Smart Data Management is the Blueprint for Smart Cities

teradata.

Table of Contents

Recent advances in data availability enable probe data from connected and autonomous vehicles, along with movement analytics from smart phones, to be used to develop a high-level of insight into the supply and demand for urban transportation. These are all vital components of an analytic ecosystem capable of integrating, analyzing, and sharing massive streams of real-time data. The ecosystem includes a data warehouse, data lake, and analytic platform. It's what allows a smart city to optimize resources, improve infrastructures, enhance residents' quality of life, and create sustainable economic development, among other high-impact outcomes.

Many municipalities are now implementing aspects of smart cities and realizing the benefits. However, most are settling for only a fraction of the full range of opportunities and returns that a smart city can offer. That's because they're not integrating and persisting all available data, analyzing it, and then using the insights to drive value for their constituents.

This is an opportunity lost. The best results from monetizing data are achieved when an entire process is accomplished from collecting data to converting it to information to extracting insights to ultimately defining actions and response strategies. In short, gathering, storing, using, and then acting on data is extremely valuable for smart cities.

At its core, a smart city is one that connects information and communication technologies to share data. Data from Internet of Things (IoT) applications, sensors, and existing city partner systems is used for analytics to drive new value. This includes open-source data, crowd-sourced data, and data from other connected devices or sources.

teradata.

Analytics Inform Smart Cities

Data is the lifeblood of a smart city. It powers apps, which give users basic information. When analyzed, the data provides granular, contextual intelligence for smart outcomes.

Smart cities require smart data management that shares information, allows app developers to create new products, and uses analytics to continuously improve the systems that form the basis of a smart city. Creating an exchange entails planning, governing, and executing best practices. Teradata's Vantage provides an analytic ecosystem to help cities achieve their goals.

Our belief is that smart cities must integrate data from all available sources. This overcomes the common problem of an inability to share data because of departmental silos.

City agencies often gather and store their own data to fit their needs. Our approach breaks down data silos to bring all data together for rich, robust analytic insights that transcend individual departments or organizations.

Our smart city management initiatives driven by Teradata Vantage, deliver a variety of smart city opportunities. For example, we've leveraged transportation data that captures where people live and work to help city planners improve transit solutions, better understand first-and last-mile needs, and deploy innovative, multi-model transportation solutions. In addition, we've worked with cities to analyze transportation data that led to deeper understandings of driver behaviors and implement improvements made possible through connected vehicles.

Smart data management solutions have become a vital building block and starting point as cities recognize the effects of an ever-increasing tidal wave of data and an exponential push for more users. As the smart data management solution grows, it can return revenue or drive down costs for the city. That money can then fund other smart city initiatives.

Envisioning a Sustainable Smart City

The smart city concept has emerged as a banner for the application of advanced technologies in an urban environment. Significant elements of a smart city include:

- Energy grids and electric vehicles
- Places to live and work
- Healthcare
- Education
- Retail
- Manufacturing
- Connected citizens and visitors
- Government services
- Accessibility and mobility

Next-Generation Accessibility Supports Services and Lifestyles

One essential element of a smart city is next-generation accessibility. "Next-generation" encompasses new and emerging technologies and capabilities with public and private sector activities. Connected and autonomous vehicles, mobility-as-a-service, movement analytics, and smart phone apps that connect citizens and visitors deliver enhanced accessibility and mobility in the smart city environment.

This freedom of movement supports access to job opportunities, healthcare, education, and other activities to support residents' economic wellbeing and lifestyles. Other elements of smart cities deliver cost savings, improvements, or sustainable growth. They include:

Maximizing Energy Usage

Detailed energy generation and consumption analytics drive the most efficient generation and distribution of energy. This includes analytics to inform city planners on the placement of electric vehicle charging stations and the effects of electric vehicles on urban transportation.

teradata.

Informing Living and Working Decisions

Urban analytics based on decision-quality data inform city residents on the best places to live and work. These analytics also enable builders and landlords to optimize their offerings while helping businesses take advantage of smart connectivity—the fabric of a smart city.

Improving Healthcare

A wide array of sensors and smartphone apps generate data for sophisticated healthcare analytics. Integrating healthcare systems with other smart city systems enables synchronization and coordination. The availability of data and advanced analytics raises the quality of healthcare, making it easier for people to access healthcare and take preventative health measures based on real-time data.

Expanding Education Opportunities

Considerable progress is being made using remote learning capabilities to provide more attractive offerings to students. This is enhanced by bringing together education and smart city systems to link schedules, curriculums, facilities, and transportation systems. The ebb and flow of students to and from campuses becomes apparent to improve planning, design, and operations.

Delivering Better Retail Experiences

Smart city technology is being applied inside retail environments. This enables a strong coordination between internal and external store activities, such as using data to monitor where shoppers come from and go to after visiting a store. Combining this with customer behavior data inside the store creates a more complete customer profile.

