

# AI-based Chatbot Service for Financial Industry

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In light of recent trends toward enhancing customer contact points, companies must clarify the issues they face, how they intend to solve them, and their specific objectives while aiming for step-by-step improvements. To this end, many companies are starting to provide “chatbots” to automate communication with people using computers as a service for interacting with customers. This movement is also being felt in the financial industry that handles a variety of complex products and services, and there are already cases of using chatbots for customer support and sales. Fujitsu has developed FUJITSU Financial Services Solution Fimplex Robot Agent Platform (hereafter, FRAP), an AI-based enterprise chatbot service. FRAP achieves automatic robot support of financial-product sales and customer support by having users converse in a chat format with a robot having knowledge accumulated by machine learning. This paper first introduces trends in enterprise chatbot services and examples of using them in business applications. It then presents a case study of introducing FRAP in Sony Bank Inc. and describes its features.

## 1. Introduction

As a provider of a wide variety of complex products and services, the financial industry today is increasingly turning to the use of chatbots in customer support and sales. The “bot” in “chatbot” derives from “robot,” and the meaning of a chatbot is a program that automatically converses with people in place of a human being or an entire system that includes such a program.

Introducing automation through the use of a chatbot makes it possible to respond to customer inquiries 24/7. For example, applying a chatbot to a business in which operators make up a big percentage of human resources as in a call center has the potential of making business operations vastly more efficient. However, automating by chatbots has not yet reached a point at which all requests can be handled, so there is a need to establish and apply technology that can satisfy service requirements. With this in mind, Fujitsu has undertaken the development of a hybrid chatbot that is capable of combining technologies such as rule-based scenarios, FAQ searching, and text mining with machine learning.

This paper describes trends and examples

surrounding the business application of chatbots and presents the features of a chatbot product developed by Fujitsu for the financial industry.

## 2. History and present state of chatbots

The chatbot itself is by no means a new idea. ELIZA, the program created by Joseph Weizenbaum in the 1960s, is considered to be the first, so chatbots have been in existence for more than 50 years. ELIZA is a natural language processing program using a simple pattern-matching technique. The underlying mechanism uses scripts to respond to user inputs. A script called “DOCTOR” would simulate a conversation such as that between a doctor and a patient and respond to a sentence input by a user (playing the role of a patient).

Subsequent advances in machine learning, natural language processing, and voice recognition technology have been driving the development of systems that enable conversation in a variety of scenarios. In addition, smartphone-based chat and messenger apps have been evolving and attracting attention.

1) Expanded use of chat services

The 2010s saw the expanded use of chat services

like Facebook Messenger in the United States and LINE in Japan. The monthly active users of Facebook Messenger have exceeded 2 billion. LINE, meanwhile, features more than 59 million monthly active users as of March 2017,<sup>1)</sup> which means that one out of two smartphone users in Japan is using LINE. Many companies have been setting up official accounts on these chat services to provide a variety of services to users.

Additionally, some companies have been using chat services as a one-way channel for delivering advertisements, coupons, etc., since around 2010. At present, the use of chat services as a two-way channel with users to automatically reply to FAQ is expanding.

## 2) Expansion of chatbots from consumer to enterprise applications

The spread of chatbots in Japan began with the use of entertainment applications such as those for light conversation (chit-chat). A typical example is "Rinna" developed by Microsoft. Set up as a high school girl that loves to chat, Rinna can engage in natural daily conversation or chit-chat like a human being.

The Rinna program is achieved through a combination of natural language processing and deep learning. More recently, there has been an increase in chatbots not only for chit-chat and other entertainment applications but also for business applications such as customer support.

## 3. Examples of enterprise chatbots

This section introduces examples of enterprise chatbots in Japan.

### 1) Pecotter: gourmet Q&A app

Pecotter is a restaurant search app using a chatbot provided by BrightTable, Inc. After the user inputs preferences, the chatbot begins by introducing eating or drinking establishments that match those conditions. It then presents locations recommended by other Pecotter users in posts. If the user finds a restaurant that he/she would like to go to, Pecotter enables the user to make a reservation and to even change or cancel a reservation.

