.4%	43.8%
Marriage Registration/ विवाह नोंदणी	92	33.1%	2.82%	27.6%	38.6%
Ticketing System for Amusement Parks/ मनोरंजक	04	22.70/	2.04%	27.20/	20.20
उद्यानांसाठी तिकीट काढण्याची सुविधा	91	32.7%	2.81%	27.2%	38.2%
Sport Facilities booking/ क्रीडा सुविधांचे बुकिंग	78	28.1%	2.69%	22.8%	33.3%
New Water Connection/ नवीन नळ जोडणी	74	26.6%	2.65%	21.4%	31.8%
Other (please specify)/ इतर (कृपया नोंदवा)	71	25.5%	2.62%	20.4%	30.7%
Drainage connection/ ड्रेनेज जोडणी	67	24.1%	2.57%	19.1%	29.1%
Shahari Gareeb Yojana Schemes/ शहरी गरीब योजना	47	16.9%	2.25%	12.5%	21.3%
"What is your "Gender?कृपया आपले लिंग नोंदवा	247	Estimate p (%)	Std error of p	lower limit	upper limit
Male	229	92.7%	1.65%	89.5%	96.0%
Female	18	7.3%	1.65%	4.0%	10.5%
Blank	31				
"What is your "Age ?कृपया आपला वयोगट नोंदवा	254	Estimate p (%)	Std error of p	lower limit	upper limit
<35	41	16.1%	2.31%	11.6%	20.7%
35-45	107	42.1%	3.10%	36.1%	48.2%
46-55	47	18.5%	2.44%	13.7%	23.3%
56-65	34	13.4%	2.14%	9.2%	17.6%
65<	25	9.8%	1.87%	6.2%	13.5%
Blank	24				

Table 9-8: Questionnaire and Summary of responses of Survey from users of PCMC Smart Sarathi App

			Time t	aken e	arlier w	ithout	Арр		
		< 10 minute s	10 minute s to 1 hour	1 hou r to 1 day	1-3 day s	4-7 day s	Mor e than 1 wee k	Not resolve d yet	Tota I
ti	< 10 minutes	10	19	20	12		2		63
m e	10 minutes to 1 hour	3	6	9	7		1		26
ta	1 hour to 1 day			2	3	1	3		9
ke	1-3 days		1	1	4	1	10		17
n wi	4-7 days		1		1	3	5	1	11
th	More than 1 week				2	1	8	7	18
Ар р	Not resolved yet	1				2	4	13	20
	Total	14	27	32	29	8	33	21	164

Table 9-9: Cross-tab frequency reflecting Time taken for service with or without availing PCMC app

	Android Downloads	IOS Downloads	Application Downloads	Android %
Mean	167.9	15.3	183.3	88.9%
Standard Error	9.1	0.8	9.7	0.2%
Median	67	9	76	90.8%
Mode	43	7	50	100%
Standard Deviation	350	31	374	7.4%
Sample Variance	122359	935	139655	0.5%
Kurtosis	81	97	78	28.1%
Skewness	8	8	7	-84.5%
Range	5576	523	5850	38.3%
Minimum	13	0	15	61.7%
Maximum	5589	523	5865	100%
Sum	246881	22498	269379	
Count	1470	1468	1470	1470
Largest(5)	2982	276	3074	100%

Table 9-10: Summary statistics: PCMC App daily download March 24, 2020 to March 31, 2024

Page Title	Month	Views	Users	Views per Users	Average Engagement Time	Events
	Aug-23	20,287	1,029	19.72	31s	22,627
	Sep-23	24,724	1,091	22.66	31s	27,236
	Oct-23	30,678	1,283	23.91	1m 27s	33,716
Property	Nov-23	26,209	1,206	21.73	25s	29,268
Listing	Dec-23	50,152	1,643	30.52	33s	54,950
	Jan-24	48,654	1,897	25.65	2m 48s	54,546
	Feb-24	77,670	2,469	31.46	38s	85,757
	Mar-24	1,20,768	3,659	33.01	39s	1,33,144
	Aug-23	2,531	363	6.97	1m 07s	2,831
	Sep-23	2,894	411	7.04	1m 15s	3,290
Bronorty	Oct-23	3,814	465	8.2	1m 34s	4,392
Bill	Nov-23	4,263	488	8.74	1m 17s	4,972
Payment	Dec-23	7,544	775	9.73	1m 26s	8,796
•	Jan-24	7,908	907	8.72	1m 12s	8,827
	Feb-24	11,819	1,164	10.15	1m 30s	13,257
	Mar-24	16,116	1,677	9.61	1m 25s	18,088
	Aug-23	8,932	518	17.24	23s	10,217
	Sep-23	7,136	510	13.99	22s	8,193
	Oct-23	9,273	614	15.1	34s	10,787
Water Tax	Nov-23	8,888	596	14.91	20s	10,246
Listing	Dec-23	11,168	767	14.56	22s	13,010
	Jan-24	15,037	839	17.92	24s	17,247
	Feb-24	15,823	1,016	15.57	24s	18,236
	Mar-24	21,963	1,396	15.73	22s	25,189
	Aug-23	1,794	192	9.34	2m 30s	2,032
	Sep-23	1,400	188	7.45	2m 10s	1,650
Water Bill	Oct-23	1,597	208	7.68	2m 18s	1,849
Payment	Nov-23	1,771	255	6.95	2m 11s	2,085