Making Manufacturing More Efficient

Like retail, manufacturing has made considerable strides applying technology to better manage processes within facilities. These include using robotics, automation, and extensive sensor networks to improve the operational management of manufacturing processes. Smart manufacturing operations are integrated with transportation to improve the inward supply of raw materials and the outward flow of finished products.

Connecting Citizens and Visitors

Mobile phones are powerful tools to connect and involve citizens. In a smart city, a web of connectivity is woven between residents, visitors, and service providers. Crowdsourcing techniques collect data about prevailing conditions, while movement analytics detect trends, patterns, and carefully aligned transportation supply and demand. This offers an unparalleled ability to understand resident and visitor behavior to develop appropriate response strategies.
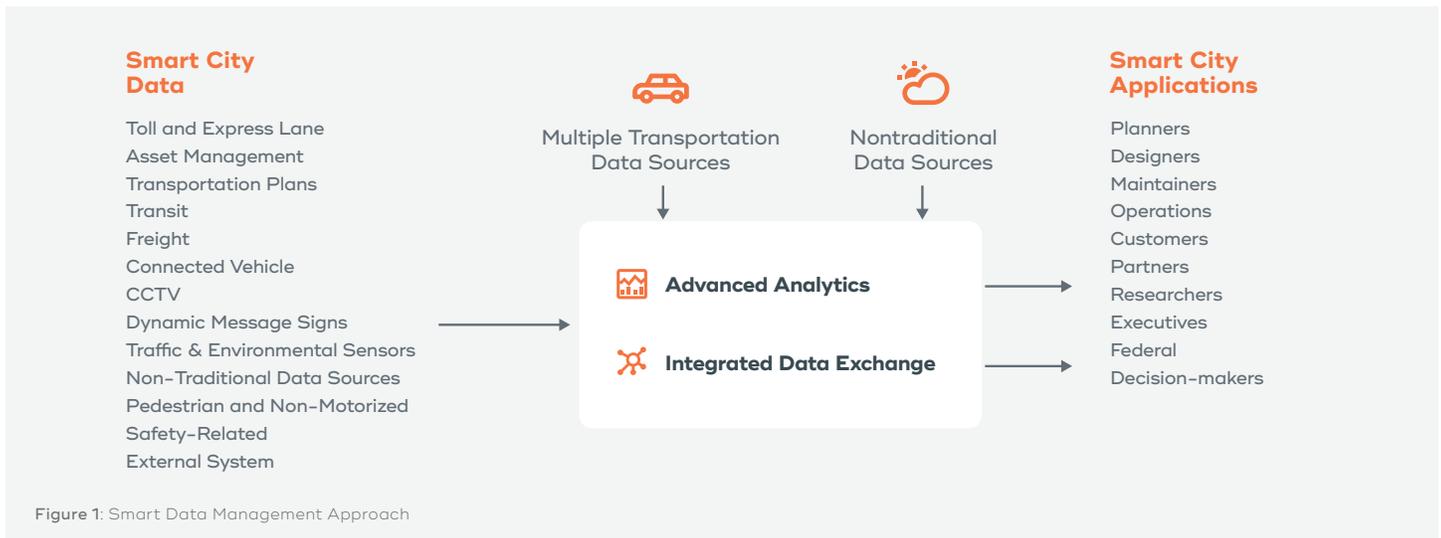
Smart City Data

Toll and Express Lane
Asset Management
Transportation Plans
Transit
Freight
Connected Vehicle
CCTV
Dynamic Message Signs
Traffic & Environmental Sensors
Non-Traditional Data Sources
Pedestrian and Non-Motorized
Safety-Related
External System

Multiple Transportation Data Sources

Nontraditional Data Sources

Advanced Analytics

Integrated Data Exchange

Smart City Applications

Planners
Designers
Maintainers
Operations
Customers
Partners
Researchers
Executives
Federal
Decision-makers

Figure 1: Smart Data Management Approach

teradata.

Enhancing Government Services

Smart cities can revolutionize a wide range of services, from trash collection to issuing permits to operations. For example, IoT sensors provide data that enables smart garbage collection based on garbage can capacity.

The sensors also dim street lights when no one is present. Interconnectivity between government systems enables better access to services and faster response times.

Mobilizing Transportation and Accessibility

A responsive, efficient, and quality transportation system plays a critical role in the overall quality of life for residents, giving them the mobility that matches their lifestyle while providing accessibility to employment, education, healthcare, and other opportunities. Transportation is being transformed within the urban environment with mobility-as-a-service and automated first mile-last mile shuttles.