### 2) Panda Ichiro: Support for part-time job hunters

Panda Ichiro is a LINE official account launched in 2014 by the part-time job-searching site "fromAnavi" managed by Recruit Jobs Co., Ltd. Introducing AI technology to the chatbot in September 2016 enabled it to deal with poor wording or typographical errors (typos)

in user input. It can also remember topics of special concern to the user from past conversations as a basis for bringing up topics.

### 3) Manami-san: 24/7 handling of customers' inquiries

Manami-san is a chat-type response system for customer support at the LOHACO mail-order/net-shopping site for everyday items managed by ASKUL Corporation. With the aim of saving on labor and improving customer satisfaction, a LINE official account for this site using Manami-san was introduced in September 2014 to respond to customers' inquiries in a chat format. In March 2016, the labor-saving effect in terms of the number of operators who would be needed to do the work of Manami-san was calculated by ASKUL to be 6.5 people.<sup>2)</sup>

## 4. Development of chatbot for financial industry (Sony Bank case study)

In June 2017, Fujitsu released FUJITSU Financial Services Solution Finplex Robot Agent Platform (hereafter, FRAP) as an enterprise chatbot service for the financial industry. The idea behind FRAP is to respond to user needs for accessing desired information as quickly as possible anytime anywhere and to service-provider needs for visualizing and managing the results of AI learning that up to now have been like a black box. The following introduces a case study involving the deployment of FRAP at Sony Bank Inc.

### 1) Background to chatbot planning and study

Sony Bank had been thinking about providing some kind of new service using Japan-developed AI. This idea overlapped with Fujitsu's desire to provide new value to customers on the basis of a digital business model different from its existing system integration (SI) business. It was therefore decided to conduct a proof of concept (PoC) study.

Before starting the study, we traveled to Silicon Valley in the United States together with concerned individuals from Sony Bank with the intention of applying AI technology to business. Getting a first-hand view of sites where groundbreaking technologies are developed and engaging in discussions with local engineers and developers provided a valuable opportunity to consider what kind of service could be achieved by fully applying AI technology. Furthermore, if we were to provide a chatbot in certain business areas, this visit provided us with a chance to consider whether such a

service would be the best.

2) Selection of applicable business

In view of actual usage scenarios, engaging in conversations with a robot time and time again can be stressful for a user. Above all, it contradicts the chatbot user's need envisioned by companies of "accessing desired information as quickly as possible." For this reason, it is important to narrow down the types of business applicable to the introduction of a chatbot.

3) Purpose of chatbot introduction

The value created by introducing a chatbot differs greatly in accordance with the purpose of use. That is, a chatbot may be introduced as a tool for expanding the number of users or as a tool for improving the level of service provided to existing users.

In the former case, users who may not be adept at finance including those of the digital native generation may nevertheless be familiar with the convenience of a chat service. For Sony Bank, making it easy to ask about the content and features of services like card loans and home loans should lead to an expanded number of users.

In the latter case, services with an even higher level of convenience can be provided to customers having an account with Sony Bank. For example, a chatbot can handle essential procedures from application handling to simple screening. This capability should promote the purchasing of financial products among existing users.

4) From system integration to operation

Sony Bank decided that their purpose of introducing a chatbot was to "improve the level of service for existing users." The applicable business was taken to be a support desk for handling FAQ from customers who already have a card loan contract. Although narrowing down the business area in this way requires even more expertise, this area can demonstrate the true value of a chatbot.

The FRAP chatbot service for Sony Bank was released in August 2017. As a distinctive function, FRAP includes a script editing function for creating service scenarios involving dialogue with robots combined with an automatic response mechanism. In the future, we plan to incorporate a thesaurus generation function using words in groups of synonyms and related concepts obtained as a result of machine learning. These functions are meant to satisfy the service-provider

needs of "visualizing and managing the results of AI learning." The following section describes in detail the functions included in FRAP.

## 5. FRAP functions

FRAP is divided into two main sections: chat screen operation that serves as the user interface and the bot section that serves as the chatbot engine.