1,771 Payment 255 6.95 2m 11s Nov-23 2,014 285 7.07 2m 07s Dec-23 2,692 334 8.06 2m 26s Jan-24 405 7.16 1m 55s 2,901 Feb-24

Impact Assessment Study: Indian Smart Cities

2,384

3,218

3,470

	Mar-24	3,761	488	7.71	2m 05s	4,449
				-		
	Aug-23	3,383	264	12.81	46s	3,775
	Sep-23	3,200	260	12.31	45s	3,602
	Oct-23	4,073	323	12.61	47s	4,520
Birth	Nov-23	2,894	267	10.84	35s	3,317
Certificate	Dec-23	5,076	342	14.84	55s	5,631
	Jan-24	4,699	363	12.94	44s	5,318
	Feb-24	4,722	407	11.6	41s	5,364
	Mar-24	5,022	501	10.02	36s	5,767
	Aug-23	1,757	109	16.12	54s	1,938
	Sep-23	838	111	7.55	30s	950
	Oct-23	958	137	6.99	27s	1,115
Death	Nov-23	1,406	108	13.02	39s	1,626
Certificate	Dec-23	1,142	137	8.34	35s	1,305
	Jan-24	4,682	158	29.63	1m 35s	4,891
	Feb-24	4,187	162	25.85	1m 16s	4,582
	Mar-24	2,257	199	11.34	42s	2,517
					1	
	Aug-23	3,533	48	73.6	47s	3,551
	Sep-23	1,180	26	45.38	1m 00s	1,184
Nagaryasti	Oct-23	2,538	42	60.43	56s	2,543
Search by	Nov-23	2,106	41	51.37	39s	2,115
name	Dec-23	2,701	40	67.53	55s	2,778
	Jan-24	2,897	43	67.37	1m 06s	2,914
	Feb-24	2,537	36	70.47	55s	2,542
	Mar-24	2,748	56	49.07	44s	2,762

 Mar-24
 2,748
 56
 49.07
 44s

 Table 9-11: PCMC App monthly average engagement numbers – August 2023 till March 2024

9.3 IMC: Survey questionnaires, summary of response and additional analyzed summary details

				95% CI estimate	
Q1. Were you aware of the	# of	Estimate	Std error	lower	upper
Indore 311 App before	Response	d % (p)	b	limit	limit
today?	S	e / • (P)	P		
Yes.	44	36.67%	4.40%	28.0%	45.3%
No.	76	63.33%	4.40%	54.7%	72.0%
Total	120				
Q2. What are the reasons					
for not using Indore 311App					
for today?					
Digitally Novice.	16	14.04%	3.25%	7.7%	20.4%
Prefer to use Physical	10	10 52%	<u>, 1 סדס ר</u>	4.0%	16.7%
Services.	12	10.55%	2.07/0	4.9%	10.270
I don't have a Smart Phone.	6	5.26%	2.09%	1.2%	9.4%
Concern about Privacy and	0	7 000/	2 5 20/	2.0%	12.00/
Security.	5	7.89%	2.55%	2.9%	12.070
I was not aware.	65	57.02%	4.64%	47.9%	66.1%
Others.	6				
Total	114				
Q3. Now that you are aware					
of Indore 311App, will you					
use it in future?					
Yes.	56	47.06%	4.58%	38.1%	56.0%
No.	9	7.56%	2.42%	2.8%	12.3%
Maybe.	41	34.45%	4.36%	25.9%	43.0%
Others.	13				
Total	119				
Q4. For what services are					
you currently visiting the					
municipality?					
Birth Certificate.	25	21.55%	3.82%	14.1%	29.0%
Lodge a new Complaint.	19	16.38%	3.44%	9.6%	23.1%
Water Harvesting Request.	11	9.48%	2.72%	4.2%	14.8%
Pradhan Mantri Awas Yojana For Flat Booking.	9	7.76%	2.48%	2.9%	12.6%

Questionnaire and summary of responses from survey for non-users of Indore 311 app

