

The Shobara Model

Leveraging multi-source local data for the public good



BRIEFING PAPERS

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In today's world, each of our lives is an abundant source of data. The places we go, the things we buy – these and other components of our daily activities leave a digital trail that is databased and stored on servers around the world. The crumbs in this trail include smartphone location data, public-transit records and the transaction histories of our credit cards and payment apps.

The mountain of data that our combined activities generate is growing rapidly. But to what degree is it actually being used? And how much of that use benefits society?

In reality, the majority of the world's data remains contained inside closed databases owned by individual businesses. Little progress has been made in utilizing the data to improve society as a whole. That includes the production of knowledge and insights that can only be extracted by combining multiple pieces of data – a basic method of data analysis but one that is difficult to carry out when the data in question is siloed inside closed systems.

In an effort to better understand barriers to data sharing for the public good and how those barriers might be overcome, the World Economic Forum Centre for the Fourth Industrial Revolution Japan (C4IR Japan) is working with local stakeholders in Shobara, a rural municipality in Hiroshima Prefecture. Shobara's population is ageing and declining; some 43% of its residents are over 65 years old and its roughly 33,000 residents are spread over a wide area. Shobara is legally classified as a city, but its population density is the eighth lowest of Japan's more than 1,700 municipalities, at only 26 residents per square kilometre. This demographic profile places a heavy burden on public services, from healthcare to transport.

The goal of the project is to create an operational model for combining data obtained from various collection points – including consumer payment platforms, public transport and private vehicles – and leveraging the resulting insights to develop real-world programmes and services to revitalize the community.



One common approach to combining data from multiple sources is to mechanically suck up a large volume of digital information, convert it into bulk big data and analyse it using artificial intelligence. However, this approach has been of limited use in creating social value from data, due to hurdles such as the need to ensure data privacy, gaining the trust of data providers and building economically viable data infrastructure.

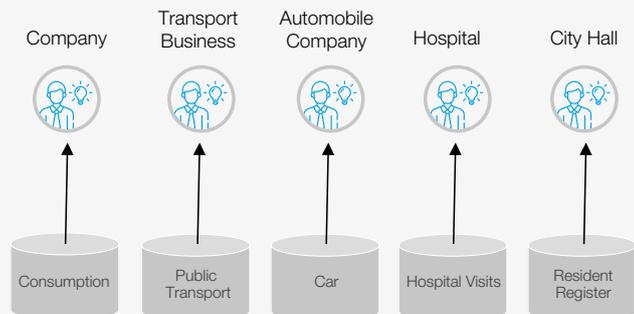
We believe the model described in this case study has the potential to overcome many of these challenges. We also believe it could be a model for public-private data use elsewhere in Japan and around the world. That is in part

because it is not a closed initiative among specific data holders. Instead, its governance model centres on a shared “data lake” that is open to a range of local stakeholders. Project participants can access and analyse the data and use it to develop programmes and services.

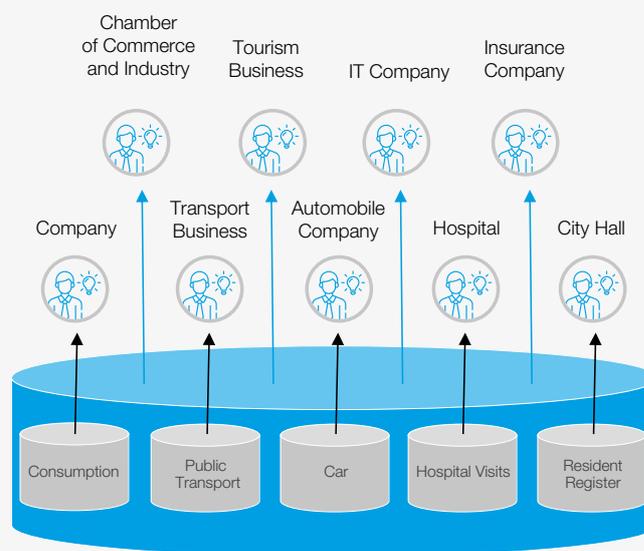
The Japanese government is currently promoting a Digital Garden City Initiative to help rural municipalities upgrade and expand their digital infrastructure and services. We believe our efforts could provide useful hints for the implementation of this programme.

