Effect of the Diffusion of ICT on White-Collar Workers' Workplaces in Japan

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I. Introduction

During the 1990s, information and communications technology (ICT) showed a remarkable progress. In the ICT advanced U.S., productivity steadily increased with the development of ICT, and the theories of "new economy" for promoting noninflationary sustainable economic growth rose (U.S. Department of Commerce, 2000; etc.). At the same time, it was argued that the rise of the new economy would require firms to adopt a new employment model (Osterman, 1999; U.S. Department of Labor, 1999; Cappelli, 2000; etc.). These arguments all suggested that the "traditional" employment model, which guaranteed long-term employment to employees, would decline as the nation moved towards the new economy, and that more and more firms would adopt an employment model where a large number of highly fluid atypical (atypical) employees[1] are hired. It was also pointed out that employees would be required to have ahigher level of skills than before in order to secure employment opportunities under the new employment model and that employees without such skills would be exposed to a greater risk of wage decrease or displacement.

The rapid development of ICT was not limited to the U.S. In Japan, ICT showed a significant progress during the 1990s as firms introduced ICT in their offices in the form of PCs, LAN, and the Internet. Like in the U.S., there was a great deal of interest in how the penetration of ICT would influence employment and work done in the offices.

Meanwhile, Japanese firms have frequently undertaken organizational reform and review of their personnel management systems in the last ten years as a result of prolonged economic recession and changes in the country's economic and social structures (Japan Institute of Labour, 2000a; Japan Institute of Labour, 2000b; etc.). These efforts have naturally brought about a certain amount of change in Japanese firms' employment structure and in how employees work. In examining the impact of ICT on the "quality of employment," we cannot overlook the effect the diffusion of ICT has on the changes in employment structures and people's work that are brought about by organizational reforms and review of personnel management systems.

In light of the above understanding of the issues, we present in this paper the results of a questionnaire survey JILPT conducted on white-collar workers in 2002. White-collar workers were selected because they are most susceptible to the influence of

ICT and because they make up a large segment of employees in Japan, which makes them the most suitable subject in examining the relation between ICT and "quality of employment" in Japan. In the sections below, we elucidate how changes in white-collar workers' employment structures and working styles in Japan are related to the diffusion of ICT.

II. Diffusion of ICT and changes in personnel management, work, and workplaces—three viewpoints

The changes affecting firms, workplaces, and workers' working styles resulting from the diffusion of ICT can be examined in many different ways. To deepen discussion on the effect of ICT on workplaces and work, however, we need to somewhat limit our approach in order to examine the current state of affairs based on our understanding of the issues.

In this paper, we look at the changes brought about by ICT on white-collar workers' workplaces and work by focusing on three topics shown below. The topics are the most relevant to the discussion on the effect of ICT on the "quality of work" and "decent work." There has also been a significant focus on the three topics in past studies and research done in Japan and in other countries.

(1) Diffusion of ICT and changes in work

Past studies conducted in Japan have shown that workers recognize that the diffusion of ICT has directly influenced their work in the form of reduction of monotonous work, speeding up of decision making, central management of information, and an increase in non-interpersonal work and self-contained work (Japan Institute of Labour, 1996; Ministry of Labour, 1996). Less directly, it has also affected the nature of regular work and the approach to work as evidenced by an increase in creative and specialized work; the rising need for good communications skills, flexibility and logical thinking; and greater personal discretion (SRIC Corporation, 2001; Japan Institute of Labour, 2001).

The diffusion of ICT may also reveal the performance gap among workers, which may have an impact on workers' morale. Past studies have pointed out that an increasing number of employees feel greater stress and anxiety as they try to adapt to ICT (Japan Institute of Labour, 1997) and that there is a decline in the sense of commitment among workers who have not been able to adapt well (Ministry of Labour, 1996).

In examining the relation between ICT and quality of employment, it is essential that we focus not only on whether workers are able to use ICT as a tool, but also on whether

they are able to adapt to changes in work brought about by the diffusion of ICT as mentioned above. In addition, when we look at workers' ability to adapt to changes, we need to consider the kind of professional abilities that have been made requisite in firms and offices with the diffusion of ICT.