Check the status of lodged Complaints	8	6.90%	2.35%	2.3%	11.5%
Marriage Certificates.	6	5.17%	2.06%	1.1%	9.2%
Death Certificate.	3	2.59%	1.47%		5.5%
Shop Registration.	3	2.59%	1.47%		5.5%
Application for Boring.	2	1.72%	1.21%		4.1%
Other.	30	25.86%	4.07%	17.9%	33.8%
Total	116				
Q5. With in what timeframe would you like to get this service? (in Q4)					
Less than an hour	40	34.48%	4.41%	25.8%	43.1%
Between 1 and 6 hours	29	25.00%	4.02%	17.1%	32.9%
More than 6 hours possibly, but within a day	12	10.34%	2.83%	4.8%	15.9%
Between 1 and 3 days	35	30.17%	4.26%	21.8%	38.5%
Total	116				
Q6. What is your gender?					
Male	75	62.50%	4.42%	53.8%	71.2%
Female	42	35.00%	4.35%	26.5%	43.5%
Transgender	1	0.83%	0.83%		2.5%
Prefer not to say	2	1.67%	1.17%		4.0%
Total	120				
Q7. What is your age?					
Less than 35	100	83.33%	3.40%	76.7%	90.0%
35 to 45	8	6.67%	2.28%	2.2%	11.1%
46 to 55	6	5.00%	1.99%	1.1%	8.9%
56 to 65	2				
66 and above	0				
prefer not to say.	3				
Other:	1				
Total	120				

Table 9-12: Questionnaire and Summary of response of Survey from non-users of Indore 311 App

Questionnaire and summary of responses from survey for ss of Indore 311 app

				95% CI estimate	
Q1. How did you come to	#	Estimated	SE of	lower	upper
App?	Responses	% (p)	р	limit	limit
Existing Users	42	58.33%	5.81%	46.9%	69.7%
IMC Indore 311 event	16	22.22%	4.90%	12.6%	31.8%
Ward Offices	5	6.94%	3.00%	1.1%	12.8%
Other:	9	12.50%	3.90%	4.9%	20.1%
Total	72				
Q2. Which services of the					
App are you using more?	#	Estimated	SE of	lower	upper
[Select up to 5 of these	Responses	р	р	limit	limit
services]					
Lodge a new Complaint	32	44.44%	5.86%	33.0%	55.9%
What is Near Me	26	36.11%	5.66%	25.0%	47.2%
Helpline Number	25	34.72%	5.61%	23.7%	45.7%
Birth Certificate	23	31.94%	5.49%	21.2%	42.7%
Dustbin Collection Car	21	20 17%	E 26%	10 70/	20.7%
Information	21	29.17%	5.50%	18.7%	59.7%
Indore Public Transport	18	25 00%	5 10%	15.0%	35.0%
(IBUS)	10	23.0078	5.10%	13.078	33.070
IMC Officials	14	19.44%	4.66%	10.3%	28.6%
Smart Parking	14	19.44%	4.66%	10.3%	28.6%
Marriage Certificates	14	19.44%	4.66%	10.3%	28.6%
Shop Registration	12	16.67%	4.39%	8.1%	25.3%
Water Harvesting Request	12	16.67%	4.39%	8.1%	25.3%
Pradhan Mantri Awas Yojana	11	15 28%	4 74%	7.0%	23.6%
for Flat Booking	**	13.2070	4.2470	7.070	23.070
Death Certificate	10	13.89%	4.08%	5.9%	21.9%
Application for Boring	2	2.78%	1.94%		6.6%
					[]
Q3. How satisfied are you					
with the utilization and	#	Estimated	SE of	lower	upper
effectiveness of the features	Responses	р	р	limit	limit
in Indore 311 App?					
[1= have been least satisfied					
and 5= have been most					
satisfied]			1 1		
5	27	36.99%	5.65%	25.9%	48.1%
4	22	30.14%	5.37%	19.6%	40.7%

