Niigata, Japan
Smarter Cities Challenge report

IBM


Asahi

Contents

1. Executive summary

Introduction

The City of Niigata, Japan, was one of 16 cities selected to receive a Smarter Cities Challenge® grant from IBM in 2014 as part of the company's citizenship efforts to build a Smarter Planet®. During a three-week period in August and September of 2014, a team of six IBM experts worked to deliver recommendations on a key challenge identified by Mayor Akira Shinoda and his senior leadership team:

> Guide the launch of the City's new public transportation system to help ensure overall success and progressive integration with other municipal facilities and services, leading to optimization for downtown revitalization.

The challenge

Since merging with nearby municipalities in 2005, Niigata, the largest coastal city on the Sea of Japan, sprawls more than 726 square kilometers and has a population just above 800,000. Niigata offers rail, bus and taxi services, but private cars remain the most widely used method of transportation. The aging population and commercial decline in the Furumachi downtown area, one of the central business districts of Niigata City, has prompted City officials to explore the development of a new public transportation system. The City hopes this system will attract more riders and catalyze revitalization of the downtown area. A Bus Rapid Transit (BRT) system is scheduled for launch in summer 2015.

There are multiple private operators that provide public bus services to residents of and visitors to the city. Because ridership has been declining, profitability has suffered, resulting in the discontinuation of many routes. Transfers to and from other modes of transport, particularly rail, are inconvenient, and information about bus arrivals and connection times is not easy to obtain.

To encourage more ridership, some routes, such as airport and tourist buses, as well as buses in outlying areas, are subsidized by the City. A significant number of contactless payment cards, called Ryuto, have been issued at a discount for use on public buses.

Both the convenience and quality of public transportation services and facilities are considered the most important factors in increasing ridership. Some routes in the city center are congested, bus stops and taxi stands are sometimes in inconvenient locations, and parking is not always easy to find near public transportation. As aging residents lose their driving privileges, access to public transportation becomes even more important. Additionally, severe winter weather and high CO_2 emission levels pose significant health and safety concerns. By increasing public transportation use, Niigata could help improve residents' quality of life while reducing its impact on the environment. Getting residents engaged in the new public transportation efforts and making visitors aware of the new system and its benefits will play a vital role in increasing overall public transport use.

Findings and recommendations

The IBM Smarter Cities Challenge team met with stakeholders across public sector, private sector and citizen communities that use Niigata public transportation. The team spent time reviewing public transportation statistics, reports and plans provided by the City, as well as published articles, and studied various public transport facilities and city attractions. The key findings and observations from these interactions are summarized below.

Key strengths:

- Public transport system changes that are currently underway and scheduled to launch in the near future, including the BRT, can free up buses for new routes and improve bus frequency.
- The Ryuto card has been issued to more than 100,000 residents.
- The Niigata Station elevation project, currently underway and scheduled to finish in 2022, will reduce downtown congestion by providing a direct roadway under the Shinkansen and local train lines.

Key challenges:

- Resident understanding of the new transportation system benefits and their implications is low.
- Bus routes, timings and stop locations are not aligned with other modes of transport.
- The City needs to improve how it promotes its services, facilities and various attractions.
- Communications to and feedback from residents and visitors are still somewhat limited in terms of breadth of distribution and depth of information.
- Use of the Ryuto card is currently limited to the public bus system.

The IBM team recommends that Niigata embrace a Connected City vision. This will require the City to improve the connected sharing of information and transactions between transportation modes, resident and visitor communities and the City's economic constituents, which include local businesses and attractions, national firms with local presences and academic and medical institutions.

To accomplish this, Niigata must incorporate new devices and mechanisms into its public transport, social and economic processes. The Connected City roadmap created by the IBM team will enable Niigata to achieve its short-term goals of delivering a successful launch of the new transportation system and increasing use of the system, including BRT. Over the long term, the Connected City roadmap will help Niigata stimulate urban revitalization. The Connected City roadmap can be implemented through three solution components, each briefly described below:

1. **Smarter transportation** will include optimizing the new BRT system plan, integrating information across all transportation modes and deploying advanced transportation initiatives. As a result, the City of Niigata, its residents and visitors will benefit from more-convenient public transport connections and greater efficiency in public transportation operations.

2. **Smarter Ryuto community** will extend Ryuto card use beyond bus fares with the creation of eRyuto, an expansion of the current Ryuto system that provides additional services. Additionally, this component includes the creation of a "Civic Pride" platform on eRyuto where residents and the City can exchange information and transactions relevant to various municipal and social programs, helping to drive the City revitalization and citizen engagement.

3. **Smarter marketing and management** will include the appointment of a chief marketing officer (CMO) and a marketing team to strengthen City communications and promotions, improve interactions with residents and visitors using social and mobile technology and improve program management across City initiatives.

Over the long term, there are additional initiatives the City should consider that have the potential to transform and rejuvenate Niigata:

- Extend the Connected City vision with next-generation technologies
- Create a transportation-oriented development model, including urban planning policy adjustments
- Intensify tourism focus and investment
- Leverage proximity to academic institutions to attract recent graduates and build a larger workforce for key sectors
- Embrace the strategic economic zone status (for agriculture) granted to the City of Niigata

Conclusion

Diligent adoption and implementation of the roadmap recommendations provided by the IBM team will position Niigata to become a Connected City, using advanced communications to connect the transportation system, the City's economic constituents and the resident and visitor communities. This will improve the integration and optimization of the public transportation system and, in turn, increase civic pride and commercial transactions across the community. Niigata will experience long-term socioeconomic benefits as a result of its intelligent public transportation efforts, including revitalization of the Furumachi downtown area.

2. Introduction

For many reasons, Niigata is well positioned to successfully implement an efficient and convenient public transportation system that will encourage new ridership, a healthy community and a robust downtown. Here is a brief look at how a new public transportation system will help address the City's current challenges, support its key initiatives and introduce new opportunities to Niigata.

A growing city

The City of Niigata is the capital of Niigata prefecture, Japan. After a series of municipal mergers, the city's population is just above 800,000, making Niigata the largest and only ordinance-designated city located on the Sea of Japan side of Honshu, the main island of Japan. The city's increased population and larger geographic sprawl have introduced new public transportation challenges in Niigata, including making sure routes provide enough coverage and frequency.

Niigata is well known as the "City of Water" because of two large rivers, the Shinano River and the Agano River, that run through it. Linking land on both sides of the river with public transport is extremely important. Bandai Bridge over the Shinano River is designated as a national cultural property and is beloved by citizens as a symbol of the city. It will serve as the main link between either side of the river for the proposed BRT line.

Agriculture, food and tourism

Large-scale agriculture has flourished in Niigata since the mid-Edo period, around the eighteenth century. Today, the city has been designated as an agriculture special zone by the Japanese government. Niigata produces various agricultural products, with a focus on the highest quality rice. At the same time, processed foods, such as rice crackers and Japanese sake, from this region are very famous. The City has been pursuing an initiative called "Designated City of Foods and Flowers," with its recent focus on developing and promoting the agricultural areas outside of the city center.

The City continues to make progress in growing its agro-tourism industry, planning and preparing sightseeing tours that provide local agricultural experiences. The City aims to become the top "Food-related Industrial City" through its efforts on the Niigata New Food Valley Project, as well as the initiatives listed above, enhancing its food culture and food-related industries. In order to promote their proud food culture globally, the City has submitted an application to certify its gastronomy with UNESCO's Creative Cities Network and is expecting a positive result. A strong public transportation system will play an integral role in helping Niigata drive its food- and agro-related tourism, as convenient commercial transport will encourage more visitors and residents to travel to its sites.

A connected airport

As one of the major cities facing the Sea of Japan, Niigata is well connected to nearby countries. Niigata Airport offers flights to Khabarovsk and Vladivostok in Russia, Harbin and Shanghai in China, Seoul in South Korea, Taipei in Taiwan and Guam in the US and is one of only two airports in Japan to offer flights to Harbin. Travel times from Niigata Airport to each of the above locations range from two to four hours, positioning Niigata as a convenient gateway to and from northeast Asia. The new BRT plans, however, do not link Niigata Airport to the city, and public transport schedules are not coordinated with incoming or outbound flights. Convenient, regularly scheduled public transportation between downtown Niigata and the airport would encourage increased use and eventually more tourism from cities around the world.

Emergency response and rescue

In addition, the City has been developing its emergency response and rescue capabilities in case of disaster on the Pacific side of Japan, especially in the Kanto region. Leveraging its proximity to the Tokyo metropolitan areas and the Niigata Seaport, the City can distribute food supplies and rapidly support humanitarian efforts. The City supported Fukushima Prefecture and other Tohoku areas immediately after the Great East Japan Earthquake in 2011. Under the threat of a Nankai Trough megathrust earthquake, these rescue investments and efforts are increasingly important. An efficient public transportation system will be a valuable component of these emergency response efforts, helping to ensure that food, water, supplies and human aid can move quickly between cities.

A. The Smarter Cities Challenge

By 2050, cities will be home to more than two-thirds of the world's population. They already wield more economic power and have access to more advanced technological capabilities than ever before. Simultaneously, cities are struggling with a wide range of challenges and threats to sustainability in their core support and governance systems, including transport, water, energy, communications, healthcare and social services.