(2) Diffusion of ICT and individualized, performance-based personnel management

On the relation between the diffusion of ICT and individualized, performance-based personnel management, one hypothesis is that the introduction of ICT will enable efficient processing of large volumes of data for personnel management, which will better delineate individual employees' and departments' performance and promote individualized, performance-based assessment and treatment. On the other hand, if it becomes possible to rapidly collect and manage data by using ICT, it would diminish the role of middle management and reduce the number of management posts (Leavitt and Whisler, 1958; Mann and Williams, 1962; Braverman, 1974; Tao, Yoshikawa and Takagi, 1996). Based on these arguments, it is possible to forecast that it will be difficult to maintain the "system of seniority-based treatment," in which employees receive more pay and are promoted as they work longer for their firms, and inevitably individualized, performance-based assessment and treatment will be promoted.

The general consensus of the studies conducted in recent years in Japan is that the more ICT advanced a firm is, the more likely that the firm will adopt individualized, performance-based personnel management. In a study conducted by the Ministry of Labour of Japan in 1996, many of the survey's respondents felt that reform of the information and telecommunications systems and the change to a flat, simplified organization would lead to a decrease in line management posts and increase the tendency towards performance- or merit-based systems. They also believed that increased sharing of information would diminish the importance of accumulating information through long-term service and weaken the practice of seniority-based promotion. These results confirm the possibility that the diffusion of ICT would promote individualized, performance-based personnel management (Ministry of Labour, 1996). It has also been pointed out that there is a positive correlation between the diffusion of ICT within a firm and the degree to which a firm was reviewing their personnel appraisal systems so that employees' performance or ability will be better reflected in the evaluation (Japan Institute of Labour, 1996; SRIC Corporation, 2001).

As a number of years have already passed since ICT was fully introduced into Japanese firms, it is now possible to draw conclusions on the future outlook as well as to confirm how personnel management systems have changed in the workplace as a result

of the diffusion of ICT. At the same time, we will need to scrutinize the relation between ICT and the change towards individualized, performance-based personnel management by controlling other factors such as company size and industry sectors.

(3) Diffusion of ICT and atypical employment

As the adoption of atypical employment by firms is determined by many factors, it is difficult to say that it is determined solely by the diffusion of ICT. It is conceivable, however, that ICT, together with other factors, is further accelerating the use of atypical employment. For instance, a company may choose to employ a greater number of atypical employees to perform jobs that have been simplified by ICT and to fulfill the need to cut personnel costs and introduce greater flexibility.

In fact, it has been confirmed in Japan in recent years that employment of atypical employees and the practice of outsourcing is expanding with the diffusion of ICT (Japan Institute of Labour, 1997; SRIC Corporation, 2001). In particular, the number of woman employees in general clerical jobs is being reduced only to be replaced by atypical employees (Ministry of Labour, 1996). It has also been pointed out that there is a growing tendency for atypical employees to perform routine work that was previously a part of the responsibility of typical employees (Abe, 2001).

On the other hand, it is possible to deduce from new findings shown below that the abovementioned trend, in which the diffusion of ICT increases the number of atypical employees engaging in routine work, may subside in time. One of the findings shows that in recent years, not only is the number of atypical employees increasing, but there is also a growing demand for such employees to serve as core employees who influence firms' competitiveness (SRIC Corporation, 2001). In Japan, atypical employees' work is expanding to include specialized, technical work as well as managerial work, and a growing number of people who register with temporary employment agencies are not clerical assistants and secretaries as was the case before, but people with specialized knowledge on IT, medical care, and finance. These trends most indicate that replacement and adjustment of clerical staff has virtually been completed.

If it holds that firms hire atypical employees for diversified purposes and that atypical employees are not employed to engage specifically in simple routine work, then it would not be possible to say that the diffusion of ICT promotes the employment of atypical employees. As ICT further spreads and the purpose for which atypical employees are employed changes, we will need to find whether the state of affairs has diverged from previous trends.

III. The effect of ICT on white-collar workers' workplace in Japan

In the section below, we present the results of the questionnaire survey of white-collar workers in Japan as mentioned above. The survey covers employees engaged in sales, management planning, personnel affairs, accounting, and research and development for firms that employ more than 100 employees. We were able to obtain response from about 1,200 employees[2].

(1) Diffusion of ICT in workplaces

Before analyzing ICT's impact on corporate personnel management and white-collar employees' work, let us make an overview of how much ICT has penetrated the workplaces of white-collar workers in Japan.

