

## SMART CITY INITIATIVES DRIVEN BY LOCAL STARTUPS

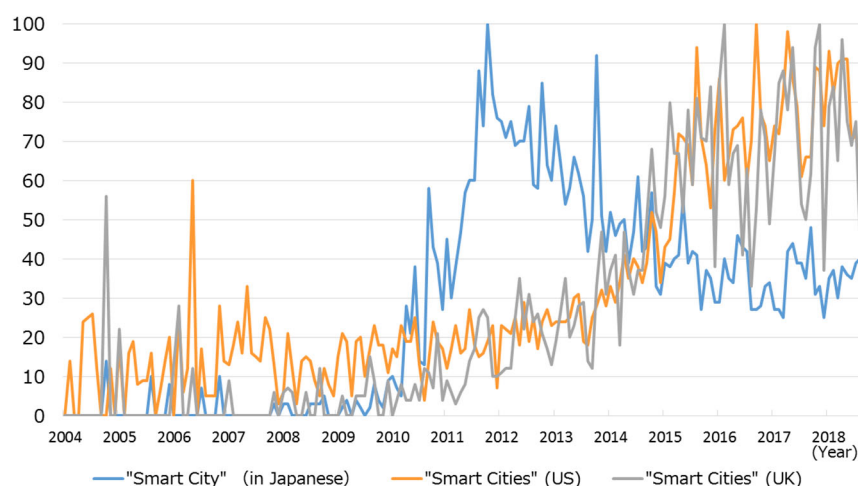
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### CHANGING DRIVING FORCE BEHIND URBAN DEVELOPMENT WITH SMART TECHNOLOGY

“Urban development with smart technology” or “smart cities” are often defined as initiatives to utilize information technologies (IT) in urban infrastructure with the aim of improving operating efficiency of the city and well-being of the citizens, or as cities that have implemented such solutions. In Japan, the concept of “smart cities” attracted much attention as a method to reconstruct disaster-affected areas, amid the increasing awareness of disaster prevention after the Great Eastern Japan Earthquake in March 2011. In this context, “smart cities” are usually referred to as schemes that introduce IT solutions, including upgrading hard infrastructure such as roads and ports, in cities, and bringing more efficient operations. However, such solutions tend to require massive initial investment, and it was difficult to present clear benefits that justify the spending.

Meanwhile, the search frequency of the phrase “smart city/smart cities” has been increasing in the US and the UK in recent years (Chart 1). Here, the term implies an entrepreneur’s establishing a startup to address social challenges and providing solutions that do not require replacement of hard infrastructure. For example, US-based Bigbelly developed and offers solar-powered, sensor-equipped waste and recycling stations, which not only compress and reduce the waste volume but optimize collection routes by monitoring real-time status and indicating which stations need to be collected. The solutions will contribute to a meaningful reduction in waste collection costs. In addition, one estimate shows that carbon emissions of garbage trucks can be slashed by 80%. The company’s smart waste management solutions are one good example of urban solutions that are widely accepted, as they are used not only in 50 cities in the US but also in 54 countries around the world, including developing countries.

Chart 1 Search Frequency of "Smart City/Smart Cities" in Japan, US, UK



Note: Maximum access = 100 (vertical axis)

Source: Prepared by MGSSI based on Google Trend

Another example is US startup company PredPol, which offers effective solutions to improve the safety and security of a city. Using artificial intelligence (AI), the company analyzed data on crimes and developed predictive policing software, which has been implemented by the Los Angeles Police Department and other law enforcement authorities around the US, including county departments of sheriffs. This technology predicts where and when crimes are likely to occur and helps place officers at the right place and time to prevent crimes. The number of robberies and break-ins has dropped in the areas where the system was implemented.

In addition to the above, solutions created by startups are used to address various urban challenges, including those related to infrastructure maintenance and energy (Chart 2).

