

# VoiceGraphy, Solution Supporting the Preparation of Minutes for Meetings Using Speech Recognition Technology, and Its UI Design

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## Abstract

VoiceGraphy is a solution using a speech recognition technology to support the preparation of the minutes of meetings. It solves various issues in preparing the minutes of assembly meetings and conferences by shortening the schedules before their distribution (disclosing) through the use of advanced speech recognition technologies and a unique editing tool that pursues efficient preparation of the minutes. It also reduces the workload and cost of preparing minutes and speeds up the creation of minutes for entire meetings based on summaries of the minutes. This paper introduces our approach to the development of an editing tool that pursues user-centered services by optimally using the appropriate speech recognition technologies.

## Keywords

assembly meeting, conference, board meeting, shareholder meeting  
meeting minutes preparation, speech recognition, efficiency, usability, real time, speedy information sharing

## 1. Introduction

Information sharing for speedy decision making in business administration and information disclosure aimed at promoting public trust for companies are both solutions that are essential in the business administration procedures of recent years. Information is thereby tending to be digitalized more and more in order to become more open and to be shared both inside and outside of companies.

Even under such trends, most minutes of various important meetings settings, such as board meetings and conferences, are still manually transcribed. It takes quite some time to manually complete transcription so that the distribution and sharing of the minutes of meetings in a timely manner becomes a very difficult process.

The VoiceGraphy solution introduced in this paper has been based on a first-class industry based speech recognition technology developed by NEC that automatically converts the voices of attendees at a meeting into text data. However, misrecognition may still occur with such a speech recognition system. This is one of the reasons that speech recognition products have not hitherto been adopted widely in the market. We have therefore developed an editing tool for VoiceGraphy that achieves improved user-centered operability. We

have also adopted a usability evaluation test to assess completion rates in the preparation of the minutes of entire meetings that also performs correction work for misrecognitions. VoiceGraphy incorporates advanced speech recognition technologies and user-centered editing tools for supporting users in reducing their workloads in the preparation of minutes.

## 2. Service Outline and Features

The concept of VoiceGraphy is “speedy support for the preparation of minutes of meetings.” VoiceGraphy, is a solution supporting preparation of minutes that solves “time consuming” and “labor consuming” issues in preparing the minutes of meetings. It does this by combining an advanced speech recognition technology with an editing tool, a procedure that thoroughly supports the efficient editing of work.

- **Advanced speech recognition technology**

State-of-the-art technology is employed to improve the voice recognition precision by mounting a real time “auto learning function” that automatically learns voice characteristics with discerning confusing similar sounding words used in a meeting.

- **Pursuing efficiency in the editing of workloads**

Integration of the audio and editing functions (linkage

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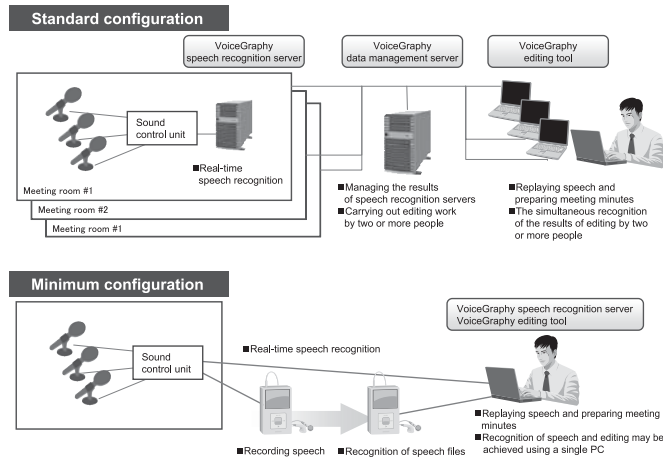


Fig. 1 VoiceGraphy system configuration.

between an audio replay section and an editing/correction section) enables improved manuscript preparation speed. Similarly, editing workload time can be reduced by between 30 to 50% due to speech recognition results by VoiceGraphy. Quick and easy preparation of the minutes of meetings thus becomes possible and will increase efficiencies not only over the entire transcription work but also in the business administration sector ( Fig. 1 ).