3	17	23.29%	4.95%	13.6%	33.0%
2	4	5.48%	2.66%	0.3%	10.7%
1	3	4.11%	2.32%		8.7%
Total	73				
Q4. Select a service that you	#	Ectimated	SE of	lowor	uppor
avail frequently in App and	# Posponsos	Estimateu		limit	limit
you are very satisfied with.	Responses	þ	μ	mmu	IIIIIC
Lodge a new Complaint	21	29.17%	5.36%	18.7%	39.7%
What is Near Me	17	23.61%	5.01%	13.8%	33.4%
Birth Certificate	15	20.83%	4.79%	11.5%	30.2%
Dustbin Collection Car Information	13	18.06%	4.53%	9.2%	26.9%
Indore Public Transport (IBUS)	13	18.06%	4.53%	9.2%	26.9%
Helpline Number	11	15.28%	4.24%	7.0%	23.6%
Shop Registration	10	13.89%	4.08%	5.9%	21.9%
Death Certificate	10	13.89%	4.08%	5.9%	21.9%
IMC Officials	9	12.50%	3.90%	4.9%	20.1%
Smart Parking	8	11.11%	3.70%	3.9%	18.4%
Marriage Certificates	8	11.11%	3.70%	3.9%	18.4%
Water Harvesting Request	7	9.72%	3.49%	2.9%	16.6%
Pradhan Mantri Awas Yojana for Flat Booking	4	5.56%	2.70%	0.3%	10.8%
Application for Boring	2	2.78%	1.94%		6.6%
Q5. What is the typical turnaround time to get that (The one you have marked in Q4) service completed via App?	# Responses	Estimated p	SE of p	lower limit	upper limit
< 10 minutes	14	20.29%	4.84%	10.8%	29.8%
10 minute to 1 hour	11	15.94%	4.41%	7.3%	24.6%
1 hour to 1 day	18	26.09%	5.29%	15.7%	36.4%
1-3 days	14	20.29%	4.84%	10.8%	29.8%
4-7 days	6	8.70%	3.39%	2.0%	15.3%
More than 1 week	5	7.25%	3.12%	1.1%	13.4%
Not resolved yet	1	1.45%	1.44%		4.3%
Total	69				
Q6. Before using App, how much time did you have to spend to get that service	# Responses	Estimated p	SE of p	lower limit	upper limit

(The one you have marked Q4)					
< 10 minutes	12	17.14%	4.50%	8.3%	26.0%
10 minutes to 1 hour	11	15.71%	4.35%	7.2%	24.2%
1 hour to 1 day	11	15.71%	4.35%	7.2%	24.2%
1-3 days	6	8.57%	3.35%	2.0%	15.1%
4-7 davs	14	20.00%	4.78%	10.6%	29.4%
More than 1 week	15	21.43%	4.90%	11.8%	31.0%
Not resolved vet	1	1.43%	1.42%		4.2%
Total	70				
Q7. Select a service that you					
avail frequently in App and	#	Estimated	SE of	lower	upper
you are NOT very satisfied	Responses	q	q	limit	limit
with.		•	•		
Lodge a new Complaint	13	19.70%	4.90%	10.1%	29.3%
Pradhan Mantri Awas Yojana	9	13.64%	4.22%	5.4%	21.9%
Dustbin Collection Car	6	9.09%	3.54%	2.2%	16.0%
Shop Registration	5	7.58%	3.26%	1.2%	14.0%
What is Near Me	5	7.58%	3.26%	1.2%	14.0%
Smart Parking	5	7.58%	3.26%	1.2%	14.0%
Water Harvesting Request	5	7.58%	3.26%	1.2%	14.0%
Indore Public Transport (IBUS)	5	7.58%	3.26%	1.2%	14.0%
IMC Officials	4	6.06%	2.94%	0.3%	11.8%
Birth Certificate	4	6.06%	2.94%	0.3%	11.8%
Helpline Number	3	4.55%	2.56%		9.6%
Application for Boring	2	3.03%	2.11%		7.2%
Death Certificate	0				
Marriage Certificates	0				
Total	66				
Q8. What is the typical					
turnaround time to get that service completed via App? (The one you have marked in Q7)	# Responses	Estimated p	SE of p	lower limit	upper limit
< 10 minutes	7	10.45%	3.74%	3.1%	17.8%
10 minutes to 1 hour	15	22.39%	5.09%	12.4%	32.4%
1 hour to 1 day	16	23.88%	5.21%	13.7%	34.1%
1-3 days	10	14.93%	4.35%	6.4%	23.5%

4-7 days	10	14.93%	4.35%	6.4%	23.5%
More than 1 week	4	5.97%	2.89%	0.3%	11.6%
Not resolved yet	5	7.46%	3.21%	1.2%	13.8%
Total	67				
Q10. What more services would you like to be added to the Indore 311App?	# Responses	Estimated p	SE of p	lower limit	upper limit
Property Tax	35	48.61%	5.89%	37.1%	60.2%
Water Tax	32	44.44%	5.86%	33.0%	55.9%
New Water Connection	26	36.11%	5.66%	25.0%	47.2%
Drainage Connection	24	33.33%	5.56%	22.4%	44.2%
Covid-19 Vaccination	23	31.94%	5.49%	21.2%	42.7%
Sport Facilities Bookings	23	31.94%	5.49%	21.2%	42.7%
Indore Infrastructure Booking	21	29.17%	5.36%	18.7%	39.7%
Others	6				
011 What is your Gender?	#	Estimated	SE of	lower	upper
	Responses	р	р	limit	limit
Male	41	56.94%	5.84%	45.5%	68.4%
Female	29	40.28%	5.78%	28.9%	51.6%
Transgender	1	1.39%	1.38%		4.1%
Prefer not to say	1	1.39%	1.38%		4.1%
Total	72				
012 What is your age?	#	Estimated	SE of	lower	upper
	Responses	р	р	limit	limit
less than 35	51	70.83%	5.36%	60.3%	81.3%
35 to 45	9	12.50%	3.90%	4.9%	20.1%
46 to 55	6	8.33%	3.26%	1.9%	14.7%
56 to 65	3	4.17%	2.35%		8.8%
over 65	3	4.17%	2.35%		8.8%
Total	72				-