Meanwhile, trillions of digital devices, connected through the Internet, are producing a vast ocean of data. All of this information — from the flow of markets to the pulse of societies — can be turned into knowledge because we now have the computational power and advanced analytics to make sense of it. With this knowledge, cities could reduce costs, cut waste and improve efficiency, productivity and quality of life for their citizens. In the face of the mammoth challenges of economic crisis and increased demand for services, ample opportunities still exist for the development of innovative solutions.

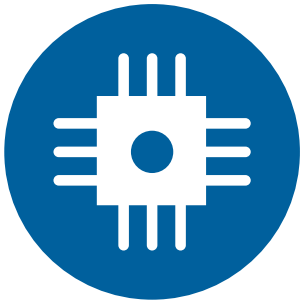
In November 2008, IBM initiated a discussion on how the planet is becoming "smarter." By this it meant that intelligence is becoming infused into the systems and processes that make the world work — into things no one would recognize as computers: cars, appliances, roadways, power grids, clothes and even natural systems, such as agriculture and waterways. By creating more instrumented, interconnected and intelligent systems, citizens and policymakers can harvest new trends and insights from data, providing the basis for more-informed decisions.

A Smarter City uses technology to transform its core systems and optimize finite resources. Because cities grapple on a daily basis with the interaction of water, transportation, energy, public safety and many other systems, IBM is committed to a vision of Smarter Cities® as a vital component of building a Smarter Planet. At the highest levels of maturity, a Smarter City is a knowledge-based system that provides real-time insights to stakeholders and enables decision makers to manage the city's subsystems proactively. Effective information management is at the heart of this capability, and integration and analytics are the key enablers.

Intelligence is being infused into the way the world works.

The IBM Smarter Cities Challenge contributes the skills and expertise of top IBM talent to address the critical challenges cities around the world now face. We do this by putting teams on the ground for three weeks to work closely with City leaders and deliver recommendations on how to make each City smarter and more effective. Over the past four years, more than 100 cities have received these grants. The Smarter Cities Challenge is the largest philanthropic initiative IBM has launched, with contributions valued at more than $50 million to date.

The City of Niigata, Japan, was selected through a competitive process as one of 16 cities to be awarded a Smarter Cities Challenge grant in 2014.



Instrumented

We can measure, sense and see the condition of practically everything.

Interconnected

People, systems and objects can communicate and interact with one another in entirely new ways.

Intelligent

We can analyze and derive insight from large and diverse sources of information to predict and respond better to change.

Figure 1: Instrumented, interconnected, intelligent

B. The challenge

During a three-week period in August and September of 2014, a team of six IBM experts worked in Niigata to deliver recommendations around public transportation to address a key challenge for Mayor Akira Shinoda:

Guide the launch of the City's new public transportation system to help ensure overall success and progressive integration with other municipal facilities and services, leading to optimization for downtown revitalization.

Currently, the City of Niigata is composed of eight wards. After a series of municipal mergers, the size of the city grew from 232 square kilometers in 2001 to 726 square kilometers in 2005. Many of the City's government functions remain in the Chuo ward, but with a sprawling area and many residents owning cars, the population center of Niigata has shifted to suburban areas. As a result, there has been a slow decline of downtown areas, such as Furumachi.

Last year, the City announced an urban design plan that included the implementation of a new public transportation system. Currently, buses provide the widest coverage and least expensive public transportation option for Niigata's residents. The City's new transportation plan, therefore, is placing its primary focus on improving the bus system. The City has already procured four new buses to launch a BRT (Bus Rapid Transit) system and intends to design new bus routes and further develop the area around Niigata Station.

The City, with private sector participation, hopes to transform public transportation and stimulate revitalization of its downtown area through increased public transport use by residents, merchants and visitors. By increasing public transportation use, the City also hopes to improve its citizens' health, safety and quality of life, as well reduce traffic and CO_2 emissions, which lowers environmental impact.

The City asked the IBM team to focus on the following:

- Understand the proposed BRT system as a part of the City's holistic concept of public transportation, including how it relates to improving the health and quality of life of its citizens and visitors as well as the City's economic development
- Consider how public transportation can help downtown revitalization
- Suggest how awareness and acceptance of the BRT can increase among residents and visitors

3. Findings, context and roadmap

A. Findings and context

There are multiple private operators that provide public bus services to residents of and visitors to the city. Because ridership has been declining, this has affected profitability, resulting in the discontinuation of many routes. Transfers to and from other modes of transport, particularly rail, are inconvenient, and information about bus arrivals and connection times are not easy to obtain. To encourage more ridership, some routes, such as airport and tourist buses, as well as buses in outlying areas, are being subsidized by the City. A significant number of contactless payment cards, called Ryuto, have been issued at a discount for use on public buses.

Both the convenience and quality of public transportation services and facilities are considered the most important factors in increasing ridership. Some routes in the city center are congested. Bus stops and taxi stands should be relocated, and park-and-ride facilities should be introduced more widely. As aging residents lose their driving privileges, access to public transportation becomes even more important. Additionally, severe winter weather and high CO_2 emission levels pose significant safety and health concerns. By increasing public transportation use, Niigata could help improve residents' quality of life while reducing its impact on the environment. Getting residents engaged in the new public transportation efforts and making visitors aware of the new system and its benefits will play a vital role in increasing overall public transport use.

The IBM team considered it critical to approach Niigata's public transportation challenge from a comprehensive perspective, rather than limiting focus to the new bus system. To accomplish that, the team gathered information from the taxi association and the rail company in addition to the City Policy Division, as well as Niigata's largest private bus company. A citizen community group comprising current and prospective users of public transportation also provided direct input.

For information about public transportation's connection to and impact on the local economy, the IBM team attended meetings with the economic affairs department, the agriculture department, the shopping association and chamber of commerce and industry representatives. Tourism, airport and seaport representatives provided further insights on potential opportunities to attract more visitors through tourism and business. Finally, the team collected information on environmental impact, resident health and resident safety from the environment, healthcare and disaster management departments.

In addition to reviewing the information provided by the above Niigata entities, the IBM team gained firsthand knowledge and experience by using Niigata public transportation and spending time studying various public transport facilities and city attractions. The key findings and observations from these interactions have been summarized in Figure 2.

Mayor's request	Themes discussed	Current strengths	Current challenges
Proposed BRT system	• Operating efficiency • Safety, health and environment • Modes of transport	"Changes will free up buses for new routes and increased frequency." "Station elevation should reduce congestion."	"Some buses are quite empty during commuter hours." "It is difficult and costly to transfer buses." "Don't understand the proposed bus routes." "The bus times and locations are not aligned to other modes of transportation."
Connection between public transportation and downtown revitalization	• Convenience • Ryuto cards • Publicity • Civic pride	"The Ryuto card has been issued to over 100,000 people today." "There are many buses that pass by Furumachi."	"Few people come to Furumachi compared to the newer major shopping malls." "We must encourage and increase civic pride." "Niigata has never been very good at promoting itself." "We would like to use the Ryuto card for many more programs and transactions in the city."
Increased awareness and acceptance of public transportation	• Awareness • Communications • Usage barriers	"Bus usage slightly increased last year." "I think I would support the new bus system if I understood the changes better." "It is critical for our future that we do not lose our bus system."	"I do not understand what the long-term vision is for the city and the bus changes." "Your communications feel just one-way — we do not feel that we are being heard." "The bus comes so infrequently I never consider using it." "We need stops/stands closer to shopping centers and better access to taxis."

Figure 2: Summary of initial findings

The IBM team considered its findings, along with observations of the City's current public transport strengths and weaknesses, to provide meaningful recommendations. Each recommendation addresses any existing challenges with applicable components, features and mechanisms.

Japan's prevailing best practices in urban development and public transportation have emphasized such models as the "compact city," which promotes high residential density by reducing urban sprawl. The IBM team, however, chose to take a more expansive perspective when addressing Niigata's challenges, considering the city's particular geographic, social and commercial realities.

B. Roadmap

The IBM team's recommendation for Niigata is to embrace a Connected City vision. This will require the City to improve connections between transportation modes, the City's economic constituents and the resident and visitor communities. The Connected City roadmap created by the IBM team will enable Niigata to achieve its short-term goals of successful launch and use of the new transportation system, including BRT, while also stimulating urban revitalization. Those short-term achievements, along with a few long-term initiatives described later in this section, have the potential to position Niigata as a worldwide pioneer of driving socioeconomic benefits through a Connected City in just under a decade. To help Niigata realize its Connected City vision, the IBM team developed three major recommendation areas (see Figure 3).