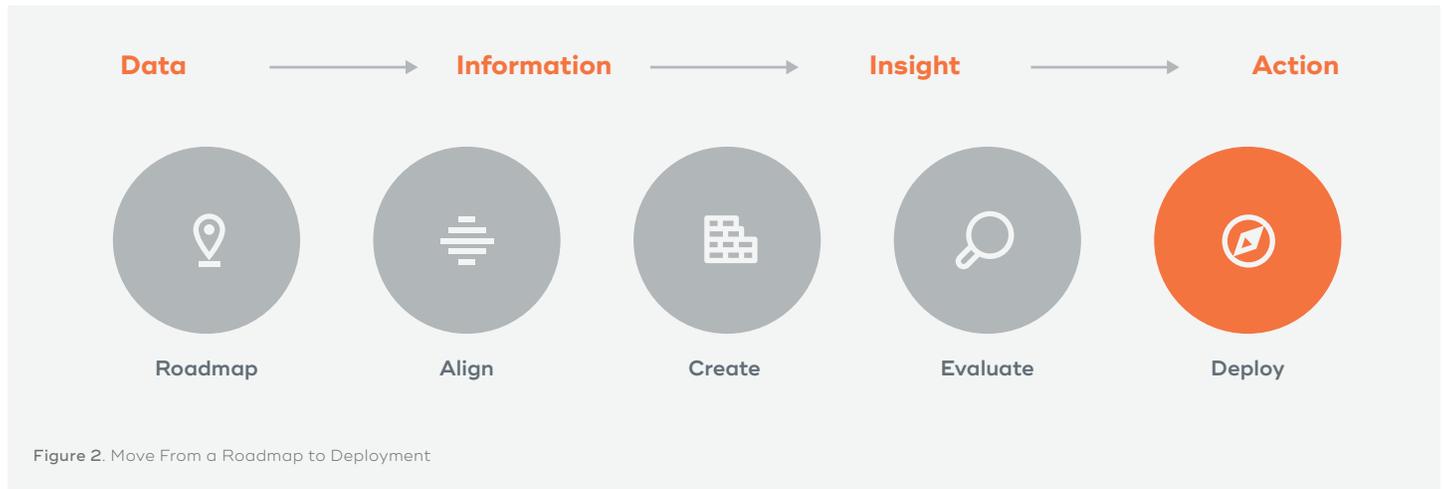## **A Proven Approach to Smart Cities**

Smart cities must optimize analytics and apply the insights to develop appropriate responses and strategies. That's where Smart Data Management delivers unique value.

The Teradata approach to Smart Data Management is to establish, develop, and connect data management capabilities across a smart city. Our philosophy is that Smart Data Management enables:

- The integration of data from sensors, other automated sources, and additional city data into a single platform as a coherent data stream.
- Automated ingestion of multiple data sources into a centralized repository or data lake that allows data to be shared and analyzed.
- The ability to conduct advanced, multi-genre analytics on combined data sets.
- Sharing data under a management regime that controls the level of data access for each user.
- An analytic sharing mechanism that allows all users to share analytics that have been predefined and created while operating the Smart Data Management system.
- The capability to value both raw data and processed information by supporting a data market approach.

To help ensure success, we recommend that cities start with a smaller project, test the process, and then scale accordingly. The Teradata solution is specifically designed with a modular and scalable approach in mind that includes both on-premises and in-cloud offerings. This gives our solution the flexibility to answer any question at any time rather than a limited approach that uses predefined, rigid questions.

teradata.

Data → Information → Insight → Action

Roadmap   Align   Create   Evaluate   Deploy

Figure 2. Move From a Roadmap to Deployment

Steps to Deployment

Based on more than 40 years of experience in big data and analytics, we start with a small, highly focused pilot project, then build a business justification for further investment. Figure 2 shows our robust methodology.

Our approach is to define a series of early-winner use cases that possess two criteria:

- Data is currently available to support the use case.

- The use case will deliver clear & immediate value to the city.

Ultimately, our Smart Data Management will support all elements of the smart city. Our ability to migrate from a small-scale pilot to full-scale deployment is based on our experience and superior implementation methodology.

We specialize in enabling customers to extract maximum value from sensing data while delivering intelligence to support world-class responses and strategies. We help cities evolve from standalone or narrowly focused-smart city projects to highly integrated, business-driven operations.

Our experience across a range of IoT and related applications, deep industry knowledge, and broad expertise with complex analytics at scale derives sustainable value from smart city investments. Using Smart Data Management as a focal point, we drive projects to success through data acquisition, data governance. and a proven strategy that optimizes and drives insights through analytics.

About Teradata

Teradata is the connected multi-cloud data platform company. Our enterprise analytics solve business challenges from start to scale. Only Teradata gives you the flexibility to handle the massive and mixed data workloads of the future, today. Learn more at Teradata.com.

teradata.