Table 9-13: Questionnaire and Summary of responses of Survey from Indore 311 App users
		< 10 minute s	10 minut e to 1 hour	1 hour to 1 day	1-3 days	4-7 days	More than 1 week	Not resolve d yet	Total
	< 10 minutes	4	1	1					6
timo	10 minutes to 1 hour	4	6	3		1	1		15
taken	1 hour to 1 day		2	3	2	4	4	1	16
with	1-3 days	1		2	1	2	3	1	10
Арр	4-7 days	1			2	4	3		10
	More than 1 week					1	3		4
	Not resolved yet		1	2		2			5
	Total	10	10	11	5	14	14	2	66

Time taken	earlier	without	: App
------------	---------	---------	-------

Table 9-14: Cross-tab frequency for time taken for service with or without availing Indore 311 app

Department Name	Number of cases	Percentage (%)
Sewerage and Drainage Department	46394	38.810
Health department	36103	30.202
Light department to take care of streetlights	18354	15.354
Water Department	11666	9.759
Stray animals	3316	2.774
Department of Horticulture	1791	1.498
Boring related complaints	526	0.440
Prime minister housing scheme	385	0.322
working category for L&T Team	356	0.298
Spitting related	153	0.128
Consumer Charge	100	0.084
Public transport service	90	0.075
14420-Helpline for Cleaning Purpose	49	0.041
Jal shakti Abhiyan	47	0.039
Food Security Administration	43	0.036
Ramky Infrastructure	43	0.036
Create Compost plant	35	0.029
Household useful materials	27	0.023

Department Name	Number of cases	Percentage (%)
Construction and demolition waste collection charges	16	0.013
For paid sanitization	15	0.013
Reuse treated waste water	14	0.012
PNG (Awantika gas)	13	0.011
Complaint related to urination in public place	9	0.008
Utensil bank	9	0.008
Regarding ban on single use plastic	4	0.003
Not available	2	0.002
Grand Total	119560	100

Table 9-15: Department-wise Service request resolution summary from IMC App – January 1, 2024 to May 20, 2024

Resolved complained Category	No. of Resolved cases	Average time required to resolve (Hours)	Standard deviation of resolution time
Sewerage and Drainage Department	46394	6.36	2.81
Health department	36103	6.34	2.80
Light department to take care of streetlights	18354	6.48	2.76
Water Department	11666	6.36	2.83
Stray animals	3316	6.33	2.87
Department of Horticulture	1791	6.40	2.80
Boring related complaints	526	6.77	2.71
Prime minister housing scheme	385	6.30	2.76
working category for L&T Team	356	6.34	2.75
Spitting related	153	6.12	2.94
Consumer Charge	100	6.41	2.84
Public transport service	90	6.36	2.89
14420-Helpline for Cleaning Purpose	49	5.35	2.88
Jal shakti Abhiyan	47	5.85	2.73
Food Security Administration	43	6.07	3.20
Ramky Infrastructure	43	6.02	2.81
Create Compost plant	35	7.11	2.64
Household un useful materials	27	6.11	3.45

Resolved complained Category	No. of Resolved cases	Average time required to resolve (Hours)	Standard deviation of resolution time
Construction and demolition waste collection charges	16	6.75	2.98
For paid sanitization	15	5.53	3.04
Reuse treated waste water	14	5.21	2.94
PNG (Awantika gas)	13	4.77	2.86
Complaint related to urination in public place	9	7.33	1.58
Utensil bank	9	4.89	2.62
Regarding ban on single use plastic	4	6.25	2.99
Not available	2	4.00	
Total	119560	6.07	2.80

Table 9-16: IMC – Category-wise mean and standard deviation of resolution time

Designation	Count	Percentage (%)
Zonal Officer (ZO)	45895	38.47
CSI	36640	30.71
Sub Engineer	18349	15.38
Assistant Engineer (AE)	10977	9.20
other	3665	3.07
Daroga	1686	1.41
Supervisor	1041	0.87
Assistant Executive	688	0.58
Deputy Commissioner Garden (DCG)	107	0.09
N.G.O	68	0.06
Executive Engineer (E.E)	63	0.05
Health Officer (HO)	63	0.05
Food Safety Ward Officer	40	0.03
Consulting Engineer	18	0.02
Team Leader	6	0.01
Ad. Commissioner	3	0.00
Operator	2	0.00
Commissioner	1	0.00
Grand Total	119312	100%