FIGURE 1 A vision for more effective use of mobile data

Status Quo



Future Vision (Shobara model)



What are the challenges to unlocking the potential of local data?

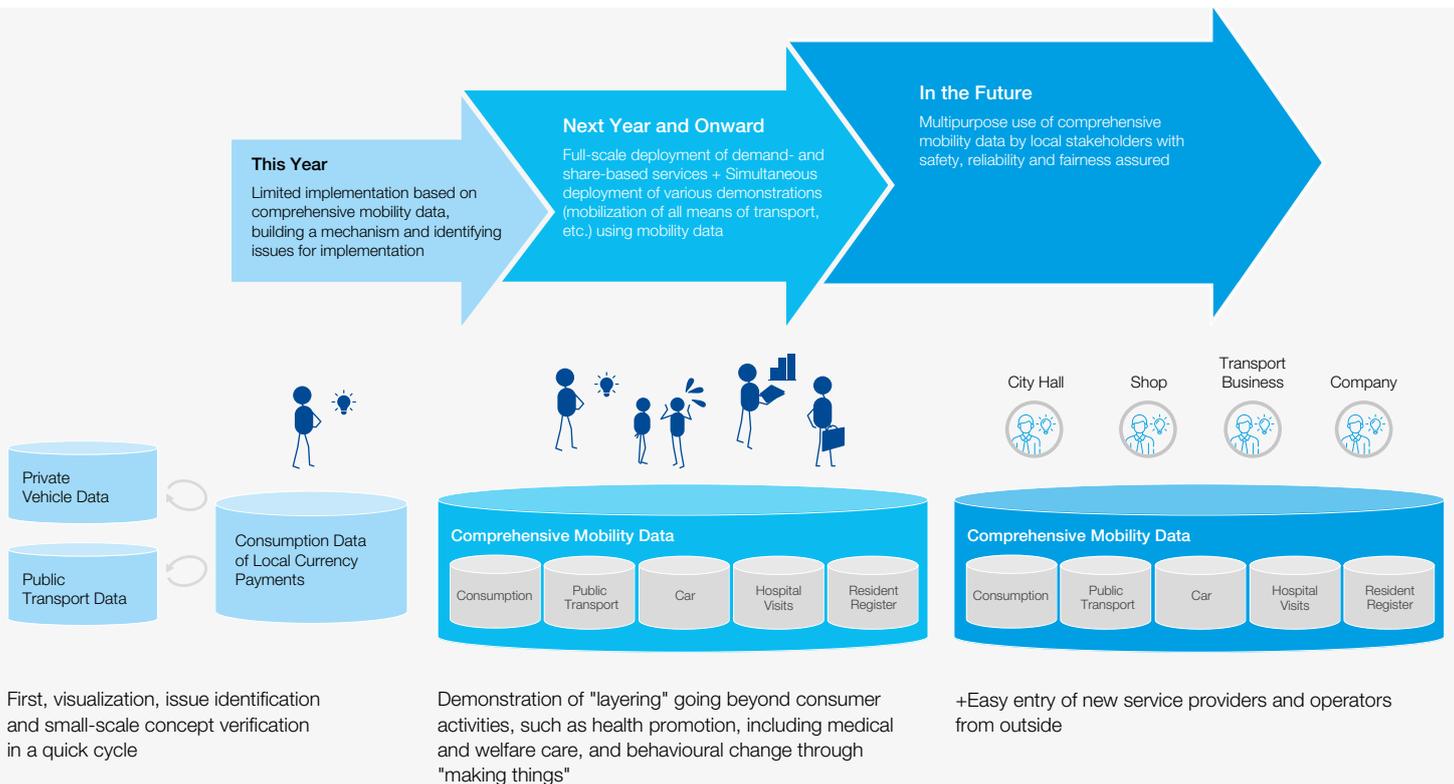
Although there have been some attempts at cross-use of data to support policy goals in healthcare and mobility, these have been little more than demonstration experiments so far. There has been little progress towards real-world implementation. The following four issues have been identified as barriers:

- Privacy: Adherence to data-handling practices set forth in privacy rules
- Endorsement: Consent of local citizens as the data-providing group
- Business case: Creation of best practices for commercial businesses using the data infrastructure
- Infrastructure: Linking of databases; analysis and resources

The daily activities of local residents are highly routine. That means if the goal of a programme or service is to change behaviour, the hurdle is relatively high (compared to, say, incentivizing the behaviour of tourists). To be viable as a business model, it must be optimized for the more personal aspects of residents’ lives, which raises the level of difficulty associated with the above issues even further. In order to develop personalized programmes and services, more detailed behavioural data is required, which makes privacy and citizen endorsement that much more important.