**Chart 2 Startups Providing Solutions to Urban Challenges**

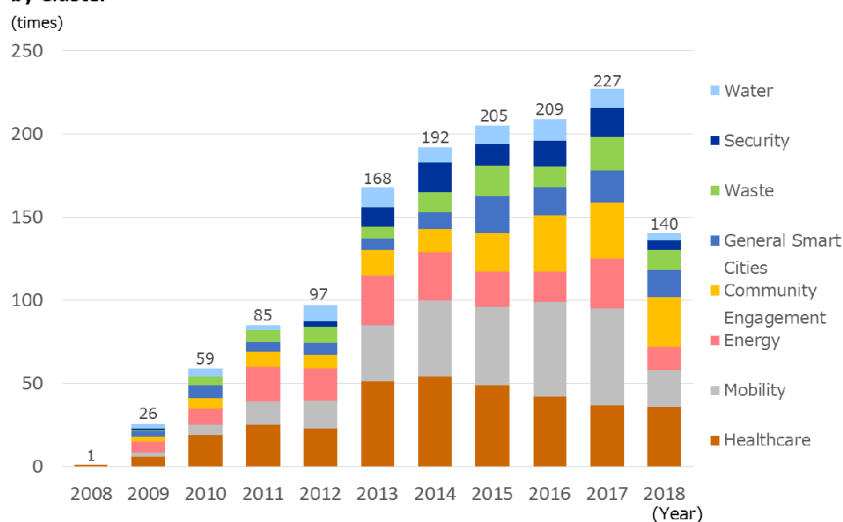
Urban Challenge	Solutions (provide by)	Effects	Customers
Garbage collection	Remote monitoring of waste stations using IoT, optimization of collection routes (Bigbelly, US)	Waste volume reduced to one-fifth; transportation costs slashed by optimizing the timing of collection; CO2 emissions of garbage trucks cut by 80%.	City governments, local shopping streets, universities, etc. (used in 54 countries)
Public security	Predictive policing technology using AI (PredPol, US)	Implementation by Los Angeles Police Department => Number of crimes reduced by 20% Implementation by Jefferson County Sheriff Office, Alabama, US => Number of thefts down 24%, number of break-ins down 13%	Police authorities (in several regions in US)
Infrastructure maintenance	Building façade inspection services using AI and drones (H3 Zoom.AI, Singapore)	Inspection period shortened from 4-6 weeks (existing method) to one day Inspection costs cut from SG\$ 37K (existing method) to SG\$ 4-12K (SG\$ 15-20/m <sup>2</sup> => SG\$ 1-3/m <sup>2</sup> )	Real estate developers (pilot test on buildings owned by Singapore-based real estate developer JTC)
Energy (microgrids)	Peer-to-peer energy trading platform using block chain technology (LO3 Energy, US)	Easier to introduce decentralized power supply => Reduction in the amount of energy lost through transmission; increase in the use of renewable energy	Users (households, business operators), power distribution companies (pilot test in Brooklyn, New York)

Source: Prepared by MGSSI based on various materials, including each company's website.

Along with the increase in the number of startups focusing on urban challenges, there are more and more moves to support them. France-based startup incubator NUMA, partnered with the City of Paris and local infrastructure operators, launched an open acceleration program called DataCity Paris with the objective of designing solutions to urban challenges in Paris. In the first round starting from November 2015, nine urban challenges were identified and 190 startups applied to use their technologies to address them. The five successful applicants moved to the experiment stage, and the final two are still working with the City of Paris and local infrastructure operators, even after the program ended. There have been three rounds of the program to date, all of which were aimed at finding excellent solutions provided by startups and using them to create smart cities.

There have been other initiatives to support the activities of startups focusing on urban challenges. The number of investments in such startups is increasing steadily every year (Chart 3).

