

# Conversation Analysis Solutions for Telecom Operators

KON Yoshinori, HATTORI Masahiro, WATANABE Noriko

## Abstract

The combination of artificial intelligence (AI) and big data promises to add tremendous value to the telecommunications business. One particularly valuable source of data is contact centers, which collect a massive amount of direct comments from customers. Effective utilization of this data is key to improving customer service and delivering new solutions and products that will appeal to customers. To better facilitate analysis and exploitation of this data, NEC has developed and deployed conversation analysis solutions that use a combination of our own voice recognition and text analysis technology to support fast, effective quick decision-making. This paper introduces our conversation analysis solutions and provides a detailed example of how it can be applied in real-world conditions.



contact center, conversation analysis, voice recognition, big data, visualization/analysis, AI, text analysis

## 1. Introduction

Today, the sheer volume and complexity of the data companies collect has reached a point where conventional big data analytics are no longer able to provide the level of specific detail needed to understand what customers truly want and need. To stay competitive as data growth continues to skyrocket, telecom companies - especially marketing and quality control divisions - need more powerful and more sophisticated tools to sift through all the data and uncover meaning. The solution is artificial intelligence (AI). One type of data where AI's speed and analytic power can prove especially valuable is customer comment data - such as recorded conversations and phone calls\* collected in contact centers and call centers, as well as comments collected from face-to-face meetings and websites. AI provides companies with the ability to rapidly assimilate, analyze, and reflect or respond to customer comments, requests, and suggestions.

Every day telecom companies receive thousands of comments from their customers. This massive amount

of data is recorded and stored for analysis, but the scale of the task - re-listening to all those conversations, analyzing their meaning, and classifying and categorizing them accordingly - has become far too massive to handle by conventional means.

In response, NEC has developed and is now deploying intelligent conversation analysis solutions that, in addition to voice recognition technology, incorporates the recognizing textual entailment (RTE) technology and emotion recognition technology.

This paper gives an overview of our conversation analysis solution and shows in detail how this technology would be applied and used in a telecom operation.

## 2. Overview and Features

### 2.1 Overview

Our conversation analysis solution is an expanded version of our customer voice data analysis solution featuring the addition of voice recognition technolo-

\* Collected and compiled for practical utilization with prior consent from the customer, as well as according to laws and regulations

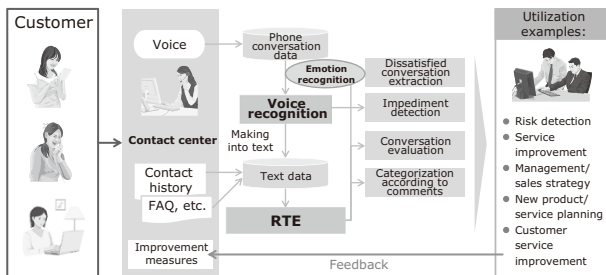


Fig. 1 Schematic diagram of the solutions.

gy and emotion recognition technology (Fig. 1). This new conversation analysis solution makes it possible to automatically classify text data generated from phone conversations according to the type and meaning of the content.

This facilitates quantitative aggregation of customer comments and adds an intelligence layer that can tackle complex analytical tasks and perform them much faster than previously. This, in turn, allows management to quickly see where customer and product services need to be improved, to highlight any management issues that need to be dealt with, and to make decisions quickly and confidently.

This technology can even make it possible to help improve the conduct of customer service representatives by detecting customer dissatisfaction in recorded conversations, enabling personnel to learn how to better deal with customers, thereby improving customer satisfaction.

### 2.2 Features

The features of our conversation analysis solution are described below.

#### (1) Visualization and evaluation of customer voices

Thanks to our noise-resistant, speaker-independent, and colloquial-sensitive voice recognition technology we have gained through years of R&D activities, voice data in call centers is converted into text and phone call data is visualized (Fig. 2). Moreover, our emotion recognition technology analyzes loudness, pitch, and tone of voice to automatically detect the degree of anger displayed by the customer and the effectiveness and sincerity of the service representative's apology.

Using this feature, conversations can now be analyzed and scored. The results can then be used for training purposes, improving the skills of the firm's customer service representatives and enhancing the company's brand image (Fig. 3).

#### (2) Analysis of conversations (recognized results)

By combining RTE-based clustering technology - that applies RTE technology with voice recognition technology and emotion recognition technology (Fig. 4), we have developed a solution that can automatically sort through and classify a massive collection of customer comments (both voice data and text data) according to meaning. This facilitates quantitative aggregation of customer comments - a task that humans alone would find extremely difficult and time-consuming. In addition, comments



Fig. 2 Sample display for conversion of voice-to-text conversion.

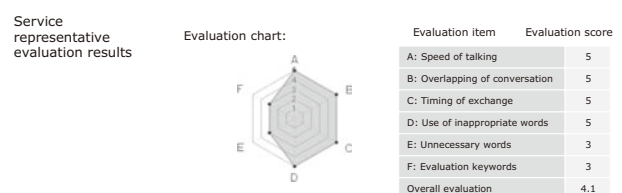


Fig. 3 Evaluation example of phone call content.