Smarter transportation	• Optimize the new BRT system plan • Integrate across all transportation modes • Deploy **advanced transportation** initiatives
Smarter Ryuto community	• Extend Ryuto card use beyond bus fares with **eRyuto** • Create "Civic Pride" platform atop **eRyuto** • Use **eRyuto** to help drive City revitalization
Smarter marketing and management	• Appoint a **CMO** and marketing team to strengthen City communications and promotions • Interact with residents and visitors by using social media and mobile technologies • Improve program management across City initiatives

Figure 3: Recommendations for a Connected City

1. **Smarter transportation** will include the collection and analysis of information from various sensors and data sources. It will also use advanced modeling and simulation techniques to achieve more integrated and optimized transportation for the city. Smarter transportation initiatives include recommendations on launching and optimizing the new BRT system, integrating it with other modes of transportation in the city and increasing convenient connections. Furthermore, the IBM team considers how Niigata can apply open data to drive intelligent and up-to-date decisions for route planning, scheduling and stop changes, to name a few.

2. **Smarter Ryuto community** will extend the current Ryuto payment system beyond bus usage with eRyuto. We recommend Niigata operate this as a public/private joint venture, allowing payment and point exchange across merchants to span the city. This will increase the convenience to residents and visitors while building a base of anonymized transaction information. Such information will help businesses increase tailored promotions and enable more-effective, often personalized services from merchants to the community. In addition, the City of Niigata will need to extend eRyuto card use to government services and citizen activities and deploy an incentive program. With widespread eRyuto use, the community will benefit from a network effect, helping to optimize public transportation and make socioeconomic revitalization easier to achieve.

3. **Smarter marketing and management** consists of the appointment of a chief marketing officer (CMO) and a marketing team to strengthen City communications and promotions, working across City departments. Resident and visitor interaction with the City through social media and mobile applications will increase participation and elevate the community experience. Deploying program management best practices across City departments and initiatives will ensure successful programs and more rapid outcomes.

The IBM team has developed a detailed implementation roadmap (see Figure 4) consisting of steps that the City of Niigata should action in the immediate (0 - 90 days), short-term (4 - 12 months) and mid-term (year two) timeline leading up to summer 2016.

Once the recommendations are accepted by the City of Niigata, City leadership should action the following “Day 0” steps: kick off route planning for the BRT, launch the eRyuto program, name the CMO and commence a program management office within the City government.

There are similar immediate steps listed in Figure 4, which the City can pursue during the first 90 days, as well as short-term steps leading up to the Phase 1 BRT launch scheduled for the summer of 2015. More complex mid-term steps are listed for adoption in year two and will build on the successful completion of earlier initiatives.

As noted previously, there are additional long-term initiatives the City should consider, some of which have already begun. These long-term initiatives include the following:

- Extend the Connected City and its capabilities by implementing next-generation technologies, such as wearable devices, frugal sensors and household and personal devices, as they become commercially available.
- Create a transportation-focused development model that expands upon the urban planning initiative that developed new downtown condominiums, attracting more than 200 residents. This development model also could include the rezoning of specific neighborhoods and the establishment of private sector “Business Improvement Districts.” This could result in special funding to improve the environment of specific business districts, such as Furumachi.
- Intensify tourism efforts by identifying domestic and international markets to target and making them aware of the wide range of attractions and facilities that Niigata has to offer. The City could implement “Tourism Improvement Districts,” a popular practice in the United States, to fund this significant investment in promoting tourism. These districts are often funded through a special tax applied to hotels in the district. These funds are then invested in promotions to drive more visitors to the city, which in turn drives increased hotel stays.

- Leverage well-established traditional and vocational academic facilities to attract both domestic and international students. This will help Niigata build a younger and larger workforce for its industries. Niigata can encourage its universities to recruit more international students, bringing critical skills and fresh ideas to the city.
- Transform the agriculture and food industries by leveraging the City's agricultural strategic economic zone status, granted by the national government, to increase food processing facilities and agricultural exports. At the same time, Niigata should incorporate modern productivity techniques for cultivation and harvesting.

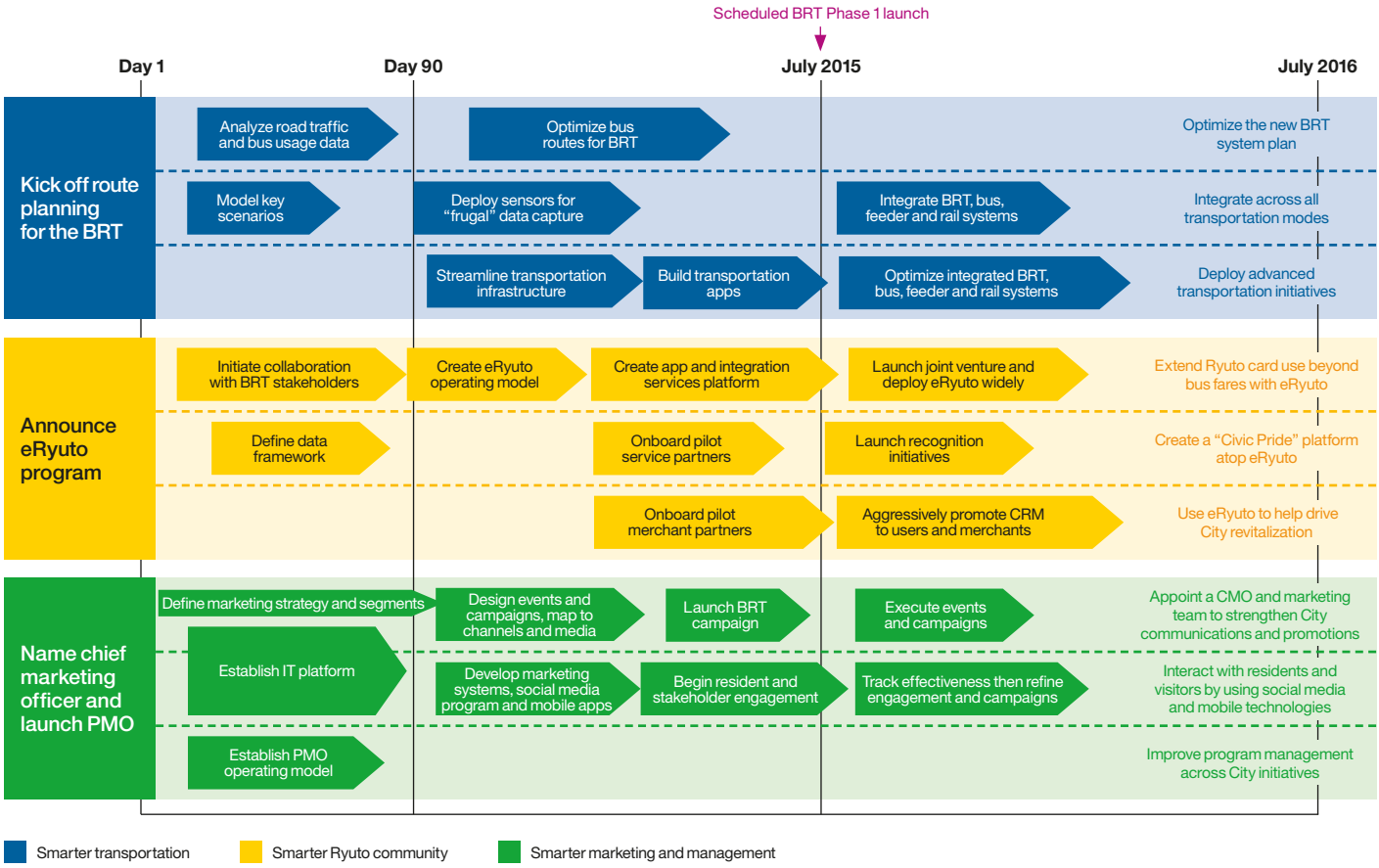


Figure 4: Implementation roadmap of recommendations

4. Recommendations

A. Smarter transportation

	Optimize the new BRT system plan	Integrate across all transportation modes	Deploy advanced transportation initiatives
Measures			
How	• Gather bus and traffic data • Apply scenario modeling for analysis • Optimize bus routes, stops and transfers	• Deploy sensors • Integrate train, taxi, flights, parking and public bicycle information • Implement intelligent operations	• Optimize route planning • Simulate traffic flow and events • Access and apply open data
Benefit	• Successful system launch and adoption	• Improved system convenience, flexibility and efficiency	• Continuous improvements to transportation and city

Figure 5: Key elements of Smarter transportation recommendations

Recommendation 1: Optimize the new BRT system plan

The City should optimize the new BRT system so that it complements and enhances the public transportation options that currently exist. This will require the City to complete key steps prior to the BRT launch, recognizing that the complete rollout of advanced transportation initiatives could take until 2022, which is when the Niigata train station elevation is scheduled for completion.

Prior to BRT launch, the City must first evaluate its existing transportation infrastructure and carry out a traffic demand analysis. To determine existing facility utilization, the City should analyze current bus, car and road use, including vehicle routing and route utilization. This data is not available from a single location but must be collected from multiple sources, including different bus companies. Data on taxi and private car utilization should be measured by noting the number of taxi stands and the number of riders/trips per day in the city. From this collected data, the City will be able to determine which facilities are overused or underused and better allocate its resources to meet demands in particular areas.

The City should consider how its transportation facilities contribute to and accommodate its citizens' health and well being, particularly for the elderly, the young and those with disabilities. It will be important for the City to collect relevant information from existing bus stop locations, such as the number of bus stops that provide shelters and benches as well as how many facilities are wheelchair accessible.