**Chart 3 Number of Investments Made in Start-ups Focusing on Urban Challenges by Cluster**



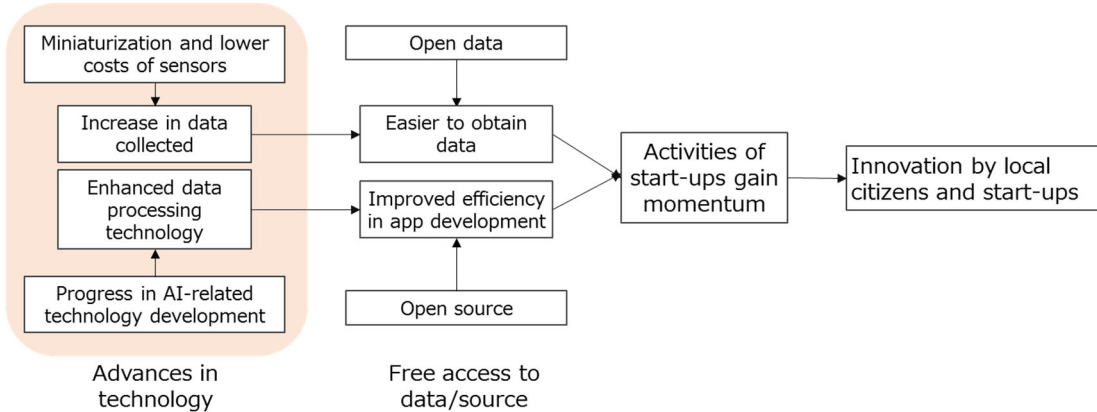
Note: Number of investments in 1H for 2018

Source : Prepared by MGSSI by using Quid based on Crunchbase and S&P Capital IQ data

## INNOVATION OF STARTUPS DRIVEN BY TECHNOLOGY AND FREE ACCESS

Startup companies are increasing their presence in smart city initiatives, helped by “advances in technology” and “free access to data/source”, as shown in Chart 4.

**Chart 4: Acceleration of Innovations Made by Start-ups**



Source: Prepared by MGSSI

We are particularly focusing on two aspects of “advances in technology”. One is miniaturization and lower costs of sensors. Sensors are now attached to various types of urban infrastructure, and a massive amount of data is being accumulated. The other is the advancement of data processing technology. Thanks to the meaningful progress in developing AI algorithms, including deep learning, as well as the use of graphic processing units in deep learning, a large volume of data can be processed at high speed.

Meanwhile, “free access” can be divided into two factors: free access to data (open data) and free access to technology source (open source). Urban infrastructure data is more likely accessible to the public and in a machine readable format (open data), making it easier to obtain data. Data processing technology is also available free of charge (open source), improving efficiency in developing applications. These factors have accelerated startups’ activities. It is just like the number of chefs (startups) increasing as ingredients (data) and cooking devices (source) are provided for free. Google, which is a leader in AI technologies, and NVIDIA, the world’s largest provider of GPUs, have promoted open source for a wider use of their technologies.

The combination of “advances in technology” and moves toward “open data” and “open source” has enabled development of various applications with a single computer. Being aware of such situation, city governments started to create an environment that fosters innovation by local citizens and startups. In the past they used to rely on a single or a limited number of players including IT vendors in seeking solutions for urban challenges. However, after facing limits on creativity and flexibility, as well as difficulty in tapping into real demand, they are now considering outsourcing the problem solving itself to citizens.

## EXAMPLES OF “SMART CITIES” DRIVEN BY OPEN INNOVATION

Startups face many challenges in smart city projects. For example, startups often find it difficult to secure a sufficiently large environment for testing their prototype solutions. They may also have trouble in obtaining data necessary for testing, as such data is located in various places. Active support from local governments in the following two points could accelerate open innovation made by startups, as shown in Chart 4.

One of the two factors that local governments can provide is test beds, where various data can be obtained and prototype solutions can be tested in a real situation. In a smart city project, a certain area of the city is often designated as a test bed used for a proof-of-concept (PoC) demonstration. Data obtained from the test bed has common data items (e.g., place), to which a number of data attributes from third parties, including infrastructure operators, can be connected. This will help startups create various applications. The city is also a place where startups build a PoC model and verify it. If local governments provide various data and a testing environment

through test beds, startups can not only turn an idea into a commercial product/solution, but also gain effective feedback from testing and improve the quality of their prototype.

The other factor is an integrated data platform. By integrating and managing data collected from various urban infrastructures in the same platform, data with completeness and exclusiveness can be accumulated. In addition, data can be processed into a machine readable format, which is a prerequisite for open data. Through such platforms, startups can obtain data efficiently, as they have access to the database covering various infrastructures.

For example, smart city projects in the UK leverage open innovations (Chart 5). Bristol was named as number one in the UK Smart Cities Index 2017<sup>1</sup>, which was published by Navigant Consulting, a US advisory firm specialized in the energy sector. According to this report, Bristol was most highly evaluated for its test bed aspect (i.e., startups can not only obtain data, but test/implement their prototype solutions). In addition, the city imports data from various infrastructure operators via a data platform called NetOS, which helps startups obtain data more efficiently. The shared data platform contributes to innovative use of data, as city governments can work together with local startups and urban infrastructure operators, which holds the key to the success of smart city projects, as indicated in the report.