Preparing the minutes of meetings generally takes six times as long as the actual meeting time. Also, a great amount of paper is consumed by the printing out of repetitive proofreading work before completing the minutes. VoiceGraphy achieves the efficient preparation of the minutes of meetings and of editing with significant reductions of both workload time and printing costs. It also contributes to supporting the preservation of a satisfactory earth environment.

### 3. Approach to Improved Usability

#### 3.1 Dissemination Issues of Speech Recognition Products

The possibility of misrecognition always exists in a speech recognition system because of not only technological matters but also due to the speaker's speech style or to the peculiarities of the system using environment, etc. Such misrecognition issues have so far prevented market dissemination of speech recognition products. VoiceGraphy has improved the precision of speech recognition and provided functions that easily correct recognition errors as they occur and has there-

by enhanced the effectiveness of the product in the market.

#### 3.2 Results of Usability Evaluation

The following usability evaluation tests are provided with the editing tool packaged with VoiceGraphy in order to clarify any unresolved issues.

##### 1) Usability evaluation tests conducted among lay participants

This test was carried out by four participants who had no previous experience of VoiceGraphy. These participants were also asked not to read about VoiceGraphy before taking the test. The test was carried out by isolating the examinees in the test room. Observers attended in order to observe the examinees from behind screens.

##### 2) Heuristic evaluation by optimally using specialist experience

The heuristic evaluation was carried out by staff of NEC Software Hokkaido who had undertaken lengthy studies in the appropriate laboratories of universities.

One of the issues revealed in the usability tests indicated that participants could not imagine the function from the design of the operation button and they often have to look up the operation manual before operating the functions. Also, the heuristic evaluation revealed the issue of operator eye tiredness. Operation buttons that are often used are located at the top of the GUI screen. However, the speech data editing field is located at the lower section of the GUI screen so that the operators' eyes are moved from the top to the bottom sections on the GUI screen. Such movements may cause eye tiredness of the operators. Including the above a total of 79 relevant issues have been noted during the usability testing.

#### 3.3 UI (User Interface) Improvements

After analyzing these issues, improvements in the UI performance have been undertaken according to the order of their priorities. Two major improvements have been achieved as follows.

##### 1) A significant improvement in the UI layout

Before the improvement of the UI layout was undertaken the functions for start and stop were located on the same button; so that operators could not intuitively recognize the function of the button. With the present modification, separate buttons are prepared for the start and stop functions and designs enabling operators to intuitively recognize the functions are employed for these buttons. Moreover, the opera-

tion buttons are moved from the top section to the bottom section on the GUI screen ( Fig. 2 and Fig. 3 ). This change has reduced the operator workload and has increased the work efficiency when repetitive key operations are performed.

**2) Improvements in the consistency of terminologies**

Sometimes there are more than two terms that exist for a single concept. In some cases the terms used in a meeting are

too specialized and only professional engineers can understand them. VoiceGraphy consistently modifies such terminologies into general terms so that even ordinary users who are not familiar with special terminologies can operate the software with less confusion, resulting thus in fewer errors. The development of consistent terminology might sound a small modification as a system improvement; however, its effectiveness as a result of this modification may offer a significant upgrade to users. It is a great improvement for users if they can operate key functions in an intuitive manner rather than have to look up an operation manual in order to understand the key functions. In this way their work efficiency as well as the scale of the psychological burden will be influenced optimally.