Next, the City should collect traffic demand data that will help it implement a system that attracts new riders. This includes conducting an origin-destination (O-D) demand study to discover latent demand for extra public transportation and particular areas with unmet transportation needs. This data may be gathered by sampling interviews and surveys[1] and should include a wide set of commuter demographics.

The City will then be ready to plan the integration of the new BRT bus route with existing bus routes.

The current route system for buses in the city is not optimized to maximize customer satisfaction, as evidenced by the dissatisfaction among customers, which was shared with the IBM team during a citizen community meeting. Suboptimal bus routes cause citizens to drive private cars because current bus routes require long wait times for some riders and are often too confusing for those making infrequent or irregular trips.

Based on travel demand across all modes of transportation, the City should revise all bus route plans. This will include making changes to existing routes and developing new routes. When making these adjustments, the City should follow two key design guidelines:

1. Minimize route overlap on arterial (or main axis) roads
2. Redeploy buses to feed riders into secondary roads and transfer points

During route revision, the City should incorporate feedback from current bus riders, potential riders and City transportation divisions and conduct scenario-planning studies to model the potential impact of future changes. At the same time, it must ensure that parking and transfer center requirements are included in BRT planning.

In the initial launch phase, the BRT bus route should consist of an extensive network of rapid bus lines overlaid on part of the existing route, with fewer stops and mixed flow lanes indicated within a circular path in the city center. In future phases, the BRT route will consist of extensive hub-and-spoke networks replacing local bus routes, with bus-only dedicated lanes to remove delays that result from multiple buses congesting the road and reduce conflicts with cars changing lanes across the BRT route.

For any new transportation routes or modes the City deploys, it can conduct a simple flow analysis based on the number of passengers expected per day, which will help optimize bus routes, stops and frequency. At this phase, as discussed in Recommendation 2, it is appropriate for the City to consider a more sophisticated method, such as the Monte Carlo simulation method,[2] to perform a more accurate analysis that reflects events and variations that simple flow analysis cannot provide. Such accurate simulation is able to account for traffic congestion, modeling the effects of a bus slowed down by traffic or another that is occasionally filled up. Once such a model is built and validated, it becomes a valuable tool that the City can use on an ongoing basis for planning, including the design of services to be implemented during special events, accidents or natural disasters. It can also be used to model more radical changes, such as the introduction of major changes in tolls, lane management and parking management.

Once the City is ready to launch the new BRT system, it should support the transition to new routes by adding staff and volunteers to educate riders about the routes, inform them of upcoming changes and to direct traffic. Ideal routing will be discovered only over time, with continued analysis and refinement, but the initial route reconfiguration plan should significantly reduce overlap between routes on the city's key public transport axis roads. Ideally, it also would deliver public transport users to transfer stations within the city center so they can easily transfer to other local public transport modes.

Recommendation 2: Integrate across all transportation modes

The City should integrate all high-volume elements of its multimodal transportation network (BRT, City buses, feeder buses, taxis, private cars and rail system), while also examining other low-volume modes (bicycles, airport flights and ferries) to increase ridership convenience, reduce delays and maximize commuter satisfaction. This will enable the City to optimize the entire transportation network and greatly improve public transport efficiency, control and incident response, while delivering an improved experience for residents and visitors alike.

To achieve these goals, the City must first model the ridership patterns of typical city populations and segments that will use the system. Some example segments include regular school or work commuters, occasional resident travelers or visitors to the city. The O-D survey described in Recommendation 1 will provide much of this input. This survey also can reveal how commuters would use new capabilities, such as the BRT buses, shared bicycles, taxis and private cars.

Additionally, Niigata should run traffic simulations. Traffic simulators can help the City plan routes, address special events or help introduce new services. Simulation will give the City a clear estimate on the possible impacts of proposed flow-improvement methods. Some simulation techniques include "what-if" scenarios, which the City could use to prevent traffic or crowd congestion based on simulated events, such as accidents or natural disasters. There are a number of simulation tools available with varying levels of sophistication. The City should consult with experts to select which tools are appropriate for their needs. For example, one tool was successfully used in Hiroshima.[3] This tool applied advanced analytics and big data extracted from existing traffic information to build an agent-based traffic simulator.

In order to then integrate and orchestrate all high-volume modes of transportation, the City must generate reliable information on how the system is functioning. For example, a commuter who needs to transfer from the Niigata or Hakusan train station to a city center bus and further connect via a long-distance bus to the Akiba or Higashi ward needs reliable routing information to avoid long wait times for transfers. This requires "sensing" the transportation network. This can be accomplished in a simple and cost-effective manner by placing a GPS transponder, a simple device or beacon, on each bus and train to distribute messages and updates on their respective GPS-located positions. The City should develop a central system that receives all of these signals and tracks public transportation, as well as other relevant data, including the availability of public bicycles at particular locations. The City can implement other frugal methods of sensing, such as using video cameras to provide traffic jam warnings, check traffic, monitor the arrival of buses and sense public bike availability.[4, 5]

Another necessary step to achieve successful integration of the City's multimodal transportation network is to ensure that the various systems and modes are well connected. For example, bus stops and taxi stops should be positioned near rail stops and bicycle pooling centers to make transfer from one method of transport to another seamless. The City should also create a simple smartphone, i-mode or SMS application to provide riders with convenient transit information, enabling residents to specify start and end points so the app can inform them of the best possible route and transit options, which could involve bus and train, bus and bus or bike and bus and bike, for example. Because of the use of sensors, the app would be able to calculate the shortest route by time, taking into account current schedule and connection information. The system should inform commuters of the next bus or train's arrival time by leveraging the City's new beacon system.

Other integration mechanisms, such as using a single payment card across transportation operators, a recommendation that is addressed in the Smarter Ryuto community section, will help Niigata achieve transportation-wide integration.

Finally, the City should consider plans for additional BRT terminals together with City parking zone policy, for example, how many parking garages or park-and-ride facilities are required. Learning from the BRT system success of Curitiba, Brazil, new BRT terminals should have convenient facilities, such as an information desk or kiosk, vending machines, newspaper stands and simple retail facilities.[5]

Recommendation 3: Deploy advanced transportation initiatives

The City should constantly monitor advanced transportation initiatives around the world and deploy relevant initiatives selectively to improve the commuter experience in Niigata. Technologies, such as an Intelligent Transport System (ITS) dashboard and simulation tools, are required to consolidate and view analytics, conduct performance tracking and plan route optimization in one central system.[3, 6, 7] Niigata should embrace the "Open Data" or "Open Government" agenda, which, in addition to putting all public transportation data and applications online, will help the City be transparent with residents across all municipal government activities. This will also provide residents and visitors with one central source of transport information and will help standardize all forms of data across businesses and City divisions.

A wide variety of ITS technologies can be integrated into the City's existing systems to improve performance regarding travel times, reliability, convenience, operational efficiency, safety and security. ITS capabilities include adjusting vehicle flow priority, operations and maintenance management, operator communications, real-time passenger information and safety and security systems.[6, 7]

There are various ITS applications, which include the following:

- **Operations management systems —** These technologies include systems that enhance BRT operations by improving operating efficiencies, increasing service reliability and reducing travel times. These technologies include transit operations software applications that assist transit agencies with driver scheduling, vehicle assignment and dispatching.
- **Passenger information systems —** These systems provide customers with information regarding all transportation services. These systems can improve passenger satisfaction and reduce wait times, thus increasing ridership.
- **Safety and security systems on all public transport modes (bus, train, ferry, bus stops and terminals) —** Deployment of surveillance cameras on public transport vehicles and at stops/terminals helps increase rider and driver safety. Two issues are important to consider when deploying such a system: the number of cameras and the download frequency of images and video to central storage.
- **Traffic management systems —** These systems include modeling techniques that can be used during system planning to reduce congestion, such as the Monte Carlo simulation models described above. Observation systems and control centers also can be used to monitor potential areas of trouble, so City officials can quickly take action and address any problems.

A set of initiatives, collectively referred to as "streamlining," could be implemented to reduce the overall amount of motorized transportation, even during the winter. This involves increasing the City's walkability and bike-ability, introducing more protected walkways, encouraging car pooling and improving parking management. Such efforts would help make the city greener and reduce road maintenance costs, while providing better transportation services and options to Niigata's residents and visitors.[8]

As soon as the ITS applications described earlier are established, the City can add a function that incentivizes customers to travel outside of peak hours or use less-traveled routes to decrease crowding. Incentives could include discounted or free rides or coupons.

Additionally, transportation innovations are taking place around the world, from car sharing to freelance transporters. The City could reach out beyond its borders to external feeder regions and design new tourist services, such as hop-on, hop-off tourist buses. The potential to transform the public transportation experience with advanced technologies and systems is unlimited. Fortunately, there are many other cities around the world already implementing similar innovations, providing Niigata City leaders with an ideal opportunity to visit these cities and learn about how particular innovations could have a positive impact on the Niigata community.[9]

Finally, Niigata should continue to optimize and improve its public transportation operations by running traffic simulations of proposed flow-improvement methods. In order to effectively do that, the City should leverage data from GPS transponders, as described in Recommendation 2, and install cameras in all buses and trains initially, then in other modes of transportation at a later date. Traffic cameras also should be installed in key public transport areas, such as the routes to Bandai Bridge or Niigata Station, to monitor and analyze traffic flow from a central location.