The chat screen operation provides a simple screen that excludes complicated functions (Figure 1). This makes it possible to add functions tailored to the products and services of the company introducing FRAP and enables total customization including colors and design. The bot section was developed with a focus on enabling FRAP use from a variety of interfaces. The following functions are included in the bot section.

1) Script editing function

The script editing function enables the customer to construct as desired a service to be provided through a chatbot (Figure 2). It simplifies the creation and editing of a script that becomes the exchange between the chatbot and the user on a browser screen.

Assuming that personnel in the planning

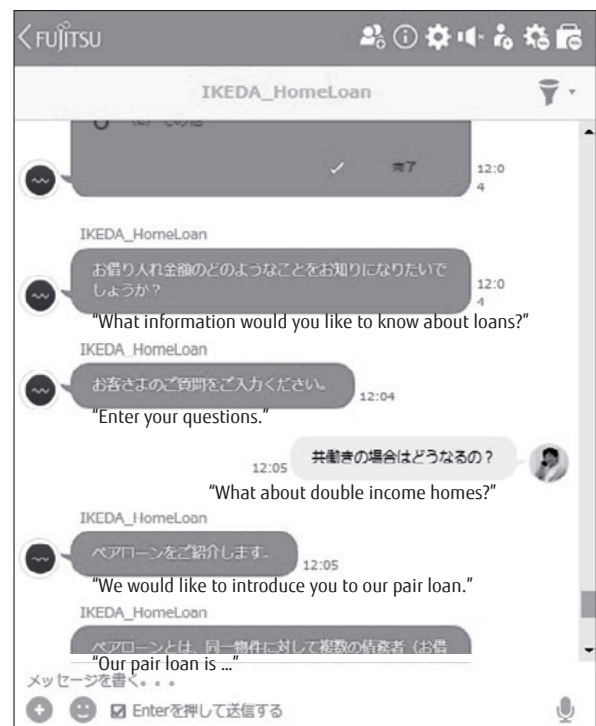


Figure 1  
FRAP chat screen.

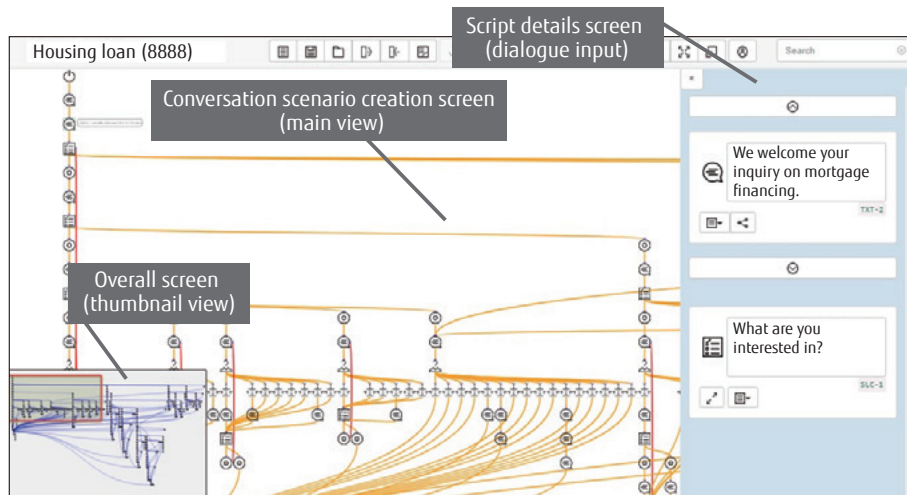


Figure 2  
Script creation screen.

department or departments in the field will also use this function, it was developed to enable users without ICT skills to create scripts by simply arranging icons on the screen with drag-and-drop operations. This changes the conventional development style in which the SI vendor programs the conversation scenario itself and negates the need for a systems engineer (SE). In short, this function enables customers to create and edit scenarios on their own and launch their chatbot services as early as possible.

This function also considers the need for service-linking scalability and incorporates a linking function using application programming interfaces (APIs) to connect with existing core systems or outside services. On specifying the destination URL, this function receives a return value in JSON or XML format that can be used within the script. Furthermore, from an operation viewpoint, it is necessary to consider the timing used to switch a prepared script. In addition to immediate switching, switching at a specified day and time may be scheduled.

