# AI for Work Shift Support — Accelerating the Transition to Human-Centered Business Value Creation

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## Abstract

In today's digital world where globalization and rapidly evolving technology have created a tumultuous and unpredictable business environment, many enterprises are struggling to keep their footing in the face of upstart competitors, shifting industry boundaries, and shrinking talent pools. Under such conditions, workforce management can no longer be taken for granted. Hiring, firing, scheduling, performance assessments, and day-to-day operations need to be optimized to ensure that enterprises function at their best and that their employees are happy and productive. In Japan, a tightening labor market makes the situation particularly acute. Finding and keeping the right talent for the right positions is a growing challenge and companies must compete with one another to attract the best employees. This makes it imperative that businesses provide environments and systems that will allow staff to concentrate on creating new value and generating new business opportunities. At NEC, we have developed a new solution that exploits the astonishing advances in AI technology to take over many of the daily routine tasks and labor-intensive operations. In consequence, white-collar workers are called upon to perform, leaving them free to focus on decision-making and new value creation. In this paper, we will examine this technology in detail and highlight several test cases that demonstrate its effectiveness.

Keywords

virtual assistant, employee assistant, human analytics

## 1. Introduction

In today's business environment, nothing is certain. Disruptive technologies abound, upstart businesses appear out of nowhere, and boundaries between industries dissolve as digitization breaks down traditional categories and exposes local companies to global competition. This fiercely competitive new world puts human resources at a premium just as the talent pool is shrinking. To make the most of their workforce and maximize productivity, enterprises are increasingly turning to automation and AI to support a working environment that allows precious human resources to focus on the creation of new values and new business opportunities.

In the consumer field, increasingly sophisticated and individually targeted services are being offered that rely on recommendation algorithms, smart speakers that capture user interactions, and purchase histories in digital space. In the business field, employees find themselves facing an ever more complex and challenging environment where they must be able to determine which system is to be used in a particular situation and — given the siloed and complicated structure of modern business systems — how to use it in the first place. Although the efficiency of routine tasks is steadily being improved thanks to tools like robotic process automation (RPA), human workers must still execute non-routine tasks which require judgment and insight. Moreover, finding the right person for the job — in-house co-creation activity, for example — can be a time-consuming proposition.

To address these issues, NEC has developed the AI for Work Shift Support solution. Maintaining a company's human resource data (specialties, business experience, expertise, etc.), and presenting management with an accurate visualization, AI for Work Shift Support goes beyond mere automation of routine tasks. It also helps improve the efficiency of non-routine tasks with chatbots and other software that can enhance and support human judgment. Verification of this system is now underway in a number of test cases. In this paper, we will explain the basic concept of the system, describe its functions, and discuss verification cases.

## 2. What Is the AI for Work Shift Support Solution?

### 2.1 Concept

The AI for Work Shift Support solution takes an employee-centered approach focused on increasing employee engagement and enhancing business value by breaking down time spent at work into two main categories: "value creation" — something that solves customers' issues and creates value, and "task" — something that does not create value but is definitely necessary. Once the work has been broken down into these categories, AI takes care of the activities ("tasks") required for decision making, while humans focus on business value creation ("value creation") (**Fig. 1**).

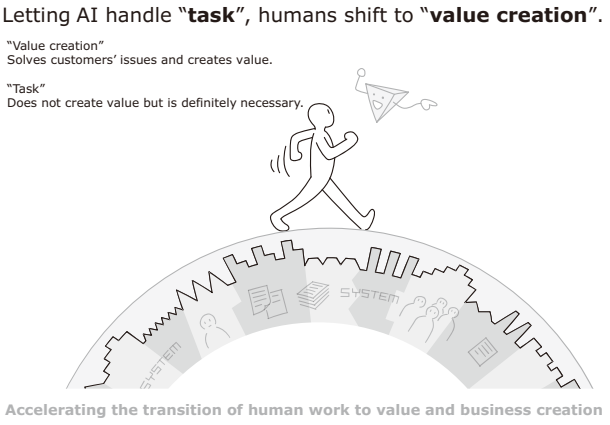


Fig. 1 Concept of the AI for Work Shift Support solution.

### 2.2 Issues the solution focuses on

The AI for Work Shift Support solution focuses on the two main types of issues that crop up in the day to day work of white-collar workers.

**(1) Issues that commonly occur when an in-house system is used**

- In-house IT environment is so complex that it is almost impossible to understand how to use it.
- Details of each business activity need to be entered in every system.
- Employees need to have some understanding of the processing methods used by the system.

->Many "tasks" are generated by the in-house IT environment.

**(2) Issues related to finding key people and knowledge**

- Finding the right person to facilitate internal collaboration can take time or may even be impossible.
- Similar operations are done at other divisions. Employees in different departments don't know each other.
- Knowledge is individual-dependent and susceptible to deterioration due to retirement and relocation.
- Even when a "Know-Who" database is set up, it is often not properly maintained.