Through discussions with experts, we recognized that a lack of economies of implementation, based on a range of use cases, is a serious bottleneck. We knew we needed to find a way to aggregate data within the region that satisfied privacy and consent requirements but was still economically viable, convenient for local residents (users) and flexible enough to allow for the creation of new businesses using the data in the future. Our team adopted a bottom-up approach to solving the above issues, which we describe in more detail below.

FIGURE 2 Roadmap for the Implementation of a Comprehensive Mobile Data Utilization Mechanism



Case study: A new model for using local data to address social challenges

In the Shobara model, we took a bottom-up approach to cross-use of local mobility and consumer data to understand the behavioural patterns of residents from various perspectives. We held monthly Regional Data Forums under the auspices of NGOs/NPOs to foster residents' trust in the use of their data. The forums also helped us to plan and promote improvement measures based on local conditions and to design, develop and implement services in an agile manner.

1. We found that it was possible to combine data from a range of sources (public transport, private vehicles, consumption, etc.) to generate insights that could be used for quasi-public

purposes, in a manner that is compatible with Japanese rules on the protection of personal information. In our demonstration experiment, the privacy-law hurdle was cleared by anonymization – that is, by not linking the original data held by each entity as a unique ID through name identification using names and addresses and instead applying data masking before cross-use and converting the data into anonymously processed data. By plotting data not tied as unique IDs on top of time and geographic information, anonymity was also ensured while still allowing for the visualization and monitoring of local issues from multiple perspectives.

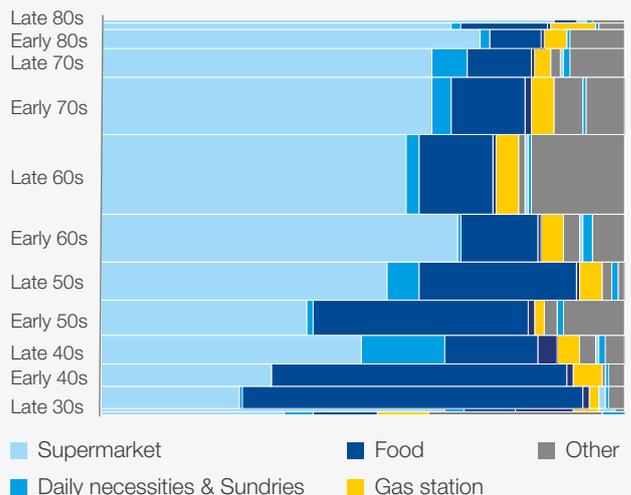
FIGURE 3 Insights Extracted from Analysis of Migration Data (excerpts)

Amount of Movement and Activity

- Consumption activity declines sharply as people enter their 80s.
- The main consumers in the region are people in their 60s, and the younger generation does not consume as much as the population.
- The ratio of purchasing behaviour between men and women does not change significantly with age (women shop twice as much as men).

Analysis Example:

Demographic Analysis by Age Group



Mobility Patterns

- Trends in outings by age group vary by residential areas.
 - Central city residents are more likely to go out until their early 70s. Suburban residents are less likely to go out in their early 70s.
- The action time of day is also unique to the region of residence.
 - Outings of suburban residents are concentrated in the morning (conversely, drastically decreases after 17.00).
- A distinctive pattern is observed in the outgoing behaviour that appears in public transport use.
 - In the case of bus use from the suburbs to go to the hospital, the respondents rarely take side trip behaviours such as shopping when the main purpose of the trip is to go to the hospital.
 - On the other hand, when returning home, they do not shop and use the supermarket bus stop as a waiting area.

