Position of Japan Regarding Changes in Work Environment Following Introduction of AI Technology in Workplace: International Comparison Focusing on Reponses by Corporate Organizations

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This study aims to identify the position of Japanese cases in the cases of eight countries that are members of the OECD and clarify the similarities and differences in terms of changes in the work environment after the introduction of AI technology, and to explore what determines changes in the work environment, with a focus on how corporate organizations respond to the new technology. The study reconstructed cases in each country regarding changes in the work environment based on the data obtained in the joint research with the OECD. The results showed both improvements and deteriorations in those OECD countries in terms of work environment changes after AI implementation. In Japan, there were many improvements that were common to the counterparts, whereas almost no deteriorations were observed, which is a characteristic that differentiates Japan from others. The results also showed that such changes are associated with task reorganization, workload, work demands, and labor-management relations. These findings indicate that these post-AI changes cannot be explained by technological features alone, but they have a significant association with how corporate organizations respond to AI.

I. Introduction

In recent years, there has been much debate about AI technology. Frey and Osborne (2013) pointed out the possibility that AI may substitute for 47% of 702 occupations in the United States. In Japan as well, Nomura Research Institute (2015) calculated the probability that new technologies, such as AI technology, may substitute for 601 occupations and indicated an estimate that around 49% of the total labor population in Japan would be replaced by such technologies. Currently, there is growing concern about future job loss due to the widespread use of generative AI[1] such as Chat GPT. In addition, in connection with the utilization of AI, Fujimoto (2024) indicated the need to discuss ethical aspects, and Krämer and Cazes (2022) pointed out concerns about the risk of discrimination, excessive surveillance, and violations of human rights.

Earlier studies relating to the impact of AI technology on workers have focused primarily on tasks, skills, employment, and wages, while few of them dealt with the work environments (Lane and Saint-Martin 2021). Hence, they conclude that whether AI improves or deteriorates the work environment is an open question. Nevertheless, there are some, albeit limited, valuable studies.

Jaehrling (2018) conducted case studies on the manufacturing and banking sectors in France, Germany, Hungary, the Netherlands, Spain, Sweden, and the UK between 2015 and 2018. In cases of banking, the introduction of AI technology resulted in a decrease in the number of existing workers, increasing the average number of customers per customer advisor, and also increasing their workload. Furthermore, the study showed that the quality of work deteriorated. Customer advisors were expected to respond to customers immediately, which increased time pressure and also increased stress.

Yamamoto (2019) conducted a survey targeting Japanese workers. The results suggest that task reorganization that takes place along with the introduction of AI technology contributes to increased job satisfaction. Conversely, it contributes to increased stress as well.

The Trade Union Congress (TUC) of the UK conducted a questionnaire targeting workers and trade union representatives (TUC 2021). The results showed concern over the use of AI technology for the purpose of monitoring workers. Workers who experienced monitoring by AI reported increased stress.

Based on the case studies in those OECD countries—Austria, Canada, France, Germany, Ireland, Japan, the United Kingdom, and the United States—Milanez (2023) showed that improvements in the work environment after AI technology resulted in reduction in tedium and improved job satisfaction and physical safety,[2] while deteriorations in the work environment resulted in increased work intensity and stress. Milanez (2023) certainly presents new findings concerning the impact of AI on the work environment, while new research challenges have emerged. First, due to the lack of an international comparative perspective, it is unclear where the cases in Japan should be positioned in the context of the changes in the work environment observed in OECD cases. Second, it is not unclear what determines changes in the work environment after the introduction of AI.

The perspective for exploring what determines the changes in the work environment after the introduction of AI technology can actually be found in the debate in Japan on microelectronics (ME) technology, a technological innovation from the 1970s and 1980s. Okamuro (1999) stated that the introduction of production equipment incorporating ME (micro-electronification) technology was "the subject of active debate and research throughout the 1980s, as it was regarded as changing the quantity of employment and quality of labor and significantly affecting the scope and composition of jobs" (Okamuro 1999:206). Based on the research findings available at that time, Okamuro pointed out that even if the introduction of ME has progressed, its impact on workers would defer depending on the responses of corporate organizations ("flexible reorganization of jobs" and "labor management methods") and stated that "the actual division of work is largely dependent on labor management methods" (Okamuro 1999:210). Even today, it is thought that technological features do not unilaterally determine the work environment of workers but rather how corporate organizations respond to the technology also affects the work environment.

Through identifying the position of Japanese cases in OECD cases in terms of changes in the work environment after the introduction of AI technology, this study clarifies the similarities and differences between Japan and other countries, and explores what determines changes in the work environment from the perspective of how corporate organizations respond to AI.

II. Method

First, this study uses the cases published in Milanez (2023) in order to understand the changes in the work environment as observed in OECD cases. Second, to identify the position of Japanese cases in OECD cases in

terms of changes in the work environment, the study also uses those published in the Japan Institute for Labour Policy and Training (JILPT) (2022, 2023). In the following section, an outline of the OECD joint research, from which these cases are derived, an overview of each case, and data constraints are described.

1. Outline of the OECD joint research

The OECD joint research was conducted between 2021 and 2022. The following eight countries participated in the joint research: Austria, Canada, France, Germany, Japan, Ireland, the UK, and the US. The author was in charge of the Japan Survey. The questions were common to all participating countries and covered a wide range of topics, including basic information on the surveyed firms and interviewees; the functions of AI technology; changes in tasks, skills, employment, wages, and the work environment; responses of labor and management; and the impact of and demands for government policies and regulations. In this joint research, "AI technology" is defined as "a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments" based on the definition set forth by a group of AI experts at the OECD (OECD 2019:23).

The industrial sectors targeted in the survey were manufacturing and finance. These sectors were selected for the following reasons: these sectors were areas where AI technology has already been implemented in workplaces (McKinsey 2017, Bessen et al 2018, OECD 2019); narrowing by sector allows for comparison across countries; and the impacts on both white- and blue-collar workers can be captured.