**Chart 5 Examples of UK Smart City Projects**

	Bristol	Manchester	Transport for London (TfL)
Project name	Bristol is Open	CityVerve	—
Test bed	City centre	Corridor Manchester (243 ha)	Tube, buses, etc.
Data platform	Bristol University and Zeetta Networks established NetOS and integrated data.	Cisco integrated individual companies' data platforms under the concept of "Platform of Platforms".	TfL's data was registered and integrated into London City's data platform London Datastore.

Source: Prepared by MGSSI based on each city's website.

The City of Manchester's "CityVerve" Project was selected as the winner for the IoT City Demonstrator, the government-led technology competition. In this project, the area called Corridor Manchester (243 ha) is designated as a test bed, and data is integrated/managed in a "platform of platforms", which is operated by Cisco.

Meanwhile, Transport for London (TfL) has promoted development of solutions through open innovation, by collecting real-time data such as the operation status and maintenance information of the tube and buses and making it available in London's open data platform "London Datastore". As a result, over 5,000 developers have utilized such data and more than 100 applications have been released. By using TfL's open data, Citymapper developed a public transportation navigation app for the smartphone. It is said that about half of all Londoners are using this app.

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## FUTURE OUTLOOK – "CONNECTING" DATA OWNERS WITH STARTUPS TO FURTHER ACCELERATE INNOVATIONS –

As described above, open data platforms provided by local governments have served as the foundation for developing solutions for smart cities. Startups that have free access to such platforms sometimes play a significant role in addressing urban challenges, by presenting innovative ideas. Meanwhile, not all data necessary for PoC is available in existing data platforms. As such, it will be more important to "connect" potential data owners with startups going forward. If players which own data that are not included in existing data platforms are involved in smart city initiatives, innovations will be further accelerated in a wider range of areas.

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<sup>1</sup> Navigant Consulting, Inc. (2017) "UK Smart Cities Index 2017", Commissioned by Huawei

The abovementioned DataCity Paris Project is a good example. France-based accelerator NUMA has identified data necessary for PoC by facilitating coordination among the City of Paris, local infrastructure operators, and startups. The company has helped startups to conduct a PoC test by making infrastructure operators provide data as “shared data”. Infrastructure operators will possibly enjoy benefits later, as they use successful solutions developed by startups, or apply them to other geographical areas they cover. For example, Paris welcomes a large number of visitors from around the world, and faces the challenge of understanding their behavior and improving the tourist experience. NUMA connected a startup strong in analyzing marketing data with telecommunication carrier SFR, payment service provider Mastercard, and transport operator RATP Group. NUMA supported the startup’s conducting PoC by asking the other partners involved to provide data necessary for analyzing tourists’ behavior. Based on the results of the analysis, SFR, Mastercard, and RATP Group successfully improved the quality of services they offer to travelers. NUMA connects data owners and startups as an accelerator and works as a catalyst of innovations.

Of note, the concept of DataCity Paris has been applied to projects in other countries, including developing countries. DataCity Projects were launched in Berlin, Germany, and Casablanca, Morocco, in 2017. There are also plans to start similar projects in Bangalore, India.

Along with rapid economic growth and urbanization of cities, many large cities in emerging/developing economies are facing urban challenges. In addition to traditional measures to solve such problems (i.e., development of infrastructure), fast and low-cost solutions are needed. The development of smart cities through open innovation meets such needs and the model can be applied to cities not only in developed countries but also in emerging countries. Going forward, more and more urban challenges will be solved through open innovation if startups are connected with data owners such as local governments and infrastructure operators.

Against this background, using an accelerator to build a network of local stakeholders will increase the possibility of finding startups that can deliver solutions to urban challenges. It will also help identify/understand challenges a city faces and get ideas/perspectives necessary for business creation (i.e., what kind of data is lacking, who are potential partners) ahead of rivals. As such, collaboration with accelerators, including NUMA, will be helpful when seeking business opportunities in smart city initiatives.

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