With the proliferation of smartphones and ICT devices in recent years, transportation operators are now able to directly provide information to users. For users, this means that they are able to gain real-time information by devices such as smartphones and tablets. For example, users can easily obtain a variety of information by means such as online news delivery and sharing of trends on SNS.

The purpose for which customers travel varies greatly, including commuting to work and school as well as sightseeing and day-to-day shopping. Moreover, services desired are diverse and vary depending on factors such as familiarity with and knowledge of railways, language used, and condition when traveling.

“Information provision in accordance with customers’ needs”, the theme of this paper, is thought to be necessary for further increasing service levels and customer satisfaction companywide in the future. The concept of information provision and services was demonstrated in our Mid-to-Long term Vision for Technological Innovation (JR-EAST Innovation Vision) formulated in 2016 as providing customers with the values of “Now, Here, Me” personalized service. In this paper, we demonstrate the system concepts necessary for achieving “information provision in accordance with customers’ needs” and introduce efforts with an objective of information provision in accordance with customers’ needs based on R&D case examples.

2. Information Provision Architecture

Until recently, information was delivered to customers in a one-way manner at individual locations by guidance announcement, in-cabin broadcasts, and emergency station guidance displays and in-cabin displays. However, with the proliferation of smartphones, the breadth of service has broadened with the ability to constantly have points of direct contact with customers. With the JR East App for which service started in 2014, we built a mechanism to provide information necessary when using JR East where one application provides a broad range of information such as railway-related content and marketing/entertainment content.

In order to achieve information provision according to the increasingly diverse and advanced needs of customers, efforts in “exposing internal and external data” and “generating content with value using data” are needed. As the concept for information systems then, a system architecture is assumed to be desirable where a common information delivery platform is built and services are made separately in the subsequent application layer according to media and service format. This differs from before where individual systems were built for each service. An image of that concept is
shown in Fig. 1. Based on this concept, we built at the Frontier Service Development Laboratory a server where JR East App content and internal and external data can be consolidated in a unified manner and delivered in order to enhance provision of information to customers. And we conducted R&D in with an objective of deploying services that can achieve information linkage with displays, external apps, and the like.

The following chapter covers examples of research underway in utilizing the server built.

3. Research Case Examples

3.1 Integrated Information Delivery Signage System

More guidance signage is being introduced in railway spaces in recent years with displays becoming more inexpensive. However, with conventional guidance signage, once a signage system is built, the system for displaying corresponded one-to-one with the content. That meant it was difficult to display content combined with other information or to flexibly change content in line according to customers’ needs.

In this research, we built a system to integrate and deliver various guidance content and developed a system that can variably control display details according to various conditions. The system developed was built using the concept of web-based signage (WBS). WBS does not depend on conventional signage software, and a signage system is built using web technology with greater versatility, and content can be switched and improved simply by switching the URL as with viewing web pages. A wide variety of information, such as train location information and station information, was selected as information to be provided in field tests in this research. Screens were produced for the individual components, and those could be combined freely according the characteristics of the locations where they were shown.

Field tests were performed from April 2016 at Tokyo and Kunitachi stations, two stations of different scales in terms of factors such as number of lines and having differing user segments. Fig. 2 shows the screens displayed at the individual stations. Items evaluated in the field tests were content design, system operability, and state of use.

For content design, agile development techniques were used to heighten level of completeness. With that technique, results of interviews with station personnel during field tests and of behavior observation were fed back to development. Considering system operability, display of information during system outages would be difficult as real-time data is displayed, so we believed that wired communications configuration rather than Wi-Fi or LTE environments would be more appropriate to the environment of stations where crowding occurs. In a survey of state of use from the number of users by behavior observation and server logs, we confirmed that up to 800 users would use the interactive signage system in summer vacation, with many of those relatively unaccustomed with using railway services. For the non-interactive system as well, the number of users tended to increase at periods where there were many users unaccustomed with using railway services and when transport disruptions occur.