Interviewees included personnel from a range of different job positions—workers using AI, managers, human resource personnel, AI developers or suppliers, AI implementation leads, and worker representatives (union or works council)—to capture the actual situation from different perspectives. It was recommended that six people from these diverse groups be interviewed per firm.

2. Overview of cases by countries

Let us look at the cases in those eight countries included in Milanez (2023). Table 1 shows the number of firm cases by country and by sector. In total, 96 cases were obtained. Note that in Austria, France, Germany, and Ireland, the energy and logistics sectors were added to the targets due to difficulties in securing a sufficient number of cases.

Table 2 shows the number of interviewees by sector, which was 147 (43%) in finance, 154 (45%) in manufacturing, 21 (6%) in energy, and 3 (1%) in logistics. Table 3 shows the number of interviewees by job position. Interviewees from the management side, such as managers, human resources personnel, and those in charge of AI implementation projects, accounted for an unexpectedly fair figure, at 60%. On the other hand, the number of interviewees from the worker side, such as workers and worker representatives (unions or works councils), proved to be rather weak, accounting for 26%.[3]

Next, let us review the major AI technologies implemented in those eight countries. In finance, they include fraud detection and legal compliance technology using anomaly detection to predict fraud; Algorithmic trading algorithms used to identify investment opportunities in financial markets; Financial forecasting tools that use predictive models incorporating a wide range of data; Underwriting software used to improve accuracy in consumer credit decisions; and Chatbots used for advising clients, routing client questions (Milanez 2023:23). In manufacturing, they include visual inspection tools using image recognition to identify objects along the assembly line; Manufacturing execution systems using real time data to identify areas of inefficiency; Real-time analysis of production lines to identify potential issues, prevent downtime; and Autonomous guided vehicles in the warehouse (Milanez 2023:23). Table 4 shows a list of occupations affected by AI technologies.[4] They are affecting a wide variety of occupations.

Table 1. Number of firm cases by sector (8 OECD countries)

(unit: case)

	Finance	Manufacturing	Energy	Logistics	Total
Austria	6	10	2	–	18
Canada	6	7	–	–	13
France	3	3	1	–	7
Germany	3	6	1	–	10
Ireland	4	8	3	1	16
Japan	4	5	–	–	9
UK	5	4	–	–	9
US	7	7	–	–	14
Total	38	50	7	1	96
% of total	40%	52%	7%	1%	100%

Source: Created by author based on Milanez (2023:26).
Note: Firms in Germany, Ireland, and the UK provided the study team with more than one example of using AI technology.

Table 2. Number of interviewees of firm and union cases by sector (8 OECD countries)

(unit: person)

	Finance	Manufacturing	Energy	Logistics	Other	Total
Austria	14	28	5	–	3	50
Canada	15	17	–	–	6	38
France	16	17	6	–	–	39
Germany	16	19	2	–	3	40
Ireland	8	11	8	3	3	33
Japan	24	26	–	–	–	50
UK	28	18	–	–	1	47
US	26	18	–	–	2	46
Total	147	154	21	3	18	343
% of total	43%	45%	6%	1%	5%	100%

Source: Created by author based on Milanez (2023:26).
Note: "Other" consists of union representatives and their AI developers who do not belong to targeted unions for this case study on the impact of AI technology.

Table 3. Number of interviewees of firm and union cases by job position (8 OECD countries)

(unit: person)

	Workers	Worker representatives	Management	HR	AI implementation	AI developers	Other	Total
Austria	7	5	17	4	10	3	4	50
Canada	4	3	18	–	4	4	5	38
France	8	–	13	3	15	–	–	39
Germany	12	7	7	1	9	4	–	40
Ireland	2	3	15	–	9	4	–	33
Japan	9	8	9	8	8	8	–	50
UK	8	4	9	5	14	7	–	47
US	7	2	14	1	13	9	–	46
Total	57	32	102	22	82	39	9	343
% of total	17%	9%	30%	6%	24%	11%	3%	100%

Source: Created by author based on Milanez (2023:27).
Note: "Other" consists of case study interviews conducted to IT personnel, IT managers, ethics researchers, purchasing assistants and data scientists.

Table 4. Occupations most affected by AI technologies (8 OECD countries)

Frequency	Occupation	Frequency	Occupation
14	Customer Service Representatives	1	Bookkeeping, Accounting, & Auditing Clerks
11	Maintenance & Repair Workers, General	1	Chemists
9	Electromechanical Equipment Assemblers	1	Credit Analysts
5	Fraud Examiners, Investigators & Analysts	1	Energy Auditors
4	Insurance Claims & Policy Processing Clerks	1	Financial Quantitative Analysts
3	Aircraft Mechanics & Service Technicians	1	Financial Risk Specialists
2	Cartographers & Photogrammetrists	1	Human Resources Specialists
2	Cutting & Slicing Machine Setters, Operators, & Tenders	1	Insurance Sales Agents
2	Data Entry Keyers	1	Lawyers
2	Insurance Underwriters	1	Loan Officers
2	Power Distributors & Dispatchers	1	Medical Appliance Technicians
2	Sales Representatives, Wholesale & Manufacturing, Except Technical & Scientific Products	1	Medical Equipment Repairers
2	Sales Representatives, Wholesale & Manufacturing, Technical & Scientific Products, Technical & Scientific Products	1	Model Makers, Metal and Plastic
2	Sheet Metal Workers	1	Multiple Machine Tool Setters, Operators, & Tenders, Metal & Plastic
2	Wind Energy Engineers	1	New Accounts Clerks
2	Wind Turbine Service Technicians	1	Purchasing Agents, Except Wholesale, Retail, & Farm Products
1	Actuaries	1	Quality Control Analysts
1	Agricultural Technicians	1	Remote Sensing Technicians
1	Appraisers of Personal & Business Property	1	Securities, Commodities, & Financial Services Sales Agents
1	Aviation Inspectors	1	Stone Cutters & Carvers, Manufacturing
1	Bioengineers & Biomedical Engineers	1	Textile Cutting Machine Setters, Operators, & Tenders
1	Bioinformatics Scientists	1	Tool & Die Makers
1	Biological Technicians	1	Transportation Vehicle, Equipment & Systems Inspectors, Except Aviation

Source: Created by author based on Milanez (2023:29–30).
Note: "Frequency" refers to the number of occupations affected by AI technology, inquired in interviews in eight OECD countries.