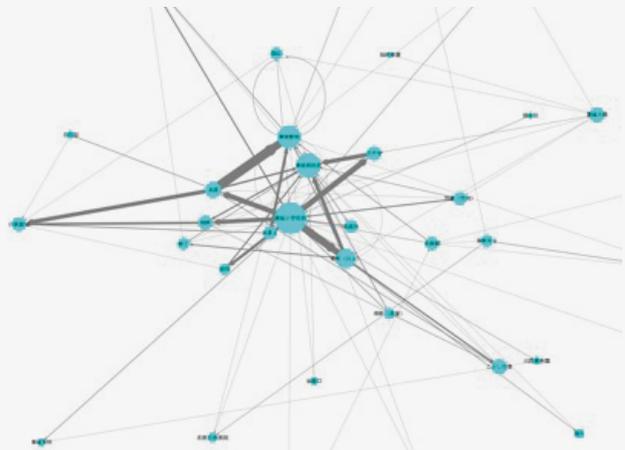
Analysis Example:

Demographic Analysis by Place of Residence



Analysis Example:

Network analysis of activity locations



2. The Regional Data Forum structure was established to foster momentum and quick implementation of data use among local residents. The resulting governance model contributed to open discussions in which participants could engage equally, and it successfully operated as a forum for active debate. Specifically, we prepared a meeting body (study group) consisting of members from industry, government and academia (IT start-ups, automotive OEMs/suppliers, local associations of commerce and industry, central government ministries and agencies, local governments, university professors, etc.). The NGO/NPO (in this case, C4IR Japan), which serves as a third party, held monthly meetings for communication and idea generation among the members of the forum. This enabled stakeholders to share benefits, disclose information and discuss concerns.

In particular, the forum fostered trust. By fostering transparent discussion within the local community regarding the handling of sensitive personal information, we were able to gain the approval of a wide range of stakeholders to promote the study from the perspective of using the data for quasi-public purposes. The data holder, a public institution, agreed to use the data while taking personal information into consideration. The results of the data analysis were shared with representatives of local residents who engaged in lively discussions to understand the current status of the community.

In addition, the planning and promotion of improvement measures based on local conditions moved forward quickly. A cycle of planning and implementation of measures derived from the analysis of overlapping behavioural data, verification of the agile effects of the data, and return of benefits to the community through improvements were created. In fact, nearly 50 ideas for initiatives were generated in four discussions alone through dialogue and discussion with local stakeholders based on insights gained through visualization of local issues.