Successful implementation of Smarter transportation will help Niigata transform into a Smarter City. The following recommendations will help the City achieve optimal deployment of the new BRT system, integrate all transportation modes and position the city for ongoing improvements through the deployment of advanced transportation initiatives.[9] These actions will result in higher commuter satisfaction and an improved public transportation experience that is more reliable, comfortable and convenient, making Niigata a more sustainable and attractive place to live.

Recommendations 1, 2 and 3: Smarter transportation

Niigata should plan and deploy the new BRT system in a way that will optimally enhance the existing public transportation systems. This will significantly improve the city's sustainability, as well as public transport efficiency and the experience for Niigata's residents. The City should integrate all major transportation modes (buses and trains), utilizing sensors and mobile apps that make the system easier to use. Further improvement will be obtained from a program of advanced transportation initiatives, which includes the selective deployment of some of the best innovations from around the world to enhance the commuter experience in Niigata.

Scope and expected outcomes

Scope:

The Smarter transportation recommendations include the following:

- Optimize the new BRT system plan
- Integrate across all transportation modes
- Deploy advanced transportation initiatives

Expected outcomes:

- Interconnected, multimodal transportation network
- Improved experience, efficiency and use of the public transportation system
- Increased bus routes and frequency
- Improved traffic flow and reduced congestion
- Regeneration of the downtown areas is supported and stimulated

Cost of inaction

If the transportation system is not improved and integrated, ridership could further decrease, with potential further decline in downtown areas and negative impact on the environment.

Proposed owner and stakeholders	Suggested resources needed
Owner: The director of transportation **Stakeholders:** • Bus companies, prefecture government and police • Bus management committee • Resident groups • Railway and taxi companies • Other transportation modes	• Minimal financial investments for BRT planning and introduction • City should consider engaging a qualified traffic systems consultant to gather the data, perform analyses and construct the simulation model • IT department or consultant to implement the web app and sensor systems • Traffic monitoring and operations center

Recommendations 1, 2 and 3: Smarter transportation (continued)	
Dependencies	**Key milestones, activities and timeframe**
Collaboration and participation with transportation companies and the prefecture government	**Short term:** • Kick off route planning for BRT • Analyze road traffic and bus usage data • Model key scenarios **Medium term:** • Optimize bus routes for BRT • Deploy sensors for frugal data capture • Streamline transportation infrastructure • Build transportation applications **Long term:** • Integrate BRT, bus, feeder and rail systems • Optimize integrated BRT, bus, feeder and rail systems • Continuous integration and improvement
Priority	
High	

B. Smarter Ryuto community

Measures	**Extend Ryuto card use beyond bus fares with eRyuto**	**Create a "Civic Pride" platform atop eRyuto**	**Use eRyuto to help drive City revitalization**
How	• Establish a joint venture company • Create an integrated point system • Expand payment capabilities	• Offer exchangeable City points • Visualize citizen activity and engagement • Develop a City-led incentive program	• Apply personalized, segmented and targeted campaigns • Leverage downtown promotions • Optimize transportation for downtown access
Benefit	• Stimulated economic growth through a digital eMoney community	• Increased citizen activism	• Increased downtown visitors

Figure 6: Key elements of Smarter Ryuto community recommendations

Recommendation 4: Extend Ryuto card use beyond bus fares with eRyuto

Niigata City is also called Ryuto ("柳都" means "the City of Willow") because of the willow trees that lined the old canals of the city. The city's private bus operator adopted this nickname for the contactless smart cards it issued, called IC cards. The Ryuto card payment service has been widely used by residents since April 2011, with cards issued to more than 100,000 residents. More than 70% of bus passengers use the Ryuto card for fare payment.

The IBM team understands that several commercial organizations are considering a Ryuto card point system, but their plans appear to be confined to their specific business domains. For example, shopping points would be used only for shopping. Integrating all of these business domains, from shopping to public transport to government services and beyond, would benefit consumers as well as those providing services. For instance, consumers would get to enjoy the convenience of using a single card for purchases from various providers. Businesses, meanwhile, could aggregate more customer data for analysis to gain insights that could lead to improved business results.

The City's bus company actively gathers Ryuto rider information, such as origin/destination and routing, but it appears they are not leveraging the data effectively to better understand or interact with their customers or to optimize their operations. They could improve their data use even more by accessing key information from local businesses and service providers, which domain integration would enable.

We recommend that the City extend its Ryuto card functionalities from current bus fare payment to an integrated point system across shopping, healthcare programs and tourism. This means that the Ryuto card will evolve into a local currency in the Niigata area. The new system could be called "eRyuto" to distinguish it from the current Ryuto service.

The following are three actions the City should lead to launch eRyuto:

- Establish eRyuto Operator as a joint venture company with the bus company and others to issue the eRyuto cards and control eRyuto point distribution.
- Create a point exchange ecosystem between the bus company and other public transportation operators, such as the bus company's subsidiaries, taxi services, Shinanogawa Water Shuttle, parking lots and shopping malls.
- Organize an eRyuto Steering Committee to define policies and govern the joint venture's daily eRyuto operations, reflecting stakeholders' requirements.

Integration of all of these systems on one IC card will increase the amount of transactional data in the operational system of the eRyuto service. The eRyuto operator can then perform chronological analysis on the data to identify the usage of each service based on a number of variables, including time, location, user profile and external factors, such as weather and local events. For analysis of user profiles, the eRyuto operator should make sure that they follow best practices when handling individuals' information by using suitable IT systems.

The analytics of anonymized eRyuto data may be shared with each affiliated segment of the program to help improve their business and create new business opportunities.

Recommendation 5: Create a "Civic Pride" platform atop eRyuto

There are several organizations that operate point exchange systems using IC cards in Japan — one notable example is T-Point. The IBM team, however, has conceptualized a much broader mechanism for using eRyuto to connect residents with civic and economic communities, rather than limiting the card to a payment or points exchange system.

This idea was inspired by the historic commemoration of the 100-year anniversary of the Bandai Bridge on August 23, 2014. The IBM team was privileged to be a part of this ceremony during which residents actively participated in the cultural events and dance performances, and local food and sake merchants offered generous promotions along with free tasting for visitors. Mayor Shinoda personally blessed a newly married young couple who, in traditional dress, recited their marriage vows in front of a significant number of residents and tourists.

The City of Niigata should launch a "Civic Pride" program to encourage more activities like the celebration above, as well as civic participation. The City could use eRyuto cards and card reader/writer units to track the participation of residents, completed and upcoming volunteer activities, which wards they can assist in or visit and even to make certain communities of residents aware of how they can help with the event or notify them of specific events they can attend. With eRyuto, the active participation of residents in community and civic events, such as summer festivals, commemorations at historic locations in downtown, blood donation drives and even voluntary municipal activities, can be conveniently recorded and rewarded.

Using a simple eRyuto service, the City can issue eRyuto points for civic contributions. They could be called "Civic Pride Points." The residents could earn Civic Pride Points, while the City could find an inexpensive way to recognize top contributors monthly, such as a profile in the local newspaper or on the City's website, an invitation to Town Hall where they can meet with the mayor, take a family photograph and receive a certificate for their household, to name just a few reward options. These measures will help promote resident engagement in City activities, including volunteer work, downtown activities and wellness improvement, while also accelerating the integration of visitors, newcomers and immigrants into the City of Niigata community. With this program, Niigata residents would be incentivized to remain informed and participate in multiple community activities, of which the City has a variety, through low-cost technology.

The City also should develop a Civic Pride Portal that residents can access, using their eRyuto identity, so they can remain informed of City activities and events. Later, this can be integrated with social media, mobile technologies and marketing systems the City will develop separately. Similar to social network systems and multiplayer games, this portal would enable residents to collaborate or compete with others based on the points they earn for participating in various activities.

The IBM team expects that a successful Civic Pride platform will drive economic benefits throughout Niigata as local merchants and corporations realize the commercial advantage of healthier, more engaged residents. This is very similar to how Albirex Niigata has leveraged resident pride in the sports teams it sponsors to increase sales of merchandise and their own products.

Recommendation 6: Use eRyuto to help drive City revitalization

After launching the eRyuto service, the City can accelerate its revitalization efforts by using stored eRyuto data. By applying data analytics, Niigata can accurately target individual residents through direct marketing campaigns that leverage segmentation, personalization and specific recommendations. Additionally, by analyzing eRyuto's transportation data, the eRyuto operator can better understand residents' commuting patterns and route utilization, gaining detailed ridership information that will support multimodal transportation connectivity optimization.

Advanced analytics of eRyuto data will provide the City with the ability to do the following:

- Understand the travel and purchase patterns of residents
- Personalize resident experiences according to patterns and data analytics
- Provide shopping recommendations and promote personalized campaigns
- Optimize multimodal transportation to ensure easy access to the city center

The eRyuto service enables the collection of transactional data from card users, including when, where and what they purchase. Statistical analysis and customer relationship management (CRM) software and services will help businesses discover new insights and opportunities on how to improve their stores and offerings. For example, chronological analysis will detail when a specific product or service sells well, and correlation analysis can help reveal synergetic relationships between products and services that help to increase sales. This information can be used to optimize the availability, timing and location of specific goods and services and also may be associated with other information, such as demographic data, including home location, age and gender, for further analysis. When storing and processing this data, the eRyuto Operator must employ leading security practices to ensure that sensitive personal information is handled with the utmost care.

