The smart cities concept is becoming a megatrend strategy for the application of ICT to improve quality of life in urban environments through novel solutions. The UN Population Division indicates that 54 percent of world’s population currently resides in cities and their suburbs. By 2050, another 2.5 billion people are expected to be added to the world’s urban population, bringing the proportion of urban dwellers to 66 percent. In India, China, and Nigeria will account for approximately 40 percent of this growth. This rapid urban population growth is creating intense pressure to redesign existing cities and to develop new cities from the ground up that can provide green and efficient transportation systems, energy grids, water systems, communication systems, health systems, public safety, and good governance, to name a few applications. The goal is to enable the development of public and private services to enhance the livability of cities and the livelihood of citizens.

Recent technological advances have accelerated the development of the smart city. The pervasiveness of digital sensors and digital control systems for the management of urban infrastructure has enabled applications such as traffic sensors, building management systems, and digital utility meters. High-speed fixed and wireless networks connect sensors and smart systems that allow information to be analyzed in near real time to improve operational performance. Smartphones, cloud computing, and the emerging Internet of Things (IoT) promote real-world interfaces and applications by embedding the latest advances in mobile and pervasive computing, wireless networks, middleware, and agent technologies into the physical spaces of the city. Smart city business models depend on a technology platform that consists of high-capacity broadband infrastructure, including cable, optical fiber, and wireless networks; physical infrastructure featuring embedded systems, smart devices, sensors, and actuators for real-time information processing;
and communications and collaboration applications to foster real-time engagement among citizens, institutions, and businesses. To be effective, smart city systems need to be instrumented, interconnected, and intelligent. Instrumentation enables the collection of timely, high-quality data through embedded sensors that communicate over wireless or wired networks. For example, devices such as smart meters for gas, electricity, and water utilities continually monitor supply and demand. Interconnection creates links among data, systems, and people. The interconnections among people, objects, and systems across the framework of the city will enable new ways to gather, share, and act on information. Finally, intelligent systems in the form of new computing models, algorithms, and advanced analytics will enable better decisions and outcomes for cities and their citizens. Smart connected objects will generate tremendous amounts of useful data to enable the development, deployment, and use of smart products and services. For example, statistical models can predict traffic flows, energy and water supply and demand, environmental conditions, educational performance, safety problems and solutions, and the efficacy of medical treatments to enable better outcomes and lower costs.

The primary motivation for this special issue is to provide perspective, and compelling examples of smart city systems that can enable the optimization or redesign of existing services and identify new value-creation opportunities. The authors’ contributions provide a view of emerging smart city applications that is representative of the types of approaches that researchers and developers are experimenting with in smart city environments and go beyond the applications presented here.

Smart Advertising in Smart Cities
The issue begins with “Intelligent Marketing in Smart Cities: Crowdsourced Data for Geo-Conquesting,” by Bo-Wei Chen and Wen Ji. The article proposes a large-scale crowdsourcing system that can enable intelligent communication strategies and planning by marketers within smart cities. Location data from personal mobile sensing devices in the form of user trails is tracked and analyzed to assess traffic flows and user behavior. Understanding traffic flows is essential for geo-conquesting, a mobile advertising tactic that uses location-based push advertising, typically through social media channels, to direct consumers toward the advertised firm when they are physically in or near a competitor’s location. The “conquest” is complete if mobile users leave the competitor’s location to pursue the pushed ad’s deal.

Geo-conquest-based advertising can be highly effective for increasing brand awareness among consumers who are currently using a competitor’s product or service. Geo-conquest ads are situationally relevant. Suppose you are standing in a long line, and you receive a great trial offer from a competitor with no lines. Geo-conquesting is often used when a new brand is trying to compete with an established one. The study presented has important implications for digital advertising in smart cities. As user behavior is tracked in mobile devices such as smartphones and wearables, analyzing user trails can generate important insights for marketers in terms of how to influence brand choice. Going further, mega-crowdsourced data can intelligently reveal the inner structure and behavior patterns within a smart city. The proposed system has implications for marketing professionals, advertising agencies, advertisers, mall owners, and retail store owners, as well as for IoT, analytics, and cloud services providers.