TABLE 1 List of issues identified and policy ideas to address them

	Issues	Ideas
Outings of the elderly	<p>Refraining from going out due to geographical factors</p> <ul style="list-style-type: none"> – One cause is distance from the centre (Seniors living in the suburbs are have fewer opportunities to go out earlier and less likely to go out later in the evening.) <p>Refraining from going out due to social factors</p> <ul style="list-style-type: none"> – Lack of transport (reserved) / Psychological behavioural inhibitions (e.g., retirement) / Lack of places to go / Culture that does not like to eat out 	<ul style="list-style-type: none"> – Compensate by moving mobile sales and services – Promote outings by holding events + providing evening public transport – Plan and organize mini-tours (e.g., hot springs & “hidden gems” packages) – Utilization of non-public means of transport that exist in the community, such as welfare buses – “Creating things” / Discover new hubs and attractions – Facilitate outings by holding events + providing transport services
Stay of citizens in the city	<p>Inhibition of stay in the city due to physical factors</p> <ul style="list-style-type: none"> – Few entertainment places/weak stores for children/ no casual base or hub function <p>Inhibition of stay in the city due to social factors</p> <ul style="list-style-type: none"> – Not a single living/business area (historical background)/A certain awkwardness (e.g., families find it difficult to eat out in the neighborhood, so they go to neighboring cities) <p>Inhibition of stay in the city due to traffic factors</p> <ul style="list-style-type: none"> – No choice but to travel by private car/ No change in distance and time to neighboring cities and towns/ Vulnerable mobility hubs (location and functionality) 	<ul style="list-style-type: none"> – Service design that redefines the service as a “living and activity area” that includes neighbouring cities and towns – Establish a base in the centre of the community, such as a shopping district (including co-working spaces) – Discovering “attractive” spots as a place to visit from outside the city – A system that makes it easy to purchase “specialties and products” from various parts of the city (e.g., mixed cargo/passenger transport, organizing events). – Create an environment that makes it easy to go out by organizing events (e.g., mini-tours) – Improve demand mobility (improve transport from home to destination, taking into account connections) – Improved means of moving around and services at destinations (develop hubs / last mile means)
Stay of students enrolled in local universities	<p>Few students (young people) live and work within the community</p> <ul style="list-style-type: none"> – Lifestyle patterns and preferences do not fit (e.g., lack of entertainment, inconvenient transportation, few part-time jobs) <p>Possibility of further reduction in bus usage due to school bus charging</p>	<ul style="list-style-type: none"> – Payment card (local currency) incentives to encourage bus use / Consider student transportation services – Involve university students in promotion of card use and town revitalization
Mobility of visitors for sightseeing, etc.	<p>Visitors from outside the city to tourist attractions, parks, etc. do not come to the center of the community (= do not consume).</p>	<ul style="list-style-type: none"> – Review of conduit (e.g., Park & Ride) – Targeted events, announcements, and incentives – Family and group discounts and other services that make it easy to come
Visitors to the national park	<p>The number of visitors is low despite the extensive physical infrastructure. Development of the area as a further tourism resource is not progressing.</p>	<ul style="list-style-type: none"> – Enhancement of attractiveness through active introduction of new mobility systems and improvement of services through accumulation and utilization of data – Diversify mobility demonstrations (e.g., increase the number of services during certain times of the day / promote citizen visitation by providing mobility services / evaluate the effect of increased traffic through marketing linkage)
Use of local payment cards	<p>Promotion of resident use has reached a limit</p> <ul style="list-style-type: none"> – Lack of male response to point grants / Sluggish use by under 50s / Franchisees do not join <p>Low visitor use</p> <ul style="list-style-type: none"> – Low awareness outside city limits / Few places/ opportunities for use / Insufficient benefits of use 	<ul style="list-style-type: none"> – Improvement of notification and PR (e.g., increase opportunities for explanation / use of influencers) and introduction of purchase-use incentives – Package use (e.g., transport, facility use) and subscriptions