->It takes too much time until co-creation is launched.

To solve these issues, we have developed AI that performs "tasks" on a substitution basis and AI that accelerates co-creation.

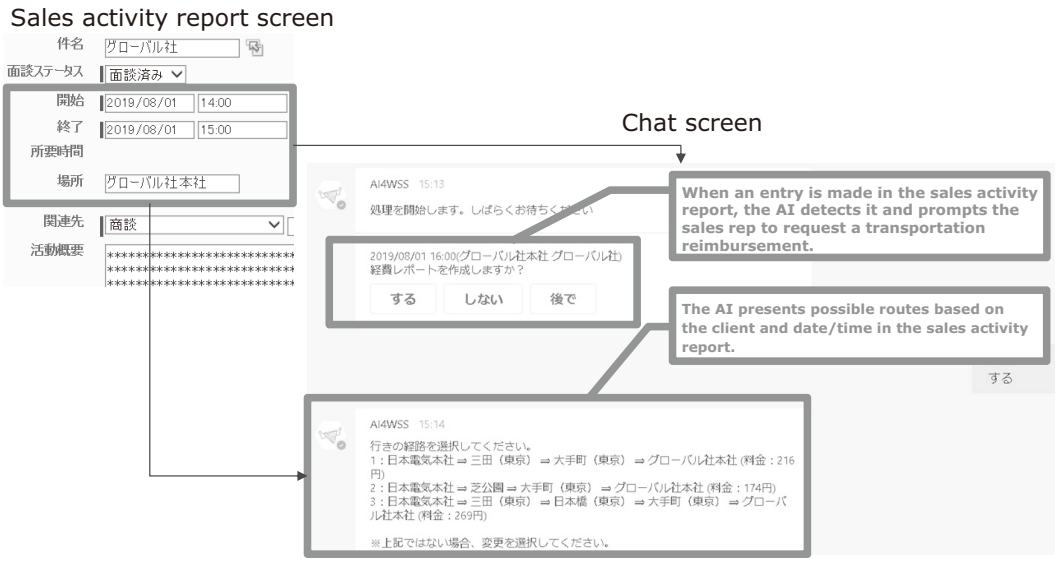


Fig. 2 Presentation of transportation routes by accessing data from sales activity reports and other systems.

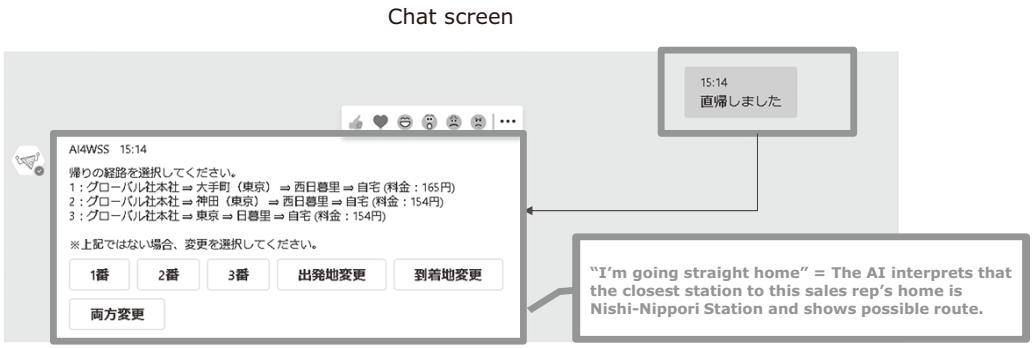


Fig. 3 Confirmation based on the personalized information.

### 2.3 Functions

**(1) AI "task" substitution**

This AI addresses the issue of too many "tasks" being generated by the in-house IT environment. Serving as a hub that connects complicated intra-company systems, it substitutes for other systems based upon the data registered in specific systems while prompting employees to take action via chatting. Below are a few possible scenarios where it can be useful.

1) When a sales rep makes an entry in a sales activity report after visiting a client, the AI prompts them to reimburse transportation expenses (**Fig. 2**).
2) The origin, destination, and closest stations are automatically retrieved from the records of past exchanges, as well as sales activity reports and schedulers. The AI prompts the sales rep to check if the route is correct (Fig. 2).
3) Because the AI understands what "going straight home" means, that entry is replaced with, for example, the Nishi-Nippori Station, which is the closest station to this employee's home. Then the AI shows the route (**Fig. 3**).
4) Finally, when the employee confirms the reimbursement, the AI launches a separate system and performs the transportation expense reimbursement process. When the procedure is finished, the AI notifies the employee.

The AI performs the transportation expense reimbursement based on data accessed from other systems. All the employee has to do is press the "Yes" button as required.