In order to increase service effectiveness at time of introduction, we will study what content is needed according to the environment where the system is set up, such as type of situation and location, and we will aim to introduce the system as a guidance signage delivery platform.
3.2 Information Provision Utilizing SNS and Internal/External Data (JR East Chat Bot)

Means of communication have changed from e-mail to social network services (SNS) with the proliferation of smartphones. Today, SNS use has spread across many age groups, not just the youth segment. It is a means of communication not just between individuals, but also is used as a platform for disseminating corporate information and providing services.

In this research, we used a messaging app and developed a prototype for a new information service that can meet customers’ needs in an easier and timelier fashion. Specifically, we used a messaging app and opened a “JR East Chat Bot” official account with a function whereby the system automatically replies to customer inquiries. In proving tests, the following items were the major points for development.

- Having a user interface where users can share information between multiple people
- Be a service where content collected for the JR East App can be easily obtained
- Make to be a form where the messaging app feature of “holding a conversation” is used to answer inquiries

In order to verify the demand for services with a “conversation style” interface, we started proving tests on May 31, 2017. As of September 10, 2017, a total of 13,968 people have registered as “friends” of the account. Fig. 3 shows content provided in the proving tests.

We conducted a questionnaire survey of users during the test period, and 3,920 people (28% of all users) responded. Even though no direct incentive was provided to respond to the questionnaire, the response rate reaching 28% suggests a high reach to messaging app users and demand for this service. For intention to use the account, 96% of respondents responded that they would like to continue to use is, confirming a very high intention to use. We will continue to gather and analyze data and work toward the goal of achieving actual service by improving answer accuracy and enhancing provision of information.
3.3 Door-to-door Navigation Service

Finally, we cover in this chapter a service to guide customers from their home to destination, including by modes of transportation other than railways. The JR East App has a route search function and a guidance function with an emphasis placed on railway information such as train location and level of crowding. However, it does not have secondary transportation information such as for buses, taxis, and ride share services (as of November 2017). A variety of route search services are currently becoming popular, but we are making efforts primarily on the following three points so as to be able to provide the optimum mobility services while avoiding delay and congestion, like car navigation systems do to avoid traffic jams, in an attempt to further improve convenience (Fig. 4).

- Achieving route search functions that include walking and secondary modes of transportation
- Achieving route search functions that take into account delays and congestion
- Achieving guidance notification functions that take into account the current location and status

This service cannot be achieved by a railway operator alone. Therefore, we are concurrently studying schemes for linkage with other companies and how the system architecture should be when working across scheme boundaries as well as who should take the lead in operating the system when achieved, all utilizing the concept of “mobility as a service” set in transport policy of other countries. Into the future, we will work with an aim of better services and applying the findings of our study as a service for the public upon field tests and the like for evaluating acceptance by customers.

4. Future Efforts

The targets in the research case examples provided herein span a wide range, from mass public to individual users, and information can be provided according to the demands of various customers using railways. However, there is still content that cannot be provided, such as congestion information. In the future, we will study expanding the variation of valuable information that can be of help in customers’ behavior judgment, such as real-time seat availability for first-class cars and station congestion information. Particularly, we believe that the scope of R&D can be expanded by exposing more fine-grained seed data including that for IoT and using artificial intelligence to combine data inside and outside the company and by making efforts to create high-value data with the aforementioned server.

5. Conclusion

In this paper, we introduced the concepts of a system architecture that enables new value to be created for information provision services at JR East and three cases of R&D carried out in accordance with those concepts. In order to achieve the mobility revolution and door-to-door navigation services aimed for in the our Mid-to-Long term Vision for Technological Innovation, coordination with other modes of transportation and other service companies in addition to railway operators will become even more important. And through future research activities, we will aim to achieve information provision that meets increasingly diverse and advanced customer needs from a customer perspective.