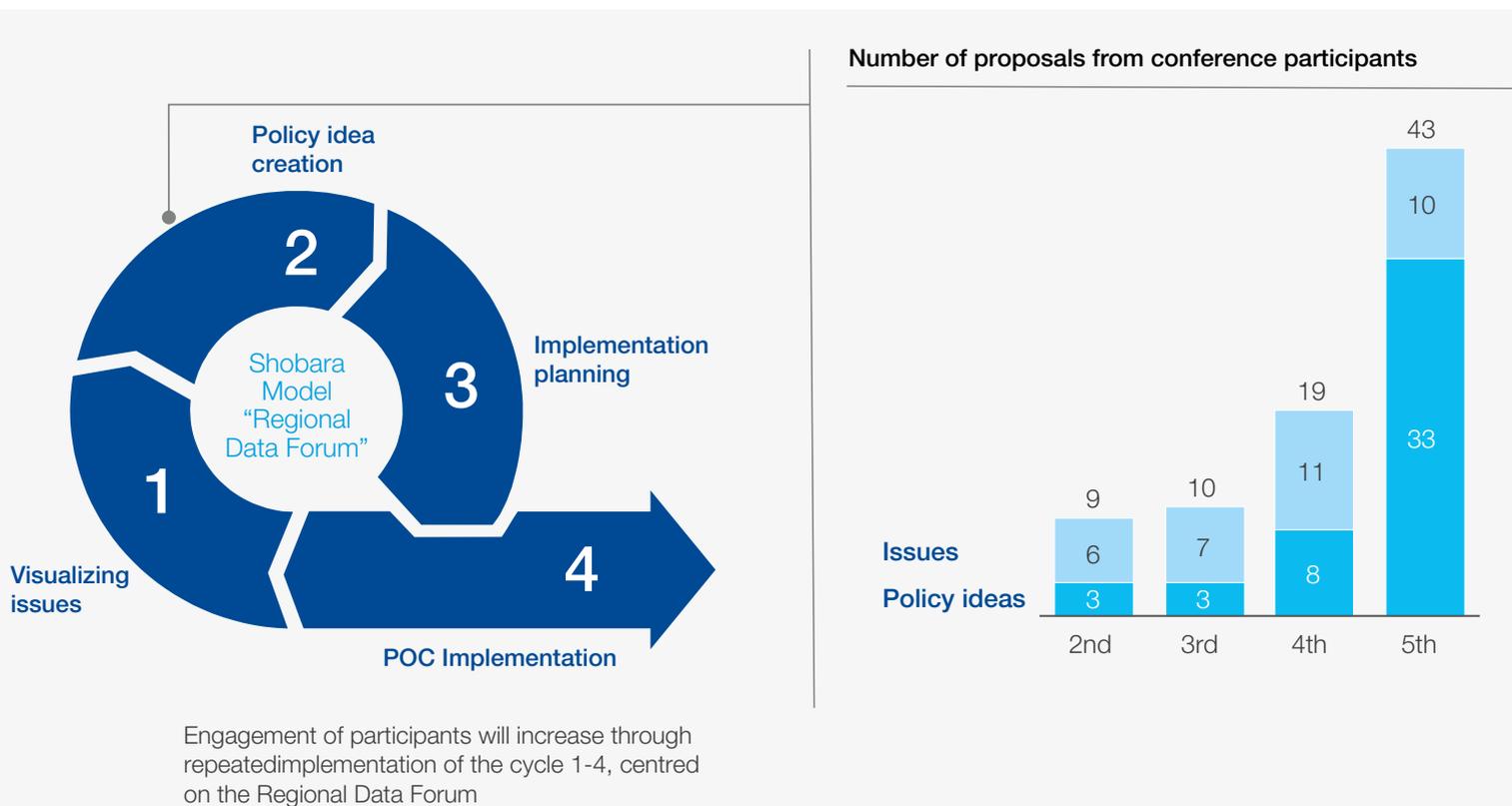
Furthermore, the cargo and passenger consolidation business, which was particularly promising, was a great success, with multistakeholder cooperation enabling the start of actual proof of concept (POC) with the introduction of an app just one-and-a-half months after discussions began. The POC has been covered by the local media and commercial operations have already begun at the urging of local businesses creating a positive cycle.

One of the highlights of this demonstration experiment was that the number of Local Data Forum participants was deliberately

expanded to include not only local residents but also related companies, prefectural governments and national organizations, which greatly increased participants' engagement. In fact, the increase in the number of participants' comments compared to the first workshop was also a result of this structure.

Building a broad community created trust. With trust in place, discussions on governance and implementation to maximize the use of data are proceeding. The importance of building such a space can be said to be a lesson learned from this case study.

FIGURE 4 Shobara Model Regional Data Forum



Shobara as a model

Taking a step back, the uniqueness of the demonstration experiment in Shobara lies in its attempt to identify mobility issues based on consumer payment data. This is a unique initiative in terms of both approach and process as the analysis of consumption data has enabled the estimation of travel by private vehicles, which was not possible with public transport data alone, and has clarified the behavioural patterns of residents.

The Shobara model was developed through trial and error, in a lively atmosphere created by passionate industry, government and academia participants. In order to turn this case into a reference model and expand the project systematically to other regions in the future, discussions and efforts from the following two perspectives are necessary.

To facilitate the horizontal deployment of this model in other regions it will be necessary to:

- Establish a hassle-free data linkage mechanism; specifically, it is necessary to draw a roadmap of what kind of data architecture will be developed and who will maintain it

- Facilitate certification of model contracts and schemes for data cross-use; models that assume multistakeholder data exchange are rarely found in the world so it is useful to lower the hurdles for such efforts

Furthermore, in order to strengthen incentives to implement this model in other regions, it will be necessary to:

- Establish rules for the participation of private companies outside the region; it is important for data economics to work in terms of actual resources for activities and the participation of private companies is essential. A framework for allocation of data and value-added creation among participants should be established
- Involve entities that possess public data; enabling the cross-use of public and private data will not only improve the value of the data infrastructure itself but also its use for disaster prevention and welfare