3. Overview of cases in Japan Survey

With respect to the cases in Japan, JILPT (2022) and JILPT (2023) record in detail the cases of four Japanese finance firms and those of five Japanese manufacturing firms, respectively. Table 5 (JILPT 2024) provides an overview of the firms surveyed. These firms engage in a range of businesses, including banking; insurance; securities; manufacturing and sale of steel; provision of IT and network services; provision of control equipment; manufacturing of electrical machinery and appliances; and provision of measuring equipment. The number of workers in each firm ranges from about 600 (non-consolidated) to about 100,000 (consolidated). Eight of these firms, with the exception of Financial Company A, have labor unions.

Table 6 summarizes the functions of and occupations affected by AI technologies as observed in Japan. The occupations affected are diverse. This diversity is common to both cases in Japan and other countries.

Table 7 shows the outlines of interviewees in the Japan Survey. Three to seven persons per firm were interviewed. For the sake of anonymity, the division of each interviewee is given as a pseudonym or not stated in this article.

Table 5. Outlines of firm cases: Business description, firm size (number of workers), and with/without union (Japan Survey)

Firm	Business description	Number of workers (persons)	With/without union
Financial Company A	Banking	600 (non-consolidated)	Without union
Financial Company B	Insurance		With union
Financial Company C	Insurance	20,000 (non-consolidated)	With union
Financial Company D	Securities	26,000 (consolidated)	With union
Manufacturing Company E	Manufacturing and sale of steel	15,000 (non-consolidated)	With union
Manufacturing Company F	Provision of IT and network services	100,000 (consolidated)	With union
Manufacturing Company G	Provision of control equipment	More than 1,000 (non-consolidated)	With union
Manufacturing Company H	Manufacturing of electrical machinery and appliances	1,300 (non-consolidated)	With union
Manufacturing Company I	Provision of measuring equipment	6,000 (non-consolidated)	With union

Source: Created by author based on JILPT (2024:14).
Note: The number of workers in Financial Company B is not indicated above for the sake of anonymity.

Table 6. Functions of and occupations most affected by AI technologies (Japan Survey)

Firm	Functions of AI technology	Occupations affected by AI technology
Financial Company A	Partial automation of preliminary mortgage screening	Mortgage screening officers
Financial Company B	Estimate of repair costs using images of vehicles in accidents	Repair cost estimators for vehicles in accidents (called “adjuster”)
Financial Company C	(1) Indicating possible answers by phone (2) Automatically providing answers on simple cases online (3) Automatically providing answers on simple cases by phone	Customer service representatives (called “advisor”)
Financial Company D	Crossover search and recommendation	Securities salespersons
Manufacturing Company E	Proposing recovery measures for problems with manufacturing lines	Maintenance workers
Manufacturing Company F	Recommendation of job matching under the in-house recruitment system	Human resources personnel * In-house recruitment system users
Manufacturing Company G	Calculating the relevance between overseas websites and orders	Marketing personnel
Manufacturing Company H	Judging pass or fail in electronic component inspection	Visual inspectors
Manufacturing Company I	Judging pass or fail in sensor chip inspection	Visual inspectors

Source: Created by author based on JILPT (2024:30, 35).

Table 7. Outlines of interviewees: Job position, main questions, and date of survey (Japan Survey)