**World's No. 1**

**RTE**

Assesses separate texts and determines whether or not they have the same meaning. Operates with the world's highest level of precision.

Won first prize in the US NIST contest.  
 > Has obtained one patent in Japan and the United States.

**World's No. 1**

**High speed**

24,000 times faster than conventional systems, while maintaining the world's highest level of precision.

Applicable to big data.  
 > One patent pending in Japan and the United States.

**World's 1st**

**Classification**

Analyzes entailment relationships between all texts and creates a classification method that uses a compact text to represent sets of text containing the same meaning.

> Two patents pending in Japan and the United States.

The world's first RTE-based clustering technology capable of real-time text classification based on inclusion of content with the same meaning.

Fig. 4 Overview of RTE-based clustering technology.

that express a high degree of dissatisfaction can be extracted automatically - something that is hard to do with text alone.

Thanks to this technology, requests for improvement of products and services, as well as complaints, can be quickly brought to management's attention, expediting decision-making, and ensuring that the company is able to rapidly respond to customer needs and reflect customer desires.

### 3. Case Study: Application to a Telecom Operator

#### (1) Analysis of reasons for contract cancellation

This is intended to ensure that action can be taken whenever critical changes occur, while searching for trends in reasons for customer contract cancellations.

The goal is to reduce the number of processes that human workers are required to go through when investigating the reasons for cancellations by applying the conversation analysis solution to trend analysis.

The conversation analysis solution uses the following methods to analyze trends:

- 1) Cancellation reasons are extracted from phone call texts.
- 2) Numbers of calls are classified according to cancellation reasons.
- 3) Information is periodically extracted and classified; the results are output.

Thanks to NEC's conversation analysis solution, it is now possible to automatically classify a portion of the cancellation reason analysis operation conventionally performed by human workers. This significantly reduces the number of processes involved. For example, previously if a customer service representative forgot to write down the reason for cancellation, it would have been necessary for someone to listen to the recorded conversation in order to determine the reason. Now, with NEC's new system, all that's necessary to do is check the relevant part of the conversation because the reason for the cancellation has already been extracted with the function described in 1) above. This reduces the time needed to check conversations to one-fifth on average.

#### (2) Assessing the type of inquiry

This function is designed to facilitate faster customer responses. It immediately detects frequently asked questions and inquiries that are likely to become more frequent, passing them on to representatives already prepared to handle such inquiries.

This enables customer service representatives to deal with customers more efficiently.

The conversation analysis solution uses the following methods to analyze the nature of the inquiry:

- 1) Information regarding problem is extracted from phone call text data.
- 2) RTE-based clustering is performed.
- 3) The results and the number of matching inquiries are displayed.

Since the conversation analysis solution helps achieve automatic compilation of keywords based on the results of voice recognition, it successfully reduces the number of processes required for advance preparation compared to ordinary text analysis. Also because automatic classification and problem detection is performed on voice data without human intervention, it is possible to determine what the problem is and how common it is much more quickly than through human analysis of call histories.

Building on the success of the conversation analysis solutions we have already deployed, we are now working to expand introduction of these systems to telecom companies who have not yet taken advantage of them. We are also looking at the possibility of deploying these solutions in non-telecom related applications as we are confident that will bring value to any company facing issues similar to those we have discussed in this paper.

### 4. Conclusion

In this paper, we have provided an overview of the technology deployed in our conversation analysis solutions and given detailed examples of how the technology could be used and what it would achieve in the field of telecommunications.

Currently, we are validating the customer call data analysis in cooperation with telecom operators. A key to adding value is to integrate our knowledge and understanding of contact center voice data with the company's existing system.

As NEC's conversation analysis solutions feature a combination of AI technologies, including RTE technology and voice recognition technology, they can be applied anywhere where massive amounts of customer voice and text data are collected. Using the conversation analysis solutions as an axis, NEC is planning to also utilize them in brick-and-mortar stores and other similar establishments.

## Authors' Profiles

### **KON Yoshinori**

Assistant Manager  
Common Carrier Solutions Division

### **HATTORI Masahiro**

Manager  
Smart Networks Division

### **WATANABE Noriko**

Expert  
Smart Networks Division

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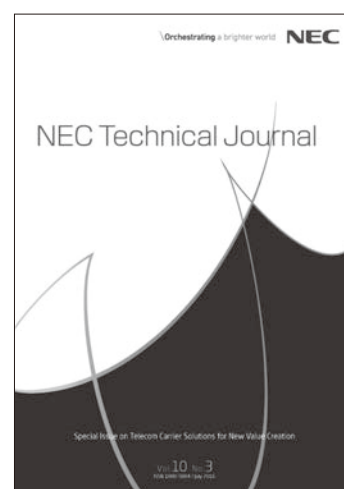
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