Trustworthy Smart City Crowd Sensing
In “The Smart Citizen Factor in Trustworthy Smart City Crowdsensing,” Maryam Pouryazdan and Burak Kantarci provide a literature survey of reputation-based crowdsensing solutions to collect and analyze data in smart cities. They also present a vote-based, reputation-aware user recruitment approach to unveil the impact of collaborative trustworthiness assessment with anchor smart citizens. Reputation awareness is important for avoiding inputs from malicious
Guest Editors’ Introduction

Crowdsensing seeks to improve sensing quality on mobile devices by promoting user participation and validation of collected data. Smart citizens have been actively participating in the monitoring, interpreting, and decision-making processes that drive smart cities. A smart citizen can be defined as an individual who is willing (opts in) to provide the sensing and processing ability of his or her mobile smart devices as a service to contribute to the collective monitoring of the city. Applications of reputation-based crowdsensing in smart cities include monitoring and reporting road conditions, traffic situations, rough road surfaces from bicycle vibration data, disaster recovery, public safety, crowd conditions, and environmental conditions.

Optimized Taxi Sharing for Smart Cities
The article “A Social-Network-Optimized Taxi-Sharing Service,” by Chaofeng Zhang, Mianxiong Dong, Kaoru Ota, and Minyi Guo, describes a cloud-based social taxi-sharing service that aims to solve the problem of limited taxi resource management in smart cities. The goals here are to make full use of public resources and minimize environmental concerns, while increasing the quality of services for citizens. The service system provides ride-sharing opportunities to users and presents the solution of the best route via smartphones. To enhance the safety and comfort level for users during taxi sharing, and to increase user trust, the system considers the social connections among peers in service provision. The authors propose a taxi-sharing framework that can optimally arrange sharing plans with help from users’ social network data. The framework includes modules for user departure information, sharing arrangements, social network data, arrangement confirmation, confirmation push to users, and taxi resource arrangement. The authors simulated the best solution for decreasing integrated cost with algorithms for the proposed model, a random model, and a no-relationship model. In each instance, the proposed algorithm generated the lowest cost requiring the least number of taxis. The authors close with the proviso that much work is yet to be done, but there is some promise in social-network-supported taxi sharing that merits further development.

Implementing a Smart City in Taiwan
In “Planning and Implementing a Smart City in Taiwan,” Chiung-I Chang and Chih-Cheng Lo introduce Virtuoso, an open source, cloud-based virtualization resource management system proposed by Chunghwa Telecom to assist the central and local governments of Taiwan in achieving smart city capabilities by 2017. The primary drivers for the Taiwanese government in developing smart cities are to identify new growth opportunities, especially for Taiwan’s ICT industries, and to enter the developing global market for smart living technologies. Smart technologies can bring improvements to homes, businesses, governance, personal safety, medicine, transportation, communications, agriculture, and the environment, to name a few intelligent service applications.

The authors first present Taiwan’s detailed smart city plan, then introduce the Virtuoso system. The system consists of the user interface, availability management, virtual machine management, storage and backup management, network management, resource optimization, performance monitoring, and energy management modules. The authors state that Chunghwa Telecom’s self-developed Virtuoso infrastructure resource management system provides the most important functions, is practical,
Caring for Ecological Smart City Assets

In the final article of this special issue, “Tree MIS: Caring for Ecological Assets in Smart Cities,” Wai-Ming To, Linda S.L. Lai, and Andy W.L. Chung present a tree management information system (Tree MIS) that cultivates the ecological assets of Hong Kong, a developing smart city. The Hong Kong government initiated its Dial 21 Strategy to enable the rapid development of ICT for public-sector management. The goal of the Tree MIS system is to ensure that people and trees can coexist harmoniously in the urban environment by improving the management of Hong Kong’s ecological assets, especially trees, in the vicinity of infrastructure developments. The system is designed to harmonize the approaches in which the health conditions of trees in various locations are monitored and diagnosed. Changes in tree health trigger appropriate action by concerned parties. The Tree MIS cloud platform can be accessed through a wide range of mobile devices. The authors demonstrate that ICT can support, monitor, and analyze urban systems in a continuous learning process with the goal of enhancing sustainability, improving resource efficiency, and increasing quality of life.

We are at the very beginning of what is becoming the smart city megatrend. The confluence of the rapid growth of cities and the digital economy, enabled by affordable technologies such as cloud computing, smart systems, and mobile networks, is making cities more innovative and promising a better life for citizens. The articles in the special section provide an introduction to the type of services that will soon be commonplace.

Acknowledgments

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It is our sincere hope that the reviewers’ comments will inform future success.

References


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