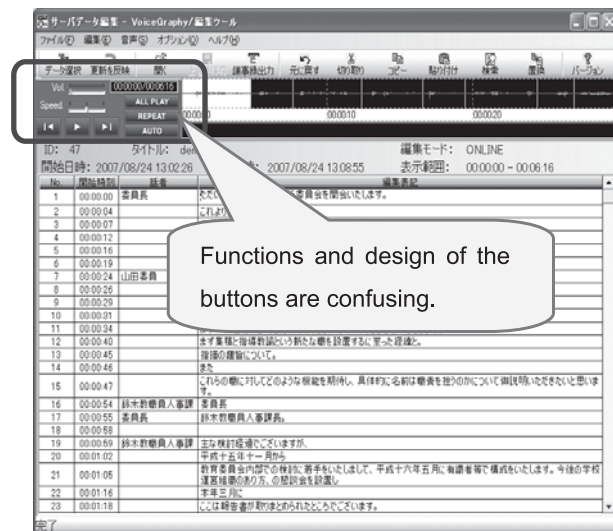


Fig. 2 Before providing improvements for the UI.

**3.4 Effectiveness**

When comparing the conventional model and the improved model after the usability evaluation test, the total number of issues marked in the test have been reduced from 79 to 17, and the number of issues marked to the “Degree of importance Z” and “A” decreased from 15 to 4 ( Fig. 4 ). This means that significant improvements in usability have been achieved.

Moreover, the VoiceGraphy editing tool has been widely praised by users. Some users have enhanced the efficacy of the editing tool and have thereby improved their work efficiency; even in environments where satisfactory speech recognition precision might not be expected.

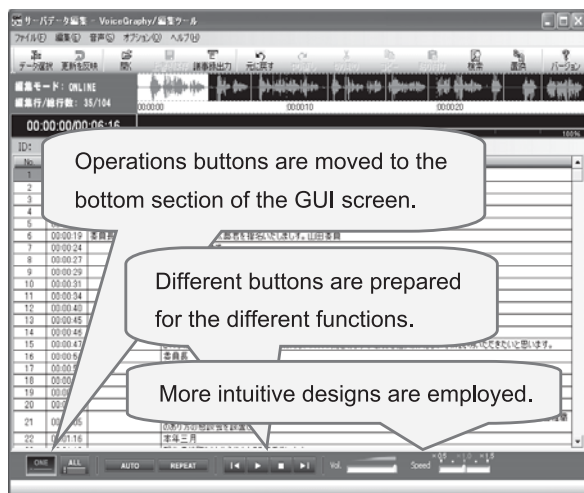


Fig. 3 After providing improvements for the UI.

VoiceGraphy Usability evaluation	Evaluation results
<b>[Without considering usability]</b>	
[Z] Over 60% of users are expected not to complete their editing work.	Degree of importance [Z]: 10
[A] Critical mistakes may occur.	Degree of importance [A]: 5
[B] Some operational inconveniences still remain even after getting used to the software.	Degree of importance [B]: 27
[C] Possible to use but usability improvements are anticipated.	Degree of importance [C]: 37
<b>Total: 79</b>	
<b>[When considering usability]</b>	
decreased from 79 to 17.	Degree of importance [Z]: 1
The numbers who checked [Z and A] decreased from 15 to 4.	Degree of importance [A]: 3
↓	Degree of importance [B]: 2
<u>Usability has certainly improved.</u>	Degree of importance [C]: 11
<b>Total: 17</b>	

Fig. 4 Usability evaluation results.

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### 4. Applications for Persons with Impaired Hearing

One of the applications of VoiceGraphy besides preparing the minutes of meetings is a hearing aid solution that enables persons with impaired hearing to attend meetings. When such a person attends a meeting, it is sometimes a great burden both to the hearing impaired person and to the staff of the company that have arranged the meeting. The company has to support the hearing impaired person by arranging for staff such as sign language interpreters or real-time transcribers. Moreover, such a person may feel inhibited by the attendance of such staff. Such a situation may pose a hindrance to the smooth progress of a meeting. Especially, in a meeting regarding a specialized industry, it is required to arrange sign language interpreters with knowledge of specialized terms, but it is sometimes difficult to arrange such staff. What is more, if sign language interpreters are arranged for a meeting, it is necessary to prepare detailed documents of the proposed meeting and send them to the sign language interpreters in advance of the meeting being held. Therefore, it is almost impossible to arrange sign language interpreters for a meeting that is held at short notice or irregularly.