**(2) AI that accelerates co-creation**

Finding the right person for a co-creation project can be time-consuming and difficult. AI speeds up the process by sorting through employee data to find the employees best suited in terms of experience, specialty, and compatibility. As and when required, it can accurately propose potential candidate employees. In this example, the AI immediately proposes candidates for key person in response to the question, "Let me know who is well versed in sweet potato power generation" (**Fig. 4**).

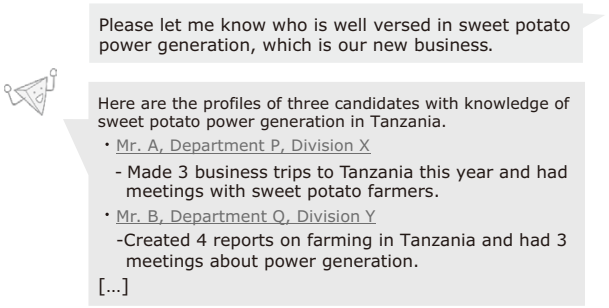


Fig. 4 Key person proposal example by AI.

### 2.4 System configuration and adopted technology

**(1) AI "task" substitution**

This solution is mainly composed of the following five modules (**Fig. 5**).

- **Chat module:** Users enter questions with a smartphone or PC and receive responses from the AI.
- **Chat content comprehension/business activity identification module:** The AI uses morphological analysis and textual entailment recognition to understand the content entered by the user such as transportation expense reimbursement or reservation for a meeting room. Morphological analysis divides the entered text into words and information such as surface case, original form, and part of speech. Textual entailment recognition judges whether the meaning of one text fragment can be inferred from the other.

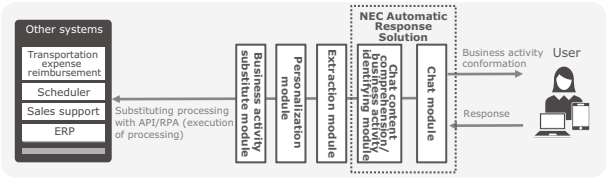


Fig. 5 System configuration
(AI business activity substitution).

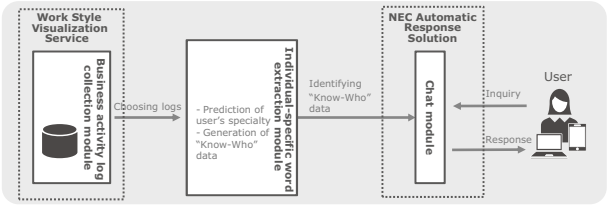


Fig. 6 System configuration
(AI that accelerates co-creation).

- **Extraction module:** Performs morphological analysis and textual entailment recognition on the user's response and extracts their entries from other systems.
- **Personalization module:** Stores the answer entry obtained in the extraction module as individual setting values for the user.
- **Business activity substitute module:** Converts the answer entry into arguments and then into scripts to execute the corresponding business activities.

NEC's Automatic Response Solution chatbot is used in the chat module, chat content comprehension/ business activity identifying module, and extraction module. A customized program is developed each time for the personalization module. An application programming interface (API) or robotic process automation (RPA) is used in the business activity substitution module.

**(2) AI that accelerates co-creation**

This solution is composed of the following three modules (**Fig. 6**).

- **Business activity log collection module:** Automatically logs when humans perform business activities and stores data with the time and user IDs.
- **Individual-specific word extraction module:** Extracts words strongly related to the individual characteristics of each user (individual-specific words) together with their relationship scores based on the business activity logs.
- **Chat module:** Users enter questions with a smartphone and PC and receive responses from the solution.

PC operation logs and scheduler data from NEC's telework solution, the Work Style Visualization Service, is used in the business activity log collection module. MeCab, an open-source morphological analysis engine, is used in the individual-specific word extraction module, while a customized program is developed on-the-fly to calculate individual specificities for that module. The chat module uses chatbots.

### 2.5 Features

**(1) AI "task" substitution**

This AI works in conjunction with other systems while converting ambiguous, atypical natural language (text, voice, etc.) input through the chat and smart speaker into input parameters for business activity content and systems according to user requirements. In so doing, it reduces pressure on the user as there is no longer any need for them to know which processing method needs to be used or to register the same content in multiple systems.

**(2) AI that accelerates co-creation**

This AI automatically quantifies and maintains the relationship between the person searching on the in-house "Know-Who" database and the keywords they are using. While many systems of this type exist, they typically require employees themselves or the administrator to enter the profile information. Our solution creates profiles on its own by performing language analysis on operation logs and collecting and analyzing the relationship between keywords and the individual employee. This ensures that the profile data is always up to the minute and lowers maintenance costs, as well.

## 3. In-House Verification

We verified this solution with the participation of NEC's employees. The methods we used and the results obtained are discussed below.