## 2) Thesaurus generation function

AI is used to automatically generate a thesaurus by applying machine learning to text in existing FAQs, call center response manuals, business manuals, etc., and data in office documents (Figure 3). Texts from FAQs, inquiry manual data, and other documents are first input, and keywords such as nouns, verbs, and adjectives are extracted, as illustrated in the upper portion of Figure 3. The similarities of these keywords

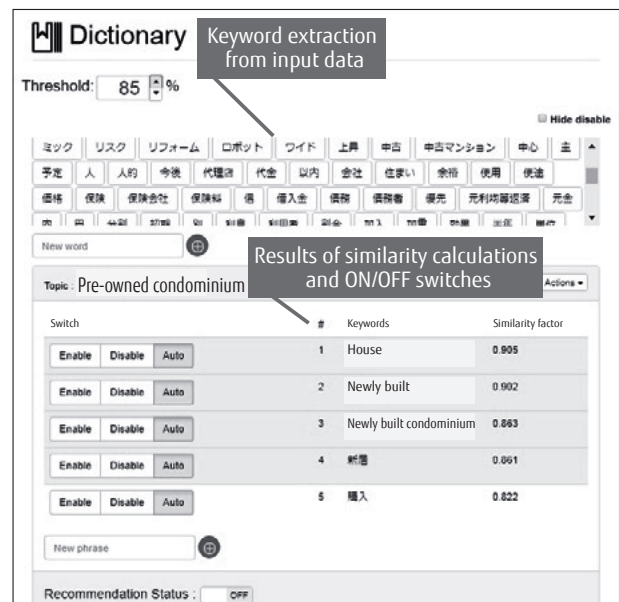


Figure 3  
Thesaurus generation function.

to other keywords are calculated as percentages. They represent the degree of association and are expressed as a similarity factor, as shown in the lower portion of Figure 3. Setting a similarity factor threshold sets a degree of allowance.

For example, in the case of a home loan, a connection can be established between the phrase “pair loan,” in which a married couple combines two loans with respect to a single property, and the phrases

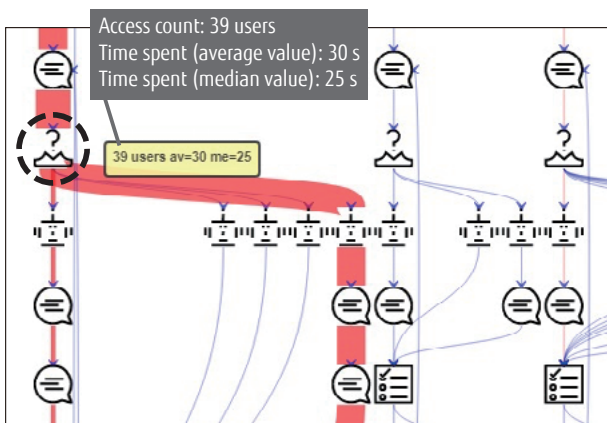


Figure 4  
User stream.

“married couple” and “double income.” In this way, instead of words being handled as simple synonyms, an awareness obtained from business know-how can be incorporated through machine learning.

This thesaurus generation function also enables the customer to switch individual phrases ON and OFF to control the automatic generation of the thesaurus and to manually register associated phrases.

### 3) User stream function

The user stream function visualizes how many chatbot users have passed through which scripts (**Figure 4**). This makes it possible to edit and improve frequently used script locations to achieve a script with more detailed responses. Visualization in this way can also uncover script locations that are never used so that scripts or expressions can be checked for suitability.

## 6. Conclusion

This paper described trends and examples of chatbot services and introduced Fujitsu’s FRAP service.

At present, Fujitsu’s chatbot service is undergoing PoC demonstrations with early users in the United States market while making inroads into the European market. By promoting co-creation activities with these early users, we seek to uncover universal application processes and education processes for the worldwide use of chatbots. We also plan to proactively incorporate feedback from early users and to provide services that enable users themselves to easily incorporate AI technologies.

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