The most widely used ICT among white-collar workers is the PC. When we asked full-time regular employees about the penetration of PCs in the workplace, 18.5 percent replied that the penetration rate was "80 to 99 percent" and 45.6 percent said it was "100 percent or more" (meaning at least one PC for each employee), indicating a high penetration rate of PCs in the workplace. When we asked when the penetration rate of PCs reached 80 percent to full-time regular employees working in an office with at least 80 percent penetration rate, about 60 percent responded that it was after 1998. This shows that ICT rapidly spread in white-collar workers' workplaces in Japan only in the last several years.

We surveyed the extent to which white-collar workers' PCs were connected to networks. On the question of LAN (local area network), 87.4 percent of the respondents said their computer was connected to LAN, while only 6.4 percent said theirs were not. On the question of when the PCs were connected to LAN, the majority of respondents replied that it was after 1998. The percentage of respondents whose PC was connected to the Internet and respondents who were provided with an e-mail address were both around 80 percent. At many workplaces, Internet connection and allocation of e-mail addresses were started after 1998 with the introduction of PCs.

(2) Changes in white-collar employees' work and workplaces

① Changes in work

How is the content of white-collar employees' work changing with the diffusion of ICT in the workplace? We categorized workplaces with less than 40 percent PC penetration rate for full-time regular employees as "low penetration" workplaces and those providing at least one PC for each full-time regular employee as "high

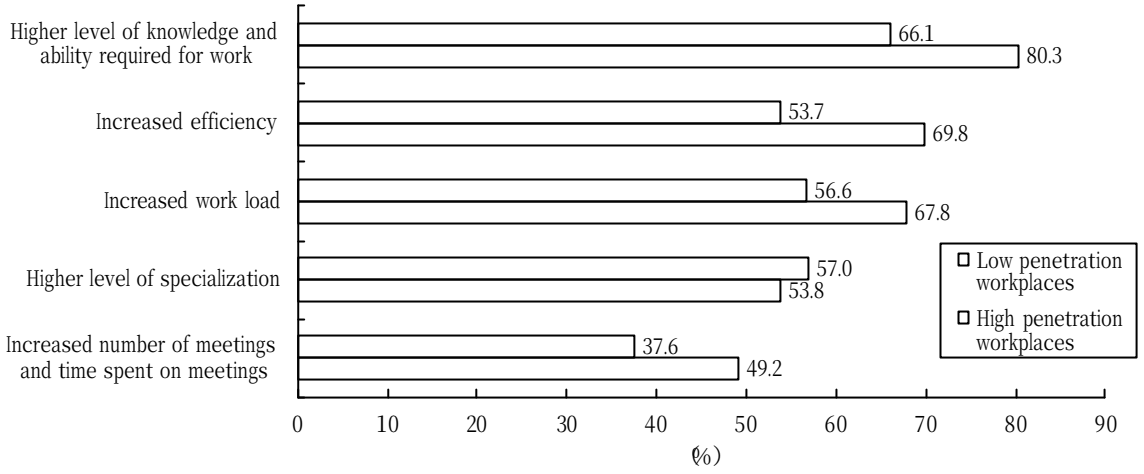
penetration" workplaces, and compared the changes in the content of work in each type of workplaces in the last three years (1999-2001).

The variance between the two types of workplaces was the largest with respect to the changes in the volume of "core jobs of management and planning" and "jobs requiring specialized knowledge or skills." At "low penetration" workplaces, 33.1 percent of the respondents answered that there was an increase in the volume of "core jobs of management and planning," while at "high penetration" workplaces, 49.4 percent of the respondents gave the same reply. As for "jobs requiring specialized knowledge or skills," about 50 percent of the respondents in "high penetration" workplaces said there was an increase in the volume of such jobs, which was about 10 percent higher than the percentage of respondents giving the same answer in "low penetration" workplaces. With regard to other types of jobs, the increase in "irregular temporary jobs" differed slightly by PC penetration rate at workplaces, and the percentage of respondents who replied such jobs increased was high among employees of "high penetration" workplaces. With respect to "jobs for assisting in core jobs" and "regular routine jobs," however, there was no difference depending on the PC penetration rate.

Secondly, with respect to changes in the quantity and quality of work in the last three years, the changes mentioned often by respondents in all categories were higher level of knowledge and ability required for work, increased efficiency in carrying out work as a result of ICT, an increase in the work load, and higher level of specialization. With the exception of "higher level of specialization," higher percentage of respondents in "high penetration" workplaces mentioned the above changes (Diagram 1).