Firm	Interviewees	Main questions	Date
Financial Company A	A, Department Manager, Total Risk Management Department	Background for introduction	Aug 10, 2021
	B, Section Chief, 2nd Risk Management Section, Total Risk Management Department	Functions and development	Aug. 11, 2021
	C, Section Chief, Business Planning Section, Loan Planning Department	Development and operation	Aug. 12, 2021
	D, Section Chief, Screening Section, Loan Business Department	Operation in the workplace	Aug. 18, 2021
	E, Screening Section, Loan Business Department	Operation in the workplace	Aug. 18, 2021
	F, Department Manager, Personnel and General Affairs Department	Personnel system, labor-management relationship	Aug. 19, 2021
	G, Section Chief, Personnel Affairs Section, Personnel and General Affairs Department	Personnel system, labor-management relationship	Aug. 19, 2021
Financial Company B	A	Background for introduction	Aug. 23, 2021
	B	Background for introduction	Aug. 23, 2021
	C	Functions and development	Aug. 31, 2021
	D	Operation in the workplace	Sep. 1, 2021
	E	Wages, personnel system	Sep. 6, 2021
	F	Labor-management relations	Sep. 7, 2021
Financial Company C	A, Group Leader, Planning Group, Personnel Affairs Department	Personnel system, labor-management relationship	Sep. 15, 2021
	B, Leader, Planning Group, Personnel Affairs Department	Personnel system, labor-management relationship	Sep. 15, 2021
	C, Leader, Planning Group, Customer Communication Planning Department	Development and operation	Sep. 16, 2021
	D, Customer Center Office, Customer Communication Planning Department	Utilization in the workplace	Sep. 17, 2021
	E, Vice Chairperson, Labor Union	Initiatives by the labor union, labor-management relations	Sep. 22, 2021
	F, Vice Director of Secretariat, Labor Union	Initiatives by the labor union, labor-management relations	Sep. 22, 2021
Financial Company D	A, Analysis Section, Sales Planning Department	Development process	Nov. 17, 2021
	B, Analysis Section, Sales Planning Department	Development process	Nov. 18, 2021
	C, Digital Transformation Department	Management of development and operation	Nov. 22, 2021
	D, Strategy Section, Digital Transformation Department	Development and operation	Nov. 22, 2021
	E, Research Section, Digital Transformation Department	Development and operation	Nov. 24, 2021
	F, Sales Planning Department	Development management	Nov. 25, 2021
Manufacturing Company E	A, Director, Control Office, EA District	Utilization in the workplace	Oct. 25, 2021
	B, Group Leader, Technology Promotion Department	Functions and development process	Oct. 26, 2021
	C, Deputy Section Chief, Equipment Engineering Department	Functions and development process	Oct. 26, 2021
	D, Control Office, EB District	Operation in the workplace	Oct. 27, 2021
	E, Director, Personnel Affairs Department	Personnel system, labor-management relationship	Oct. 29, 2021
	F, Secretary General, Labor Union	Initiatives by the labor union, labor-management relations	Nov. 1, 2021
	G, Control Office, EA District	Operation in the workplace	Nov. 4, 2021
Manufacturing Company F	A, Manager, Personnel Affairs Department (system design division)	Background for introduction, outline of functions	Nov. 5, 2021
	B, Personnel Affairs Department (system design division)	Functions and operation	Nov. 10, 2021
	C, AI and Data Analysis Department	Functions and development process	Nov. 11, 2021
	D, Personnel Affairs Department (labor division)	Personnel system, labor-management relationship	Nov. 12, 2021
	E, Chairperson, Labor Union	Initiatives by the labor union, labor-management relations	Nov. 17, 2021
Manufacturing Company G	A, Manager, Communication Department, Marketing Headquarters	Background for introduction, impact on business	Apr. 18, 2022
	B, Innovation Department, Marketing Headquarters	Functions and development process	Apr. 19, 2022
	Y, R&D Department, Technology Headquarters, Company GA	Functions, and development and introduction process	Apr. 21, 2022
	D, Communication Department, Marketing Headquarters	Operation in the workplace	Apr. 26, 2022
	E, Manager, Headquarters Office, Personnel and General Affairs Headquarters	Human resource development, work conditions	Apr. 27, 2022
	F, Vice Chairperson, Labor Union	Initiatives by the labor union, labor-management relations	Apr. 28, 2022
Manufacturing Company H	A, Section Chief, Manufacturing Department A, Production Headquarters	Background for and purpose of introduction	May 11, 2022
	B, Manufacturing Department A, Production Headquarters	Operation in the workplace	May 11, 2022
	C, Manager, Technology Headquarters	Development and operation process	May 13, 2022
Manufacturing Company I	A, Department Manager, AI Promotion Department	Development history and process	Jul. 6, 2022
	B, Process Development Section, Process Department, Technology Development Headquarters	Functions and introduction process	Jul. 20, 2022
	C, Production Section, Process Department, Technology Development Headquarters	Operation in the workplace	Jul. 20, 2022
	D, Chairperson, Labor Union	Initiatives by the labor union, labor-management relations	Jul. 29, 2022
	E, Department Manager, General Affairs Department	Personnel system, labor-management relationship	Aug. 4, 2022

Source: Created by author based on JILPT (2024:26–27).
Note: For the sake of anonymity, the divisions of the interviewees of Financial Company B are not specified above. Interviewees in Manufacturing Company G include a counterpart person of the joint development from Company GA, an AI technology supplier to Company G.

4. Data constraints

There are some constraints in this study. First, since the OECD joint research does not present all cases in all those eight countries, country-by-country comparisons are limited to those in Japan and those in specific countries. Therefore, in this study, when it is stated that similarities are found between cases in Japan and those in the other countries, it means that similarities are found between specific cases in Japan and those in the other countries, and it does not mean that similarities are found between all cases in Japan and those in the other countries. On the other hand, when it is stated that differences are found between cases in Japan and those in the other countries, it means that a phenomenon observed in specific cases in other countries is not observed in all cases in Japan.

Second, this study does not cover generative AI tools, such as ChatGPT that have emerged in recent years. This is because the OECD joint research was conducted between 2021 and 2022, and generative AI became the focus of attention after that research period.

Third, even though this study covers 96 cases in those eight countries, it is not possible to generalize the findings obtained because it is based on case studies. Milanez recognized this limit of case studies and took the following measure. "….[T]his study has been conducted in parallel to OECD surveys of firms and workers regarding the impact of AI in the workplace. The survey questions and the case study interview guides were developed in close consultation, allowing for each set of results to shed light on the other" (Milanez 2023:13). The "OECD surveys" mentioned here refer to Lane, Williams, and Broecke (2023),[5] which targeted seven countries in the OECD joint research except for Japan, namely, Austria, Canada, France, Germany, Ireland, the UK, and the US.[6] Comparing the case studies targeting those eight countries with these questionnaires, Milanez stated as follows: "The overall, combined picture is surprisingly aligned, reflecting the same patterns through both quantitative and qualitative evidence" (Milanez 2023:13). The results of the case study are not far removed from the overall trends.

III. Analysis of data

This section examines how the working environment has changed since the introduction of AI technology. The changes in the working environment include both improvements and deteriorations. When Japanese cases are positioned in those eight countries, many similarities can be found for the improvements in the working environment. On the other hand, there is almost no evidence of deteriorations in the working environment in Japanese cases, which is different from cases of other countries. This suggests that these changes in the working environment are associated with the way in which corporate organizations respond to AI.

1. Improvements in the working environment

In OECD cases, improvements in the working environment resulted in reduction in tedium, increased job satisfaction, improved physical safety, reduction in workloads and fatigue, and improved well-being. In Japanese cases, there was no reduced tedium, but improvements were observed for the other factors mentioned above. The results also suggest that improvements in the working environment are associated with task reorganization and workload setting.

(1) Reduced tedium

Reduced tedium were often observed in the finance sector, of which the automation of simple tasks was a typical example (Milanez 2023:73). Let us look at the cases of a UK financial firm.