Analyzing stored transactional data of eRyuto users will enable local businesses to design and deliver personalized services at the individual level. For example, a personalized advertisement may be mailed to an individual's residence or delivered as an eCoupon to that user's mobile phone based on his or her profile preferences. One possible approach is to apply collaborative filtering[10] to the whole of transactional data within a targeted service. Simply put, collaborative filtering on an eCommerce website identifies similar site users based on their purchasing preferences. The system then recommends products or services to a user that he or she has not purchased before but more than likely would purchase, based on the preferences of similar users. Many other recommendation systems are also available. These personalized services increase the relevance and, in turn, the conversion rates of promotions, helping local businesses and the economy to thrive.

Finally, transactional data that details use of transportation services will be very helpful in optimizing the design of multimodal transportation. As is the case in purchasing behavior, chronological analysis could be used to identify bottlenecks in current public transportation routes with respect to particular transit elements (the bus, the bus stop or the transfer point) and also may reveal inefficiencies in capacity utilization that can be addressed.

Recommendations 4, 5 and 6: Smarter Ryuto community

The City should expand current Ryuto card use beyond bus fare payment and integrate point-of-service capabilities across transportation and shopping services with eRyuto. To accelerate citizen activism/engagement in City events and efforts, Niigata should utilize eRyuto as a Civic Pride Point system and encourage action through incentives. Finally, the convenience of eRyuto and the integrated transportation system will motivate citizens to visit the downtown shopping mall by using public transportation.

Scope and expected outcomes

Scope

The Smarter Ryuto community recommendations include the following:

- Extend Ryuto card use beyond bus fares with eRyuto
- Create a Civic Pride platform atop eRyuto
- Use eRyuto to help drive City revitalization

Expected outcomes

- eRyuto Operator can collect big data, such as citizen travel and purchase patterns, transportation ridership and usage information, and shopping trends
- Increased number of passengers and shopping customers with effective data analytics
- Increased citizen engagement/activism in City events and volunteer work
- Improved business sales per customer by adopting further advanced analytics
- Data is used to optimize and plan BRT/bus routes

Cost of inaction

If there is no change to the Ryuto card functionality, the City would miss a valuable opportunity to motivate citizens to visit the downtown commercial area and stimulate downtown revitalization. Bus ridership would not increase as much as it could.

Proposed owner and stakeholders	Suggested resources needed
Owner: eRyuto Operator, a joint venture company consisting mainly of the City office and the bus company. This company will issue eRyuto cards and control distribution volume of the integrated points. **Stakeholders** • City office • The bus company and subsidiaries • Niigata City Hire-Taxi Association • Shinanogawa Water Shuttle • Chamber of Commerce and Industry • Association of Niigata Central Shopping Mall • Tourism Convention Association	• Data scientists and IT architects are required for effective analytics of eRyuto consumer data. After designing the basic architecture, the City can contract with external vendors for information and communications technology (ICT) development. • Security/privacy expertise is required. The City should enhance its standard policies for handling sensitive personal information and apply these standards across City departments. • Costs would be shared across stakeholders, not just the City. Stakeholders should consider private investors and alternative funding models to support their efforts.

Recommendations 4, 5 and 6: Smarter Ryuto community (continued)

Dependencies	Key milestones, activities and timeframe
There are no dependencies on other recommendations, but it will take a long time to start a joint venture company due to law and business traditions. Sufficient negotiations with stakeholders, especially the bus company, are mandatory. Overall, the following dependencies should be considered: • Budget for eRyuto and eRyuto Operator launch • IT system development and operations for eRyuto management and Civic Pride Portal service • Strict security/privacy policy standards and operations with regard to sensitive personal information are required	**Short term:** • Study point system success examples, such as T-Point, and use cases of SIB investment financing • Establish the eRyuto Operator business model and ecosystem with domain experts, such as attorneys, lawyers and accountants • Establish an eRyuto-based Civic Pride Point system • Define an integrated point data framework **Medium term:** • Negotiate with the bus company and other main stakeholders • Implement a financial investment plan • Plan, design and implement an ICT system for eRyuto • Plan, design and implement an ICT system for the Civic Pride Portal • Start pilot for the parts of the Civic Pride program that can be launched without the physical eRyuto card **Long term:** • Launch eRyuto Operator • Start eRyuto services • Organize eRyuto Steering Committee • Start Civic Pride Point program • Promote Civic Pride program • Create and release various analytics applications • Create security/privacy regulations and standards when using, opening and sharing analyzed data
Priority	
High	

C. Smarter marketing and management

Measures	**Appoint a CMO and marketing team to strengthen City communications and promotions**	**Interact with residents and visitors by using social media and mobile technologies**	**Improve program management across City initiatives**
How	• Work across City departments • Understand stakeholder needs • Establish IT platform • Lead marketing efforts for transportation, tourism and Furumachi development	• Communicate via social media • Monitor mobile feedback • Develop and utilize mobile applications	• Work across City teams • Manage major programs in a consistent and efficient manner • Instill best practices across City teams
Benefit	• Increased awareness and participation in City programs and initiatives • Drive economic growth	• Increased resident and visitor participation and collaboration • Improved community experience	• More rapid and successful programs

Figure 7: Key elements of Smarter marketing and management recommendations

Recommendation 7: Appoint a CMO and marketing team to strengthen City communications and promotions

An immediate action the City of Niigata should take is to appoint a CMO and create a marketing group to promote Niigata and its government services. This newly created marketing team would significantly improve the City's ability to communicate and interact with its various resident and visitor stakeholder groups in much more effective and impactful ways. The CMO would lead this team and take ownership of the City's marketing strategy, stakeholder segmentation, brand management, communications planning and execution. This will help improve Niigata's communications for its various government services, including the new transportation system. This CMO-led marketing team will help drive the City's various economic development efforts, including revitalizing the Furumachi downtown district, increasing tourism in Niigata and even promoting eRyuto.

The marketing team should first establish the City's overall marketing strategy and approach. Initial work will include developing an in-depth understanding of the wants and needs of key stakeholder segments, including the elderly, parents with children, local area business visitors and tourists from key countries. To manage the City's marketing processes and communications channels effectively, an information technology platform needs to be established. This platform will enable Niigata to standardize its marketing approach and reach various stakeholders in both a personalized and cost-effective way.

The marketing team would then work across various City departments to help design and coordinate the promotion of government services. For key initiatives, the City could maintain ownership of the end-to-end marketing planning and execution. Examples of key initiatives are the new transportation system, promotion of Niigata as a tourist and business destination and promotion of the Furumachi downtown area to stimulate revitalization.

The new bus transportation system launch will serve as a good opportunity to illustrate what the marketing team is able to achieve and how it will operate. Effective and strategic communication driven by a well-coordinated team promoting the new transportation system to residents will be vital to the success of the new system's launch.

During the IBM team's interviews with residents, a number of concerns about the City's current transportation system surfaced. We list the three most commonly heard concerns below:

1. The number of routes continues to decrease each year.
2. Many existing routes run less frequently.
3. Many of the buses are aging, making the ridership experience less than optimal.

Additionally, two qualities residents value greatly in transportation are convenience and speed.

Using that information, the new CMO could develop a clear marketing strategy to directly address those pain points and values. The marketing team could establish a new brand and vision for the BRT, one that shows a distinct departure from the existing brand that residents associate with their pain points. The new public transportation brand would promise greater speed, improved convenience, new/modern buses and an increase in frequency and routes. The marketing team could also link the new system to the social and economic benefits it is expected to drive in the city so that citizens can share in the full vision the municipal government has and understand how their use of the public transportation system contributes to that larger vision.

The marketing department should then launch an integrated communications program that would include signage throughout the city and near current transportation points, newspaper and billboard advertising and digital promotions that reflect the new brand and its value proposition. The marketing department should clearly articulate exactly how the new system will deliver improved service speed, convenience and frequency, as well as optimized routes and an enhanced user experience. It can clearly address potential points of confusion and concern, such as the transfer experience, and how the establishment of a hub and spoke model can make bus usage more efficient.

In the US, the City of Boston provides a good example of how a strong marketing and communications campaign can help make the launch of new transportation services a success. Boston's launch of its Silver Line BRT system is the first bus service for which the Massachusetts Bay Transportation Authority (MBTA) conducted a major marketing campaign. Marketing tactics included branding, logo development, signage, online promotion, print advertisements and an opening launch event. Historic markers, designed during a process that involved resident and community groups, feature images from Boston's historical archives. These markers were placed at stops and helped to drive citizen engagement and pride in the new line. The result of these marketing efforts was a positive initial public response to the new BRT line. More than half of the respondents surveyed by the MBTA said the new line was better than the old bus service, while only 7% said that it was not.[11, 12]

Recommendation 8: Interact with residents and visitors by using social media and mobile technologies

Social media and mobile technologies are providing both public and private sector organizations with an opportunity to engage with their various stakeholder groups in new and collaborative ways. These interactions provide stakeholders with a significant and powerful new voice that helps the public and private sectors understand their needs and opinions in a much deeper and personalized way. For the City of Niigata, social media and mobile technologies could enable much broader and more personalized communications than those that exist today and provide residents and visitors to the city with a more influential voice.