### 3.1 Verification of the effectiveness of AI "task" substitution

Case:

Based on data entered in the schedulers, the AI notifies employees via chat to claim reimbursement for transportation expenses and executes the necessary processing on the transportation expense reimbursement system based on the employee's confirmation.

Verification targets and details:

- We measured the operation time of the system and compared it with conventional operation time (30 people selected from 3 divisions).
- We conducted a questionnaire regarding the required time to reimburse transportation expenses before this solution was introduced (281 people from 3 divisions).

Results:

- Transportation expense reimbursement time was reduced to 1/3 that of the previous method (324 -> 108 sec.)
- Transportation expense reimbursement was made 2.5 times per month on average according to this questionnaire.
- A separately conducted questionnaire informed us that it took employees 63 minutes on average to understand how to use this system (excluding inquiry time at the help desk if there was one).

Based on this, we found that the total annual time reduced per employee was 3 hours.

Calculation formula:

{(324 − 108)/60/60 hours × 2.5 times × 12 months} + 63 minutes ≈ 3 hours

### 3.2 Verification of the effectiveness of the AI that accelerates co-creation

**(1) Verification of time savings when searching for a key person**

Verification targets and details:

- We conducted a questionnaire regarding the number of times the employees spent searching for a key person using the conventional method and how long it took (281 people from 3 divisions).

Results:

- The average number of times employees searched for a key person was 5.4 every 3 months.
- The average time until they found a key person or gave up was 39.3 minutes.

Based on this, we found that employees spent an average of 14 hours/year searching for a key person. Since this solution identifies a key person immediately, we found that effective time savings per person was 14 hours/year.

Calculation formula:

5.4 cases/3 months × 4 × 39. minutes = 855.36 minuets ≈ 14 hours

Table 1 Data used in the verification

| Data type | Log | Schedule |
|---|---|---|
| Period | November 3, 2017 to January 31, 2018 | December 1, 2017 to January 31, 2018 |
| Number (people) | 392 | 361 |
| Number of records (cases) | 1,249,153 | 33,807 |

Table 2 Relevance factors

| Word | Relevance factor | Word | Relevance factor |
|---|---|---|---|
| Work style | 80% | Telework | 90% |
| Company A | 90% | Verification test | 90% |
| Company B | 100% | "Xxx xxx" meeting | 20% |
| Face recognition | 100% | Event "Xxx" | 80% |

**(2) Verification of whether the appropriate key person was found or not**

Verification details and data:

- We calculated the ratio of matching the key person to specific words (**Table 1**).

Results:

- High relevance factors* (**Table 2**) were achieved. We confirmed that this solution could be utilized by converting the in-house data (PC operation logs, scheduler data, etc.) into data (key person data) needed by the employees on a daily basis.
- The reason the relevance factor of "'Xxx xxx' meeting" was low is that people irrelevant to this meeting were also selected because "Xxx xxx" was a combination of common nouns.

## 4. Potential Applications for this Solution

### 4.1 AI "task" substitution

In addition to the verified cases discussed above, this solution can be expected to impact a wide range of applications.

- At-a-glance access to data on the attendance and absence of employees based on entrance/exit information and daily reports, confirmation of data via chat, and automatic entry of data in the attendance/absence system
- At-a-glance access to task status reports based

* Calculated by extracting 10 employees ranked at the top in the degree of involvement with specific words to judge if they are the key people and using the formula: "Number of key people among the extracted 10 employees ÷ Number of extracted people."

on data from schedulers, etc., confirmation of data via chat, and automatic entry of data in the process input management system
- Coordination and scheduling of meetings via chat using information like sales activity reports
- Confirmation of assurance for inventory for required products via chat using the information like sales activity reports and places provisional orders

### 4.2 AI that accelerates co-creation

Employee profile data such as specialties, expertise, and so on can be applied in the following situations.

- When the management is considering launching or reviewing systems or operations, this AI can optimize setup while eliminating redundancy and shortage of skills.
- Displaying profiles of each employee can help just-relocated employee determine which employees can provide support or possible friendship.

## 5. Conclusion

NEC's AI for Work Shift Support solution provides businesses with an effective means to transform their workplace into one that is more efficient, more productive, and more creative. In-house verification studies have demonstrated that this system can dramatically reduce the time employees spend sorting, entering, and manipulating data across a broad range of daily tasks.

As demand for skilled, flexible human resources increase, forward-looking enterprises are expected to build a smart, human-friendly environment in order to free up employees to focus on activities that create new values and new business opportunities. By leveraging the AI technologies to manage and streamline the huge amounts of buried data that companies collect, NEC is committed to leading the way in planning and developing solutions that will provide enterprises with the tools they need to succeed and grow in today's evolving business environment.

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