> … a UK financial firm implemented a robotic process automation (RPA) system to assist with a range of activities including mortgage underwriting, interest adjustments, commercial banking and brokerage. In each of these areas, the system's main purpose is to process customer data according to a set of rules. This led to the automation of many simple administrative tasks. For example, following the death of a customer, the firm sends information to the individuals that the deceased registered as informants. Whereas this information would have been gathered and sent by hand before the introduction of the RPA system, workers now input basic data onto a smart form. The system uses this information to automatically generate the package of information the informants require, including data such as account balances. The system also amends account information, as necessary. For example, if the deceased's account was joint, the account will be put into the surviving member's name, adjusting the roles. … One worker discussed how their work has become less administrative and saw greater value in more time spent supporting customers and colleagues across the firm: "Getting rid of tedious administrative work [allows us] to focus on the things we're actually in for – customer interaction and to support the departments in the company." The technology had helped her to enjoy her work to a greater extent on a more personal level as well: "It has improved things for me. [It was] tiresome and repetitive, reading through all the [customer information]. When you're doing things that can be more stimulating, you're enjoying your day more. I think that is true of others as well." (Milanez 2023:73–74)

Many simple administrative tasks have been automated since the introduction of AI technology, followed by the allocation and reorganization of attractive tasks. This suggests a link between reduction in tedium and task reorganization. In this case of a UK financial firm, job satisfaction increased, however, new tedious tasks were created, as described below. In Japanese cases, no reduced tedium was observed.

(2) Increased job satisfaction

Increased job satisfaction was observed in the cases in those eight countries, which is a similarity between Japan and other countries. In the cases of a UK financial services provider offering life insurance, pensions, retirement and investment services, tasks were reorganized and job satisfaction increased after the introduction of a chatbot. "The chatbot assists customers to serve themselves by directing them to the answers to frequently asked questions. As a result, customer service representatives handle a reduced volume of basic customer queries, which has helped diversify the range of topics they cover with customers. The representative interviewed as part of this case study explained: 'The work is more interesting, definitely. It adds variety because [with the removal of frequently asked questions] customers don't ask the same things every time'" (Milanez 2023:75).

The case of a UK financial firm, already mentioned above, also shows an increase in a worker's job satisfaction. "…one worker was actively involved in a six-month process to co-develop the technology with an external vendor and internal AI implementation workers. This involvement was rewarding for her: '[t]o be involved in [the development] and see it implemented, there was a lot of job satisfaction for me there'" (Milanez 2023:75–76). This suggests a link between task reorganization, which allowed the worker to be involved in the development task that was rewarding, and greater job satisfaction.

Among Japanese cases, job satisfaction improved at Financial Company C and Manufacturing Company G. In the case of Financial Company C, after the AI chatbot was introduced, the advisors working at the call center were assigned a wider range of tasks and involved in the development process, which may have increased their job satisfaction. A senior advisor at this company, who was also tasked with managing the AI chatbot, stated: "I was engaged in the work relating to training the AI chatbot, and I was happy to see that the accuracy of the AI chatbot improved" (Respondent D, Company C) (JILPT 2024:105). In the case of Manufacturing Company G, which introduced the AI technology to calculate the contribution of websites to orders, workers' job satisfaction increased through engagement in the new task of conducting deeper analysis. These two cases of Japanese

companies also suggest a link between task reorganization and increased job satisfaction.

(3) Improved physical safety

Improved physical safety of workers was observed both in the case studies in Japan and those in the other countries. An Austrian steel manufacturer, which implemented AI software that controls a straightening machine used to correct the concentricity of steel rods, saw improved physical safety. "Before the AI was introduced, workers would perform the straightening manually, which could lead to accidents if materials were mishandled. The introduction of the software allowed for the straightening to be automated. Workers now monitor the machine from behind a barrier, which has reduced accidents" (Milanez 2023:76).

Improvement in physical safety was observed in the cases of Japanese Manufacturing Company E. An AI developer at this company considers that safety in the workplace improved, explaining "(Using AI technology, [added by the author]) we became able to learn past knowledge by ourselves and use safety-related data, so we can perform work more safely" (Respondent B, Company E) (JILPT 2024:107). In addition, a maintenance worker also finds AI technology useful in locating safety-related data and believes that it is contributing to improving safety in the workplace to some extent. A maintenance manager recognizes that task reorganization has allowed them to focus on safety-related tasks, which has improved safety in the workplace. Again, this case study suggests a link between task reorganization and improved physical safety.

(4) Reduced workloads and fatigue

After the introduction of AI technology, reduction in workload and fatigue were observed. This is also common to the cases in Japan and those in the other countries. In the case of a US aerospace manufacturer, the inspection environment was improved. The company's AI automated the visual inspection of turbine blades for jet engines. "The project lead interviewed as part of the case study reported that the technology had a positive impact on the work environment of inspectors. Before the introduction of the AI technology, inspectors sat in a controlled light environment ("a darkened room") for long periods inspecting blades using a magnifying eye piece. He elaborated: 'The human factors of manual visual inspection were pretty horrible. It is done in a controlled light environment, so they sit in a darkened room [for eight hours] staring through a [three-times] magnifying eye piece or [a] big lens with a ring light. Obviously, they take breaks and what have you. But it is not a particularly pleasant working environment. The [inspection] cell that [replaces] that room is its own controlled light environment'" (Milanez 2023:77).

In Japanese cases, reduced physical burden was observed at Manufacturing Company E and Manufacturing Company H. The AI technology used by Manufacturing Company E was able to identify the cause of a problem on the production line at the production site. The factories are located in several districts, and in some districts, the sites are so large that the office where maintenance workers stand by is away from the site where the trouble occurred. If the maintenance workers were unable to resolve a problem immediately after arriving at the site, they would return to the office to look up past problem cases and then return to the site again. AI has made it possible to investigate the cause of a problem at the location where it occurred, eliminating the need to go back and forth in such manner and reducing the physical burden of workers. Furthermore, although it was not the initial goal to introduce AI, the introduction of the technology has reduced the overtime work of maintenance workers, for the following reasons. The company's production lines operate 24 hours a day, 365 days a year, in three shifts, and problems may occur at night or on holidays. In the past, when maintenance workers working at night or on a holiday were unable to handle a problem, they would call off-duty maintenance workers to handle the problem, thus causing overtime work. With the introduction of AI technology, maintenance workers are now able to respond more effectively than before by utilizing the technology. As a result, the frequency of calls to off-duty maintenance workers has decreased and their overtime work has also decreased. Here, AI has resulted

in reduced physical burden of workers.