VoiceGraphy recognizes and displays the speech used at meetings in real time, so that a hearing impaired person can view the speech texts displayed on the GUI screen and is able thereby to understand the context of the meeting in real time. Misrecognition may also still occur with VoiceGraphy. However, as long as the subject, content and purpose of the meeting are disclosed to a hearing impaired person before the meeting, the contents of the meeting can be conveyed satisfactorily. Thus, VoiceGraphy is employed usefully for such people. In general, a hearing impaired person will understand the contents of the meeting by reading the texts transcribed and displayed by the VoiceGraphy's speech recognition function. A hearing impaired person need only ask the support staff to write down a part that he/she feels is necessary for clarification. Thus, VoiceGraphy will decrease the burden for both the hearing impaired person and the support staff.

When a speech recognition system is announced in the market, any negative aspects of the system are generally focused. The advantages of the system such as displaying speech texts in real time, etc. are not stressed. It is difficult to manually transcribe speech in real time and several minutes are the limits for which humans can effectively continue transcribing. Machines or VoiceGraphy do not get tired, so they can continue to transcribe for limitless hours and to display their

recognized results. When work may be assigned to be undertaken by machines, human staff resources may be allocated to work for which more creative and profitable abilities are required.

### 5. Approach to Usability by NEC Software Hokkaido

NEC Software Hokkaido, Ltd. set its products quality vision to achieve customer satisfaction by improving its production processes to provide high quality and reliable software and service applications. One of our product quality goals is "providing advanced software applications for users that are superior in usability and friendliness." VoiceGraphy is one of our representative products that are aimed at achieving this goal.

Our approach to promoting usability activities over the entire NEC Group contains (1) understanding user needs (enlightenment activities), (2) holding training opportunities (educational activities) and (3) implementation of various projects (evaluation activities). Through such activities, we intend to establish permanent activities for the better usability of each department.

Vision (1), understanding user needs (enlightenment activities), includes an introductory lecture of usability. 409 members of staff of the NEC Software Hokkaido, Ltd. (55% of the entire staff and 75% of the staff of the software development departments) have attended this lecture. Vision (2), holding training opportunities (educational activities), includes practical training in usability. This training course is presented in three classes: a specifications requirements definition class, a UI design class and an evaluation class. A total of 215 staff members have attended these classes. Vision (3), implementation of various projects (evaluation activities), includes the execution of evaluations. With regard to the evaluation testing of VoiceGraphy, we have received good reports from our customers such as praise for the ease of use, etc.

We will continue to promote our activities in each department in order to improve product usability by providing educational opportunities for all our staff from beginners to engineers, and also by accumulating the practical experience gained from our various projects.

### 6. Conclusion

This paper outlines our VoiceGraphy product, which is a preparation support solution for producing minutes of meet-

ings using speech recognition technology. It also introduces our approach to the development of advanced usability content and a packaged editing tool.

We expect that an increased market demand for speech recognition technology solutions is imminent. VoiceGraphy can therefore be a product to meet such demands by functioning as an operations tool as well as a business management tool. We intend to continue to develop advanced speech recognition technologies, and we will also pursue the maximum applications of VoiceGraphy while listening to customer needs and by understanding and defining their system environments.

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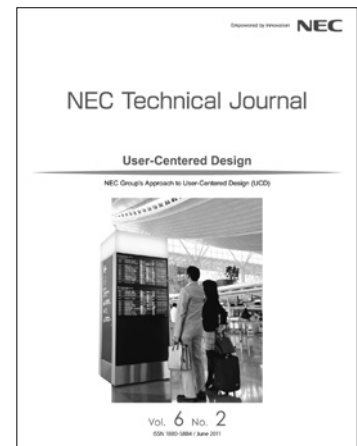
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July, 2011

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