By incorporating social and mobile interactions between the City and its public transport riders, the City could uncover a number of valuable opportunities. For example, if the City announced the creation of a new bus route, it could use mobile and social channels to communicate and describe the upcoming changes to the system. Citizens could then share their reactions, both positive and negative, to the news. This would enable the City to quickly learn more about residents' and visitors' specific concerns related to the new route, as well as the perceived benefits.

There will be certain stakeholder segments that are not as likely to use social or mobile technology. These segments would require alternative communications channels to receive similar information and provide their feedback. One such alternative approach could be to deploy City workers or volunteers in busy areas or at City events, equipped with a mobile device, such as a tablet, which they could use to collect in-person feedback. The City could aggregate the feedback, analyze it and integrate it with the other social and mobile channels to achieve a more comprehensive response to its citizens' and visitors' input.

There are many examples of innovative social and mobile applications in use around the world that Niigata could consider developing and deploying. An app could provide citizens with the opportunity to provide real-time feedback to the City while in transit or on the move, letting the City know when a bus is running late, for example, or when and where they encountered a pothole that needs attention.

A good example of a city that is effectively utilizing strong social and mobile engagement is San Francisco. In San Francisco, the city has established very strong two-way communication with its citizens by implementing mobile platforms for many of its services. The city is a very active user of social communications channels, both sharing information and receiving feedback on public transport information.

Recommendation 9: Improve program management across City initiatives

In order to ensure the success of the three recommendation areas in this report — Smarter transportation, Smarter Ryuto community and Smarter marketing and management — and to improve the execution of various other initiatives underway in the city, Niigata should establish a program management office (PMO). This PMO would be a shared service that works across all government departments and projects to help the City drive them to successful completion in a quick and consistent manner.

The PMO would quickly establish a set of best practices and project management techniques. These would include following defined processes, setting up governance, establishing and tracking milestones, measuring key performance indicators (KPIs) and managing risk and dependencies. The PMO could then deploy these best practices in a standardized way across all major government projects, providing training and support to all departments throughout implementation.

Such program management efforts are a best practice in many cities around the world, and Niigata would benefit greatly from this approach.

Recommendations 7, 8 and 9: Smarter marketing and management

The City should appoint a CMO and marketing team to strategically brand and promote its programs and services to its residents and visitors. Branding and marketing efforts should focus on the new transportation system and eRyuto and position Niigata as a tourist and business destination to the rest of Japan and the world. The City should create new mobile and social communications channels to improve its engagement of and interaction with residents and visitors. Finally, to drive these programs and the other initiatives described throughout this report, the City should establish a PMO that applies best practices to manage the City's various programs and initiatives.

Scope and expected outcomes

Scope

The Smarter marketing and management recommendations include the following:

- Appoint a CMO and marketing team to strengthen City communications and promotions
- Interact with residents and visitors by using social media and mobile technologies
- Improve program management across City initiatives

Expected outcomes

- Infuse marketing and promotional skills into all City departments
- Better understand key stakeholder groups' wants and needs, enabling the City to design better services to meet those wants and needs
- Drive increased tourism and use of public services, including transportation
- Improve brand image of the transportation system and positively impact the City's image
- Help support the revitalization of the City and its historical shopping and business district
- Increase engagement with stakeholder groups to drive greater mutual understanding as well as greater trust and shared buy-in
- Set clearer objectives for major programs and create a shared vision and expectations while working toward common goals
- Help drive a greater completion rate across projects and improve efficiency and effectiveness across government programs

Cost of inaction

The cost of inaction is resident confusion about the new transportation system launch, as well as other government programs, and less buy-in and acceptance of the new transportation system, which will result in lower ridership.

Proposed owner and stakeholders	Suggested resources needed
Owner: New CMO to report to the mayor and work as a shared service across government departments. The CMO would be the owner of the new social and mobile strategy as well. The IT or City Planning Division could be responsible for the PMO. **Stakeholders:** • All City departments • The Niigata bus company • Niigata Prefecture government	• Marketing budget that funds the marketing team headcount, a cloud-based IT platform and communications needs, such as signage and advertising through print, social media and digital communications channels • Mobile application development and platform • Social listening and analytics tools • PMO budget, including headcount, initial setup processes and advising on structure and methodology

Recommendations 7, 8 and 9: Smarter marketing and management (continued)	
Dependencies	**Key milestones, activities and timeframe**
• Budget approval and funding • Gaining marketing, IT and program management outside expertise	**Short term:** • Appoint the CMO • Define marketing strategy and stakeholder segments • Select and establish IT platform • Launch PMO and establish PMO operating model **Medium term:** • Design events and campaigns and map them to communications channels and media outlets • Develop marketing systems, social media program and mobile applications • Launch new transportation system campaign • Begin engaging residents and stakeholders **Long term:** • Execute marketing events and campaigns • Track marketing effectiveness and refine engagement and campaigns
Priority	
High	

5. Conclusion

In developing the Connected City implementation roadmap, the IBM Smarter Cities Challenge team has been pragmatic yet strategic and believes that it is well within the capacity of the City of Niigata to achieve success in the timeline depicted. Success will depend on the actions and involvement of four key stakeholder groups: the City government, organizations in the private sector, transportation companies (primarily train, bus and taxi) and the community of residents and visitors.

Incorporating fundamental best practices throughout the public transportation system and building on the City's current strengths will help Niigata achieve its Connected City vision. Moving forward, the City must focus on three key recommendation areas: Smarter transportation, Smarter Ryuto community and Smarter marketing and management.

The initiatives within these recommendation areas will help ensure increased transportation use by residents and visitors, more social and health benefits to the community and economic growth for the city and its businesses. These initiatives will also help the City educate residents and visitors about the new public transportation system and its improvements, as well as engage them in Connected City efforts to achieve rapid adoption of the solution.

The IBM team believes that Niigata can extend its history of transportation innovation, which has included maritime canals, enhanced seaport access, excellent roadways and use of rising bollards in Furumachi mall areas to encourage more pedestrians, by turning the IBM team's Connected City recommendations into action. All stakeholders, from the City government to local businesses to Niigata's residents and visitors, will benefit from this Connected City approach.

6. Appendix

A. Acknowledgments

Name	Title	Organization
Government officials (in chronological order by interview)		
Akira Shinoda	Mayor	Niigata City
Hirotoshi Ikeda	Director	City Policy Department
Hisayoshi Kobayashi	Division Manager	Urban Transportation Policy Division
Hiroshi Nozawa	Section Manager	Regional Transportation Development Office, Urban Transportation Policy Division
Satoshi Shimizu	Division Manager	New Transportation Initiative Division
Atsushi Tanaka	Section Manager	New Transportation Initiative Division
Hironobu Suzuki	Division Director	City Planning Division
Nobufumi Maruyama	Assistant Division Director	City Planning Division
Hiroshi Yoshida	Division Manager	City Planning Division
Tetsuya Ishida	Division Director	Urban Development Division
Motomu Koizumi	Division Manager	Urban Development Division
Kazuya Tosa	Section Manager	Regional Promotion and Creative Planning Department
Takao Yuda	Assistant Counselor	Port and Harbor Division
Tsutomu Nakano	Division Director	Airport Division
Daisuke Matsuo	Office Manager	New Food Valley Promotion Office, Industrial Policy Division
Kazuhiro Saitoh	Division Director	Strategic Agriculture Policy, Zone and Rural and Urban Exchange Division
Munetaka Kawasaki	Section Manager	Smart-Energy Promotion Office, Environmental Policy Division
Yukako Kobayashi	Section Manager	Environmental Policy Division
Hiroshi Kamimura	Division Director	Disaster Prevention Division
Takehiro Wakasugi	Section Manager	Disaster Prevention Division
Toru Musha	Technical Staff	Disaster Prevention Division
Yuichi Minamizawa	Section Manager	Crisis Management Division
Yuki Sato	Assistant Section Chief	Crisis Management Division
Shinichi Suzuki	Division Manager	Tourism Policy Division