Manufacturing Company H conducts visual inspections of electronic components through image recognition using AI technology. In the past, inspectors used only a microscope to perform visual inspections. However, after the introduction of AI, the technology displays the inspection results on a monitor, which has reduced inspectors' eye fatigue to a certain degree compared to when they were only using a microscope.

(5) Improved well-being

In many of OECD cases, workers' well-being improved after the introduction of AI technology. This is another similarity between Japan and the other countries. Improved well-being arises through reduction in work pressure and workload.

Let us first look at the case of a Canadian car manufacturer. The company "implemented an AI technology to monitor the stocks of materials along an assembly line and automatically order replenishments when stock is low. Previously, monitoring and ordering replenishments were done by workers themselves, and it sometimes happened that a worker would fail to replenish their stock of materials before running out. This would trigger a stop of the entire production line, which would be visible and embarrassing. An assembler described this as follows: 'It was uncomfortable, needing to stop the line because a part has run out in your station. A couple of hundred people would be waiting and not working because of you. You do not want to be the cause of a line stop.' As a result, assemblers were supportive of the implementation of this particular AI technology. It automated a small portion of their overall tasks, and 'made life easier' by taking away personal culpability for not replenishing stock levels in time." (Milanez 2023:77–78). In another case of an Austrian steel product manufacturer, mental burden was reduced through the introduction of AI software to automate the straightening of steel metal rods. "Workers were more at ease following the introduction of the AI technology because it absolved them of the responsibility of producing parts without faults" (Milanez 2023:78).

In this part, we look at cases of increased well-being through reduced workload, as reported by a member of an Austrian financial services company's works council. "'There has been a general transformation in the banking business of more regulations and, at the same time, more demands on customer advisors. [This has increased] pressure to do more work faster, which can be stressful.' To the extent that AI technologies can return workloads to more manageable levels by automating certain tasks, this interviewee believed that AI could increase well-being" (Milanez 2023:78). However, the level at which a workload is set varies from organization to organization. It is suggested that improving well-being is associated with the setting of the workload.

As we looked at Japanese cases, improved well-being was observed at Manufacturing Company H and Manufacturing Company I. In both cases, AI technologies were used in the process of visual inspection. This technology provides the inspectors with a judgment on whether the inspected parts are acceptable or unacceptable.

An inspector in the manufacturing department of Manufacturing Company H talks about the reduction of mental burden with the use of AI technology. "I have to make the same judgment with my own eyes, but sometimes I feel it is difficult depending on my conditions on the day of inspection, as sometimes I am not feeling well, or I have a headache, or something like that. In this aspect, although I am not saying that AI should be used for all inspections or that AI is 100% perfect, I feel that AI shifts out the subjects of inspection to a certain extent and reduces my mental burden. If we can operate AI well, man-hours will be greatly reduced, and we can do other things accordingly, which I think is good" (Respondent B, Company H) (JILPT 2024:110). Similarly, at Manufacturing Company I, the mental burden of inspectors has been reduced by AI.

2. Deteriorations in the working environment

While there have been improvements in the working environment since the introduction of AI technology, there have also been deteriorations, resulting in the created tedious tasks, increased work intensity, and increased

stress. Deteriorations in the working environment were rarely observed in Japanese cases, although they were observed in those in the other countries. In this respect, there are differences between Japan and the other countries.

(1) Created tedious tasks

The previous section showed reduction in tedium due to improvements in the working environment. The reduction in tedium occurred through the allocation and reorganization of attractive tasks following the automation of tedious tasks. On the other hand, in a country other than Japan, there was a case in which tedious tasks were created after AI technology automated tedious tasks.

That was a case of a UK financial firm. "…[A]nother worker interviewed as part of the case study claimed that the new version of the task is just as tedious as the previous version. Instead of inputting basic customer data into a database, workers input it onto smart forms so that the information on the smart forms can be used to automate other processes. To this worker, the AI system did not improve job content at all. She added that more concentration is required of workers to make sure that the correct information is input into the RPA system, as the workers typically do not see the end output of the RPA system" (Milanez 2023:79). In this case, as mentioned above, the firm introduced RPA to process customer data and this resulted in reduction in tedium through improvements in the working environment. While the AI system increased job satisfaction for one worker by reducing tedious tasks and giving more attractive tasks, the above-mentioned worker experienced reduced tedious tasks and was given different tasks that were also tedious. Whether tedium is reduced is determined by the way in which tasks are reorganized after the introduction of AI technology.

(2) Increased work intensity

Cases in countries other than Japan showed an increase in work intensity, such as the raised level of work demands. The UK financial firm A can be referred to as a past case, which introduced the RPA mentioned above and saw an increase in work intensity. "…[A] worker interviewed as part of the case study reported that workers were expected to leverage automation to 'get more done'" (Milanez 2023:79). In this case, the level of work demands was raised, which suggests a link between higher work demands and increased work intensity.

Increased work intensity was not observed in Japanese cases. However, Financial Company A experienced a temporary increase in workload (already resolved by the time of the survey). Following the introduction of AI technology, the company was able to achieve uniform screening and reduce the screening time per case. This also resulted in the improvement of customer services. However, a combination of multiple factors, including the introduction of AI and the negative interest rate policy,[7] caused a drastic increase in the number of mortgage applications. As a result, the number of cases to be screened by the screening officers also increased drastically, making them busier than before the introduction of AI. The chief of the screening section of the loan business department said, "since the introduction of AI, the number of mortgage applications has increased, partly due to market factors and the effect of other sales measures, which offset the effect of the introduction of AI" (Respondent D, Company A). This increase in workload was subsequently addressed through temporary dual assignments and organizational changes. This case study suggests a link between increased labor intensity and workload setting.