Table 9-17: IMC – Frequency distribution of Designation of officer resolving cases

Impact Assessment Study: Indian Smart Cities



Figure 19: Daily count of PMAY applications via Indore 311 app



Figure 20: Number of birth and death certificate requests via Indore 311 app between January and March 2024

9.4 NDMC: Questionnaire for NDMC 311 App users and Additional details

Detailed features of NDMA-311 app:

a. About NDMC	b. Connect with NDMC	c. Smart meter
 About NDMC. NDMC History. Website. What is in the news today. 	 Facebook. NDMC toll free number-1533. Twitter. Write Feedback. 	1. Login 2. Register 3. Payment
d. Complaints	e. Helpline 24*7	f. Important Information
 Create a new complaint. My complaints. View all complaints. Write feedback. MDMC Toll-free number. 	 Ambulance service. Hospital contact details. Delhi police (Control room). Delhi police (Senior citizen cell). Delhi police (Women in distress). Disaster management helpline. Fire service (Control room). 	 Budget 2018-19. Clean NDMC. Cyber Security. e-courts. FAQs. Fight Dengue/ chikungunya. NDMC walk. PM relief fund. Rainwater harvesting. View medical stock. Virtual tour smart toilets.

g. E-hospital

- 1. Patient registration, 2. Admission, discharge, and transfer,
- 3. Billing, 4. Clinic (OPD and IPD),
- 5. Lab information system, 6. Radiology information system,
- 7. Store and pharmacy, 8. Operation theatres management,
- 9. Dietary, 10. Laundry, 11. Queue management mobile app.

h. All citizen services	i. OPD registration	j. Monitor water quality
 Community hall. Birth certificate. Building plan approval. Child name inclusion. Death certificate. Online health license. Still birth certificate. Yellow fever vaccination. 	 People can get online medical services. Book appointment. Book teleconsultation appointment. Lab report. Blood availability. 	 Bacteriological reports. Chemical reports. Physico reports.
k. Garbage vehicle tracking	I. Traffic and parking	m. Employee corner
 C&D waste management system. Mechanized road sweeping. Sewer cleaning vehicles. Garbage vehicle tracking. 	 NDMC smart parking Smart parking summary Traffic 	 Employee attendance details Facilities for employees.
n. What's near me		

1. ATM, 2. Baratghars, 3. Bus stands, 4. Business directory, 5. Citizen facilitation center.

6. Clinics/ Dispensaries, 7. Community centers, 8. Construction and demolition waste bins, 9. Embassies/ High commissions, 10. Hospitals, 11. Litter bins, 12. Markets,

13. Metro stations, 14. Monuments, 15. NDMC gyms, 16. NDMC open gyms,

17. NDMC swimming pools, 18. Pharmacies, 19. Physiotherapy centers,

20. Police stations, 21. Postal codes, 22. Public Toilets, 23. Schools,

24. Speed Limits, 25 Stadiums, 26. Trolley data, 27. Twin bins, 28. Veterinary Clinics,

29. Water ATMs, 30. Water electricity bills.

The following feedback form was built within the app for the current research project.

https://online.ndmc.gov.in/311 feedack/

1. How did you come to know about the NDMC 311 Citizen App?*

Existing Users

ONDMC Event

🗌 Website

□ Newspaper

2.	Which	services	of the	App	are	vou	usina	more?*
<u> </u>		00111000		1 YP P	0110	, ~~	Gonig	

(Please select up to 5 of the given services that you use most often using the app.)

C Electricity Bill

🗆 Water Bill

Property Tax

Birth Certificate

Death Certificate

🗆 Near Me

Department Information

□ Grievance Management

□ Waste Collection

3. How satisfied are you with the utilization & effectiveness of the features in NDMC 311 Citizen App?* ((1 for Extremely Dissatisfied, 5 for Extremely Satisfied))

01 02 03 04 05

4. Select a service that you avail frequently in App and you are very satisfied with.*

Select Service

5. What is the typical turnaround time to get that (The one you have marked in Q4) service completed via App?*

 \Box < 10 minutes

□ 10 minute to 1 hour

□ 1 hour to 1 day

1-3 days

4-7 days

O More than 1 week

□ Not resolved yet

6. Before using App, how much time did you have to spend to get that service (The one you have marked in Q4)*

 \Box < 10 minutes

10 minute to 1 hour

□ 1 hour to 1 day

🗆 1-3 days

4-7 days

O More than 1 week

□ Not resolved yet

7. Select a service that you availed in App and you are NOT very satisfied with*

Select Service

8. What is the typical turnaround time to get that unsatisfied service completed via App? (The one you have marked in Q7)*