Name	Title	Organization
Yasuko Sato	Division Manager	Domestic and Overseas Tourism Office, Tourism Policy Division
Akira Murakami	Office Manager	Health and Fitness Promotion Office, Health Improvement Division
Noriko Sakai	Division Manager	Health and Fitness Promotion Office, Health Improvement Division
Industry (in chronological order by interview)		
Yutaka Yokoyama		Niigata Visitors & Convention Bureau
Tomoko Ishizuk		Niigata Visitors & Convention Bureau
Hitoshi Akatsuka		Niigata Visitors & Convention Bureau
Toshiharu Matsuzaki	Administrative Director	Association of Niigata Central Shopping Mall
Shusaku Maekawa	Senior Manager	Association of Niigata Central Shopping Mall
Masayoshi Satoh	Area Manager	Association of Niigata Central Shopping Mall
Takeshi Ishizuka	Manager	Administration Department (planning office), Niigata Branch, JR East
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Norihiko Sasaki	Executive Director	Niigata City Hire-Taxi Association
Fumio Nitta	Chief Instructor	Niigata City Hire-Taxi Association
Sigeru Fujisawa	Representative Director	Secretary General, Niigata Association of Corporate Executives
Ken Takama	Manager	Niigata Association of Corporate Executives
Shuuichi Toyama	Chairman President	Town Planning Committee of Niigata Chamber of Commerce and Industry Chuo Building Co., Ltd.
Yoshihiko Watanabe	Vice-Chairman Manager	Town Planning Committee of Niigata Chamber of Commerce and Industry Sales, HOKURIKU GAS Co., Ltd.
Masayoshi Abe	Vice-Chairman Executive Managing Director	Town Planning Committee of Niigata Chamber of Commerce and Industry Daiichi Printing Co., Ltd.
Koichi Sato	Administration Officer	Research Center of Niigata
Ryosei Kudoh	Deputy General Manager	Niigata Branch, Development Bank of Japan Inc.
Atsushi Muramatsu	Branch Manager	Niigata Branch, NTT East

Name	Title	Organization
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Kunio Takahashi	Manager	Management Department, Kaihatsugiken Co., Ltd.
Mika Hasegawa	President	Mika Universal Design Office
Kazunori Kojima	Regional Cooperation within Promotion Senior Manager	Niigata Visitors & Convention Bureau
Tatsuya Inoue	Division Manager	Niigata Chamber of Commerce and Industry
Yasuaki Haga	Town Development Support Manager	Niigata Chamber of Commerce and Industry
Junpei Sato	Town Development Support Division Secretary	Niigata Chamber of Commerce and Industry
Michihei Kurihara	President and CEO	Shinanogawa Water Shuttle, Inc.
Tohru Wada	Manager	Niigata Kotsu Co., Ltd.
Eitaroh Tanaka	Manager	Niigata Kotsu Co., Ltd.
Takeshi Watanabe	Manager	Niigata Kotsu Co., Ltd.
Hiromu Ikeda	Chief Chairman President	Niigata Association of Corporate Executives Niigata Sogo Gakuen Incorporated Educational Institution
Special thanks		
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Yoshiya Kamo	Manager	Smarter Cities, IBM Japan
Hiroshi Oka	Manager BU-Hokushinetsu	IBM Japan Chubu Region Enterprise Sales
Hiroto Kurita	Sales Representative BU-Hokushinetsu	IBM Japan Chubu Region Enterprise Sales
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B. Team biographies

David C. D'Lima

Leader SWG Strategy — GIC/SIH, IBM Global Business Services – Globally Integrated Delivery, IBM Singapore

David C. D'Lima is a Director in the IBM Global Business Services® (GBS) Service Integration Hub based in Singapore. He leads the mission to accelerate the growth and expand the capabilities of the Global Delivery team in new market technologies, including cloud, analytics, social and mobile applications, as well as offerings from IBM product and services brands.

D'Lima has more than 25 years of experience in crafting and delivering transformational and IT support programs around new technologies, leveraging globally integrated talent and teams. He has provided advisory and consulting services to C-level leaders for IT-enabled business transformation initiatives across industries and markets. Prior to joining IBM, D'Lima was a senior manager with an India-based consulting firm for more than 16 years. He has consulted for multiple transportation, government and healthcare firms globally, including in the US, Europe and Japan.

After completing his bachelor's degree in electrical engineering from the Indian Institute of Technology, Bombay, D'Lima was awarded a graduate assistantship at North Carolina State University (USA) where he was granted a master's degree in computer engineering. He has been a visiting faculty member at several well-known business schools in Asia and Europe and has been invited to speak at international conferences, including the Intergovernmental Technology Conference in Philadelphia and the Comdex Asia Forum, Singapore, on Integration Challenges for ASPs (a predecessor of SaaS).

Jeremiah Gibber

Director, Market Development, IBM Japan

Jeremiah Gibber is the Director of Market Development and Insights for IBM Japan. He and his team are responsible for analyzing the Japanese economy and IT marketplace, developing deep expertise on this subject matter and advising IBM Japan's senior executives on how to best shape and align the company's strategy.

Prior to this role, Gibber was an Associate Partner in the IBM Global Business Services (GBS) Strategy and Analytics Consulting practice. Gibber was a leader in the Strategy and Change Internal practice, providing strategy-based consulting services to IBM's global leaders and helping them solve challenges and drive profitable growth. He has been with IBM for nine years, working in multiple countries. Before joining IBM, Gibber worked for two different technology companies focusing on international business development, helping them create their globalization strategies and establish presences outside of the US.

Gibber has an MBA from the Emory University Goizueta Business School and a BSBA in finance and French from Washington University in St. Louis. He has studied at a European business school in Paris, France, and collaborated with the Carter Center while at Emory University to study economic development in Mali.

Huong Morris

Growth Market Innovation Leader, Industry and Solution, IBM Research

Huong Morris is the Global Markets Innovation Leader at the IBM T.J. Watson Research Center, New York. Over her career, she has worked in Sydney, California's Silicon Valley, New York and Shanghai. Recently she moved to Singapore to give greater focus to Asian markets. Morris's present role is to sense technology marketplace shifts in growth markets and to inform the IBM global research and development organization. Morris is charged with researching technology solutions developed around the world and applying them to solve IBM clients' most challenging problems. In her most recent prior post, Morris spent three years in Shanghai developing solutions and capacity for emerging markets in the fields of Smarter Cities, Smart Transit, logistics, water, healthcare, natural resources, pharmaceutical supply chain and public health.

Morris has postgraduate degrees in engineering and computer science from academic institutions in Australia and the US, along with many patents and publications in software engineering, database systems, information management and large system integration. She has received awards for her contributions, which include the IBM flagship database product (IBM DB2® software), that have created more than $1 billion in IBM revenue.

Morris's interests are in global citizenship and culture and the development of new markets and their technical capacity. She and her family have lived this firsthand through travel, cultural immersion and living and working in more than 40 countries.

Akira Sakakibara

Distinguished Engineer, Smarter Cities, IBM Japan

Akira Sakakibara is an IBM Distinguished Engineer and CTO for Smarter Cities, IBM Japan. He is responsible for applying innovative IBM solutions to Smarter Cities initiatives. He is currently leading the IT design of a large solar power plant project that includes SCADA and big data analytics systems. Sakakibara also helps create and support the Internet of Things (IoT) cloud platform that has been used in various Smarter Cities projects across industries.

Before joining Smarter Cities as an IBM IT Architect, Sakakibara contributed to dozens of service delivery projects over a span of 20 years, providing expertise to the banking, securities, automotive, industrial and newspaper industries. After spending two years working in the IBM Tokyo Research Lab, he headed up the Emerging Technologies and Architecture service areas of IBM Global Business Services (GBS) as a global leader.

Sakakibara holds a BA in public economics and financial engineering from Hirosaki University. He lives in Tokyo with his wife and two sons. He enjoys playing basketball, golf and skiing and is an avid Sudoku player.

Satsumi Takeo

Distinguished Engineer, IBM Global Technology Services ITS Solution Center, CTO for Middleware and Database Design and Management Leader, IBM Japan

Satsumi Takeo is an IBM Distinguished Engineer and is currently the CTO on Middleware and Database Design and Management in the IBM Global Technology Services® group. She has served a diverse set of clients in a variety of industries, including banking, insurance, credit card, retail, telecommunications and industrial. She has designed and implemented mission-critical and highly available systems, as well as data warehouse systems, in Japan and other Asian countries, serving as project architect and specialist.

Prior to her current role, Takeo worked in technical sales, collaborating with IBM Labs in the IBM Software Group (SWG) and the IBM Systems and Technology Group (STG).

Takeo holds a BS in mathematics from Tohoku University and has been serving as the university ambassador for Tohoku University. In her spare time, she enjoys listening to music, especially classical music, watching movies, traveling and exercising. She is passionate about volunteering with students to encourage their interest in science.

Issei Yoshida

Advisory Researcher — Text Analytics and Search, IBM Research

Issei Yoshida is an Advisory Researcher at IBM Research – Tokyo. He is currently leading the development of an information retrieval solution based on natural language processing and machine-learning technologies.

Yoshida joined IBM in 2001 as a software developer for text analytics middleware and moved to the research division in 2003. His research interests include data indexing and algorithms for efficient search, as well as how his discoveries can apply to the real business issues his clients face. He has participated in many research projects as a leading architect in this field. He has been engaged in solution proposal and service implementation activities in a wide range of industries, including healthcare, automotive, social media service on the web, insurance and telecommunications. He was awarded the Field Innovation Award from the Japanese Society for Artificial Intelligence in 2011.

Yoshida holds BS and MS degrees in mathematics from the University of Tokyo. He lives in Tokyo with his wife and two daughters, with whom he enjoys spending time. He also enjoys going on long walks and thinking about how to make search algorithms much faster.

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December 2014
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