(3) Increased stress

Increased stress was observed following the implementation of AI technology, mainly due to greater monitoring of workers, the need to learn new systems, and higher work demands. Such increase in stress was observed in cases in the other countries and was rarely observed in Japan, with the only possibility of increased stress due to the need to learn new systems. Greater monitoring of workers was observed in the case of a UK financial firm that introduced a chatbot.

> The chatbot assists customers to serve themselves by directing them to the answers to frequently asked questions. It also monitors customer service representatives' calls in a range of ways, such as recording call or chat times, the number of chats a worker has open at a given time, the wait time to speak to a representative, and the files accessed during calls. The union representative interviewed as part of the case study stated that such monitoring increases workers' stress levels and has negative impacts on job satisfaction and worker engagement. In her opinion, as a general matter, while automation and AI have the potential to foster positive worker outcomes, in reality, their use often results in negative impacts for workers: "I have not seen much to disprove my scepticism around corporate motivations for introducing AI and automation. On the whole, automated systems are not liked by workers." … In this case study, the union representative explained that fears of greater monitoring were heightened by the possibility that the data can be used to inform performance reviews, bonus allocation and disciplinary proceedings. She called for greater transparency around worker-related, data-driven decision making, adding that the misuse of automated workflow and monitoring systems at the company must be addressed. (Milanez 2023:80)

It appears that monitoring by AI technology has led to increased stress among workers. However, it can also be said that labor and management did not fully discuss the use of AI, and that the lack of consensus between labor and management led to the increase in stress on workers. This is because the problem of monitoring by the chatbot would not have arisen if labor and management had reached a consensus on the functions and scope of use of the new technology prior to its introduction. As an example of a works council, let us introduce the case of a German energy provider. The company's works council was concerned about whether the technology could be used to monitor workers and whether it could lead to job cuts.

> An example of representative worker consultation involving a German works council followed the introduction by a German energy provider of an AI technology that provides sales agents with the likelihoods that customers will cancel their contracts. Two AI developers interviewed as part of the case study stated that any new software used in the firm must be approved by the IT Committee of the works council, which consists of five people: three works council members, a data protection officer, and one person from the office of the CIO. … The questions of the works council members were answered by the project manager of the AI solution. The main concerns of the works council related to whether the technology could be used to monitor workers on an individual basis. As the members were assured that this was not the case, the AI solution was approved. The IT Committee imposed an additional condition that, if the AI technology would have an impact on workers in the future, such as job cuts, the firm must report back to the works council. So far, this has not been the case. (Milanez 2023:90)

The works council requires the elimination of personal data monitoring and the reporting of job cuts. The IT Committee is composed of many worker representatives from the works council, and this committee has the authority to approve AI technology. The existence of this committee limits the functioning of AI to a certain extent. It is suggested that the increase in stress due to greater monitoring is actually associated with the nature of labor-management relations.

There were concerns related to the need to learn new systems. This was especially true for the older age groups. It was pointed out that "older workers were singled out as being particularly worried" (Milanez 2023:80). Older workers tended to have difficulties in adapting to new technologies in the case of an Austrian manufacturing company and in that of Financial Company B in Japan. However, as the details of both cases are unknown, the association between the need to learn new systems and increased stress is unclear.

There was also an increase in stress due to higher work demands. Although the nationality is unknown, a case

of a financial company is instructive. "The technology was implemented to improve customer service by suggesting courses of action to customer service representatives in real time. The AI's suggestions include product sales. Before the technology was introduced, workers generally responded to customer questions. While they were asked to cross-sell products before, there was less emphasis on this. The AI has increased the emphasis on product sales. As a customer service representative explained: 'My stress level [is] higher. Before, I didn't have to address an additional offering to the customer. Now, I have to at least try. This is because our group should discuss in at least 50 percent of all communications with the customers an additional offering, and if we don't reach this goal, my manager will ask us why. He cannot see these numbers on an individual basis, only for the complete group. Nevertheless, the stress is [greater]'" (Milanez 2023:80–81). Stress increased because the goals required of workers were raised and their progress was also managed. This suggests a link between increased stress and work demands.

IV. Discussion

In the introduction to this study, the author pointed out that earlier studies have not adequately examined what determines the changes in the working environment after the introduction of AI technology. First, this study reveals that the changes in the working environment can be divided into improvements or deteriorations depending on the responses of corporate organizations, namely, task reorganization, workload setting, changes in work demands, and labor-management relations. Second, the perspective of the corporate organization's response is important for identifying what determines the changes in the work environment after the introduction of AI. In this respect, let us look at the findings of this study in the context of earlier studies.

Yamamoto (2019) showed that task reorganization along with the introduction of AI technology in Japan contributes to increased job satisfaction. The same result was obtained in Japanese cases in which a link between task reorganization and increased job satisfaction is suggested. This result was also observed in the cases in the other countries, indicating similarities between Japan and the other countries.

Earlier studies mainly discussed what determines the increase in stress. Regarding the case of the banking sector, Jaehrling (2018) pointed out that the introduction of AI technology reduced the number of workers and increased their workload, and that it also increased time pressure as workers were expected to respond to customers immediately, which resulted in increased stress. This study, on the other hand, showed that even if the number of workers did not decrease as a result of the introduction of AI, stress increased due to higher work demands and progress management. Thus, although the result of increased stress is similar, the paths leading to that result are different. This study showed that the increase in stress after the introduction of the technology is also associated with changes in work demands.

Yamamoto (2019) suggested that task reorganization along with the introduction of AI technology in Japan also contributes to increased stress. In Japanese cases covered in this study, no increase in stress due to task reorganization was observed. However, it is necessary to continue observation of the cases because it is logically possible that stress increased due to task reorganization. On the other hand, the increase in stress observed in Japanese cases could have occurred among older workers due to the need to learn new systems created by AI.