 \Box < 10 minutes

10 minute to 1 hour

□ 1 hour to 1 day

□ 1-3 days

4-7 days

O More than 1 week

□ Not resolved yet

9. What makes you less than satisfied while getting this service via App? (The one you have marked in Q7)*

10. What more services would you like to be added to the NDMC 311 Citizen App?*

11. What is your Gender?*

□ Male

G Female

□ Transgender

12. What is your Age?*

□ < 35

35-45

46-55

56-65

🗆 over 65

	Field inspection	Mchallan	Complaints	% increase in Field inspection	% increase in Mchallan	% increase in Complaints
Mean	883	564	3398	109%	80%	-10%
Median	605	295	3303	110%	-55%	-12%
Standard Deviation	736	567	886	130%	292%	13%
Standard Error	150	116	181	38%	84%	4%
Sum	21203	13533	81547			
Minimum	156	72	2101	-69%	-92%	-30%
Maximum	3668	2012	5518	363%	805%	19%
Count	24	24	24	12	12	12

Table 9-18: Monthly service request numbers in NDMC 311 app of field inspection, Mchallan and Complaints categories



Figure 21: Monthly service request numbers % increase in FY 23-24 from 22-23 in NDMC 311



Figure 22: NDMC Barat Ghar booking in the different facility locatios under NDMC



Figure 23: No. of electricity and water payment at NDMC – on different days of the week

	Birth registration			Death registration		
	daily	daily weekly Monthly			weekly	Monthly
Mean	130	784	3398	106	664	2878
Median	126	738	3229	102	645	2785
Standard Deviation	67.2	214.3	684.4	56.8	171.6	483.4
Standard Error	3.8	29.7	197.6	3.1	23.8	139.5
Minimum	1	518	2605	1	311	2226
Maximum	390	1583	5085	295	1053	4095
Sum	40771	40771	40771	34540	34540	34540
Count	314	52	12	326	52	12

Table 9-19: Summary statistics of NDMC birth and death registration in 2023



Figure 24: Weekly Electricity and Water Bills ONLINE PAYMENTS - NDMC

Impact Assessment Study: Indian Smart Cities



Month	Count of Amount	Average of Amount	SD of Amount	
Sep-23	136	475184	1843645	
Oct-23	1281	435134	2246072	
Nov-23	1120	395174	2331867	
Dec-23	1169	529567	3479454	
Jan-24	1457	457704	2784478	
Feb-24	1398	314710	1897391	
Mar-24	1599	510994	6033506	
Apr-24	1825	221298	1094977	
Grand Total 9985		401751	3226459	

Figure 25: NDMC monthly birth and death registration in 2023

Table 9-20 NDMC Monthly Electricity payments September 2023 to April 2024

	electricity	water
Mean	401751	95873
Standard Error	32289	5880
Median	15301	4379
Mode	341	50
Standard Deviation	3226459	415729
Sample Variance	1.04E+13	1.73E+11
Kurtosis	1977	340
Skewness	36	14
Range	2.1E+08	14281818

	electricity	water
Minimum	1	1
Maximum	2.1E+08	14281819
Sum	4.01E+09	4.79E+08
Count	9985	4998
Q3=third quartile or 75 th percentile	76730	31223
Q1=first quartile or 25 th percentile	2076	825
IQR=inter-quartile range	74654	30398

Table 9-21: summary statistics of electricity and water payment at NDMC based on data from 2023 September to April 2024

	Electricity bill payment			Water bill payment		
	average	SD	count	average	SD	count
Monday	232918	1287676	1797	70697	341478	883
Tuesday	507962	3625351	2211	104555	524696	1013
Wednesday	248458	1750088	2044	80353	346959	680
Thursday	539407	5767951	1434	56093	216658	1064
Friday	391412	1994381	1986	137158	495708	1143
Saturday	837057	4484537	490	187417	553146	208
Sunday	41749	68976	23	108095	261340	7

Table 9-22: Summary statistics of average, SD, count of electricity and Water bill payments at NDMC on different days of the

week

9.5 Rainwater Harvesting (RWH) through SCMA:

Smart city mobile applications can enhance rainwater harvesting by engaging citizens, providing real-time data, and integrating with city infrastructure. Here are key contributions of SCMA to RWH:

- 1. Citizen Engagement and Education:
 - Awareness Campaigns: Apps can educate residents on RWH benefits and environmental impacts.
 - Tutorials and Guides: Provide step-by-step guides and videos for RWH system installation and maintenance.
 - Community Challenges and Rewards: Encourage participation with challenges and rewards, like discounts on water bills.
- 2. Data Collection and Monitoring:
 - Real-time Data Collection: Users can report RWH system performance, creating a citywide database.
 - Sensor Integration: Connect IoT sensors for real-time monitoring of water levels, usage, and quality.
 - Rainfall Tracking: Provide weather forecasts and rainfall data to help manage RWH systems.
- 3. Optimization and Resource Management:
 - Site Suitability Analysis: Use GIS data to suggest optimal RWH installation sites.
 - Maintenance Alerts: Send notifications for scheduled maintenance and potential issues.
- 4. Policy and Compliance:
 - Incentive Programs: Facilitate access to government incentives for RWH installations.
 - Regulatory Compliance: Provide information on local regulations and ensure compliance.
- 5. Community and Collaboration:
 - Networking: Create a platform for sharing RWH experiences and best practices.
 - Crowdsourcing Solutions: Allow users to contribute ideas for improving RWH.
- 6. Integration with Smart City Infrastructure:
 - Water Management Systems: Integrate with city water management systems to optimize harvested rainwater use.
 - Emergency Response: Coordinate responses during extreme weather to protect RWH systems.
- 7. Personalized Recommendations and Analytics:
 - Usage Analytics: Provide data on water usage and savings from RWH.
 - Personalized Tips: Offer tailored advice to optimize system efficiency.

Example Features of a Smart City RWH App:

- Interactive Maps: Show existing RWH systems, suitable installation sites, and public RWH facilities.
- DIY Resources: Provide resources for DIY RWH installations.
- Community Dashboard: Display aggregated RWH data to encourage collective achievement.

9.6 Horticulture Services through SCMA

Smart city mobile applications can enhance urban agriculture, community gardening, and city greening, making these activities more accessible and efficient. Here are key horticulture services these apps can offer:

- 1. Plant Identification and Care Advice:
 - Instantly identify plants from photos and receive care tips, including watering schedules and sunlight needs.
- 2. Gardening Tutorials and Tips:
 - Access a library of articles, videos, and step-by-step guides on topics like soil preparation, composting, pest control, and seasonal planting.
- 3. Community Garden Management:
 - Tools for reserving plots, managing schedules for shared spaces, and coordinating with other gardeners.
- 4. Smart Irrigation Systems:
 - Control smart irrigation systems via the app, automating watering based on weather forecasts and soil moisture levels.
- 5. Plant Disease and Pest Diagnosis:
 - Use AI-powered tools to diagnose plant diseases and pests from photos and get treatment recommendations.
- 6. Local Plant Nurseries and Garden Centers:
 - Find local nurseries, garden centers, and farmers' markets, complete with operating hours, available products, and user reviews.
- 7. Weather Forecasts and Alerts:
 - Receive real-time weather updates and gardening-specific alerts, such as frost warnings and optimal planting times.
- 8. Sustainability and Urban Greening Initiatives:
 - Get information on city-sponsored greening initiatives, tree planting drives, and incentives for urban agriculture.
- 9. Garden Design and Planning Tools:
 - Use virtual tools for garden planning, including layout design, plant selection, and maintenance schedules.
- 10. Educational Programs and Workshops:
 - Listings of local horticulture workshops, gardening clubs, and educational programs to boost community engagement in sustainable gardening.
- 11. Volunteer and Community Engagement Opportunities:
 - Information on volunteering in local parks and community gardens, and involvement in urban beautification projects.

These services help create greener, more sustainable urban environments by making urban gardening accessible and enjoyable for residents.

9.7 Few Testimonials for SCMA from the citizens

"The application is very helpful. The user interface of the application is very interactive and easy to use, one can use it smoothly. Great work on the design part as well. Very well designed. I would recommend the locals to install and experience it."

- Disha Gajjar, Student, Ahmedabad Smart City

"I used Smart City's 311 Application to get my child's Birth Certificate. I was pleasantly surprised to see that within 24 hours I got my digitally signed birth certificate on the application itself. There are many services on Indore 311 like Complaint Redressal, which I regularly use. Kudos Smart City."

- Rachna Jain, Software Engineer, Teleperformance, Pimpri Chinchwad

"We are new to this place, but this App helped a lot in finding various utilities in the town. Also, it saved us from standing in a long queue for ticketing."

- Divyanshu Bhandari, Businessman, Udaipur

"My family members and myself have used most of the modules of Indore-311 application made by Smart City. It is very informative, and there is a quick response from Municipal Corporation, whether you have filed a complaint or any other request, it is resolved very quickly. What a wonderful app!"

- Ajay Pawar, Medical Representative, Indore



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