TUC (2021) pointed out increased stress among workers who experienced monitoring by AI technology, suggesting a link between increased stress and such monitoring. The same result was found in this study. However, this study additionally found that a lack of consensus between labor and management on the implementation of AI was associated with increased stress. In this study, increased stress due to monitoring was observed in the cases in which there was no consensus between labor and management on monitoring by AI, while increased stress due to monitoring was not observed in the cases in which consensus was reached.

Regarding changes in the work environment after the introduction of AI technology, this study presented the

following five points of association that have not been explicitly presented by earlier studies: (1) reduced tedium and task reorganization, (2) improved physical safety and task reorganization, (3) improved well-being and workload setting, (4) created tedious tasks and task reorganization, and (5) increased work intensity and work demands and workload setting.

Finally, Milanez (2023) points out that the effects of AI technologies on tasks are not simply due to inherent technological features but are also determined by a set of decisions made by developers, policymakers, managers, and others. The author agrees with this view. Furthermore, in this study, the author would like to add the finding that changes in the work environment, as well as changes in tasks, are determined not only by technological features, but also by how corporate organizations respond to technologies, such as task reorganization, workload setting, changes in work demands, and labor-management relations. A focus on the responses of corporate organizations has the potential to provide a deeper understanding of what determines changes in wages and employment other than changes in tasks and the work environment.

It should be noted that, although this study showed changes in the work environment after the introduction of AI and the responses of corporate organizations that determine such changes, the AI covered by this study did not include generative AI, such as ChatGPT. Therefore, this study couldn't fully capture the impact of the latest AI technologies. The actual use of generative AI in the workplace and the resulting changes in the working environment are important research topics for the future.

V. Conclusion

The purpose of this study was to identify the position of Japanese cases in OECD cases and clarify the similarities and differences in terms of changes in the work environment after the introduction of AI technology, and to explore what determines changes in the work environment, from the perspective of how corporate organizations respond to AI. Accordingly, the study reconstructed cases regarding changes in the work environment based on the data obtained from Milanez (2023) and JILPT (2022, 2023). The results showed that changes in the working environment after the introduction of AI were observed as both improvements and exteriorizations in those eight countries. In Japan, there were many similarities to other countries in terms of improvements, whereas almost no deteriorations were observed, which is a difference between Japan and the other countries.

What this study reveals is an association in that the responses of corporate organizations with regard to AI technology, such as task reorganization, workload setting, changes in work demands, and labor-management relations, can determine improvements and deteriorations of the working environment. Earlier studies had shown that increased time pressure, task reorganization, and monitoring, which resulted from a decrease in the number of workers, were respectively associated with increased stress caused by deteriorations in the work environment after the introduction of AI. However, this study showed that changes in work demands and labor-management relations were also associated with increased or decreased stress, even where the number of workers did not decrease. The study also showed that not only changes in tasks but also changes in the work environment are affected by the responses of corporate organizations.

The findings of this study have implications for the future response of labor-management representatives with regard to AI technology. This is because the nature of labor-management relations can to some extent determine the impact on workers after the introduction of AI. The findings suggest that for future labor-management relations, it will be important to take an initiative-taking stance toward AI, from the perspective of how labor and management will work together to change jobs, rather than considering that the new technology will change jobs. Labor-management representatives are expected to consider the use of AI, focusing on how to reorganize tasks, how to set workloads, whether to change work demands, and how to build consensus for the

introduction of AI.

In conclusion, the findings of this study indicate that changes in the work environment after the introduction of AI technology could not be explained solely by technological features, but they are associated with how corporate organizations respond to AI. Additional study is needed to explore in detail the reality of generative AI and its impact. It is expected that the effects on workers can be better captured by focusing on the responses of corporate organizations.

This paper is based on Chapter 7 (written by IWATSUKI Shinya) of JILPT 2024, with additions and amendments in line with the gist of *Japan Labor Issues*.

Notes

1. According to the glossary provided by the Nomura Research Institute generative, AI refers to technologies that can generate a variety of content. While traditional AI aims to automate predetermined actions, generative AI aims to learn patterns and relationships in data and generate new contents, including texts, images, sounds, music, and videos (https://www.nri.com/jp/knowledge/glossary/lst/sa/generative_ai, last accessed November 12, 2024).
2. Physical safety refers mainly to safety when performing hazardous work in a factory.
3. I would like to frankly share my impressions from the interviews. To understand exactly how AI technology is being used in the workplace, it was most important to speak with employees who are directly using it. The next group was the project managers responsible for the implementation of AI technology. Of course, it was also essential to ask managers about the background of AI technology implementation, and to inquire with those in charge of AI technology development about its development process and functions. However, for our questions regarding the changes that have or have not occurred in specific tasks and skills or in their workplaces, as well as the reasons behind these changes, it was most valuable to listen to general employees who are actually using AI technology (JILPT 2024:13). In this context, for countries where only a relatively limited number of interviews with general employees were conducted, further case studies remain an important challenge for future consideration.
4. The table does not specify which type of occupation applies to the respective occupations from the cases in each country.
5. A total of 5,334 workers and 2,053 firms in the manufacturing and financial sectors in Austria, Canada, France, Germany, Ireland, the United Kingdom and the United States were surveyed by OECD.
6. A similar survey could be conducted in Japan to better understand the situation in the country. This will be a future research challenge.
7. For a comprehensive explanation of negative interest rates, see the Japanese Bankers Association' website (https://www.zenginkyo.or.jp/article/keywords/8898/, last accessed November 12, 2024). The Bank of Japan decided to introduce quantitative and qualitative monetary easing with a negative interest rate at its policy board and monetary policy meeting on January 29, 2016. The introduction of a negative interest rate means that the Bank would apply a negative interest rate of -0.1% to current accounts that financial institutions hold at the Bank. Subsequently, at the policy board and monetary policy meeting on March 19, 2024, the Bank decided to lift the negative interest rate, considering that the negative interest rate policy has fulfilled its roles.

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