The above results show that the trend pointed out by past studies conducted in Japan that the diffusion of ICT would gradually make the nature of work more sophisticated is continuing unchanged in recent years. In addition, the diffusion of ICT promotes efficient execution of jobs. At the same time the work efficiency is improved, however, individual employees' work load at workplaces with high penetration of ICT is expected to increase more than at other categories of workplaces. This gives rise to concern for excessive increase in the work load.

Diagram 1: Changes in work in the last three years by PC penetration rate (MA)

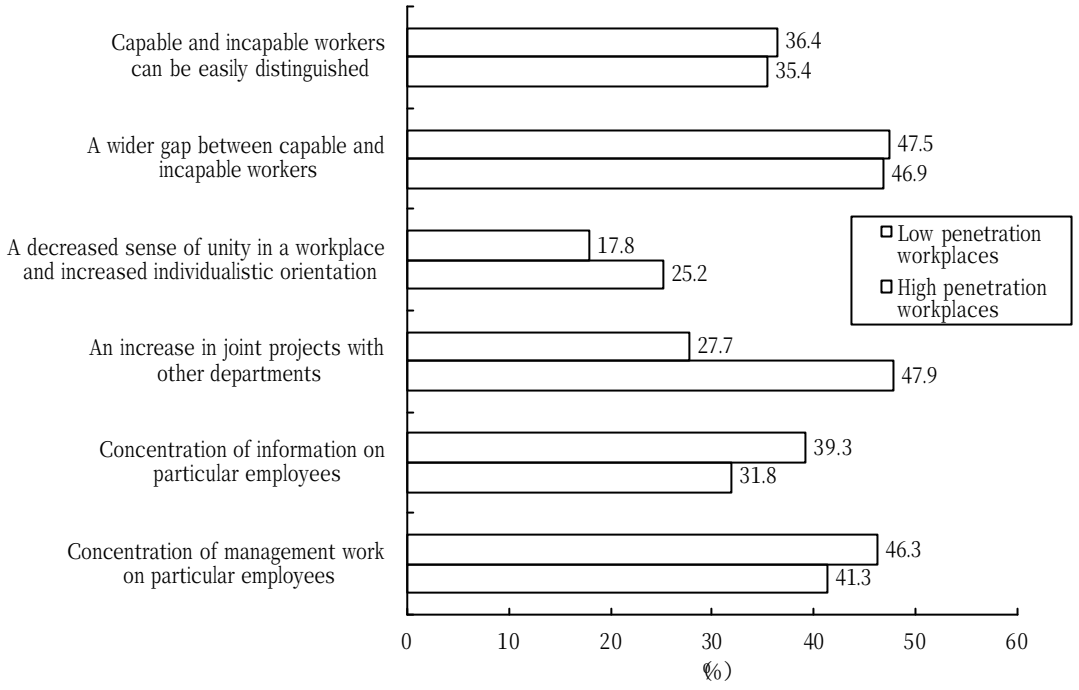


② Effect on the workplace

How then is the introduction of ICT affecting the workplace (Diagram 2)? The results of our survey show that as the penetration of PC rises, there is an increase in joint projects with employees in other sections and departments. About 50 percent of the respondents in "high penetration" workplaces, whereas about 30 percent of respondents in "low penetration" workplaces observed this trend in the last three years. Additionally, 25.2 percent of employees in "high penetration" workplaces and 17.8 percent of those in "low penetration" workplaces said the sense of unity within the workplace weakened while individualistic orientation was strengthened. These results suggest that while opportunities for members of a workplace to work together on a common project will gradually decrease with the diffusion of ICT, opportunities for working on a joint project with employees in other workplaces will increase.

The tendency for the diffusion of ICT to result in exposing a gap in the abilities of employees at a workplace and hence change the way in which jobs are performed could not be observed in this survey. In both "high penetration" and "low penetration" workplaces, the percentage of respondents who answered that the gap between the ability of workers widened in the last three years and that it was easy to distinguish between workers who performed well and workers who did not was virtually the same. Similarly, the percentage of respondents who said that the work involving scheduling and managing projects was concentrated on particular employees was around 40 percent regardless of the PC penetration rate.

Diagram 2: PC penetration rate and changes in the workplace (MA)



③ Abilities that will be required with the diffusion of ICT

We have already confirmed above that the nature of white-collar employees' work is becoming more sophisticated with the diffusion of ICT and that higher level of knowledge and ability is required. Specifically what kind of professional skills is now required among white-collar workers?

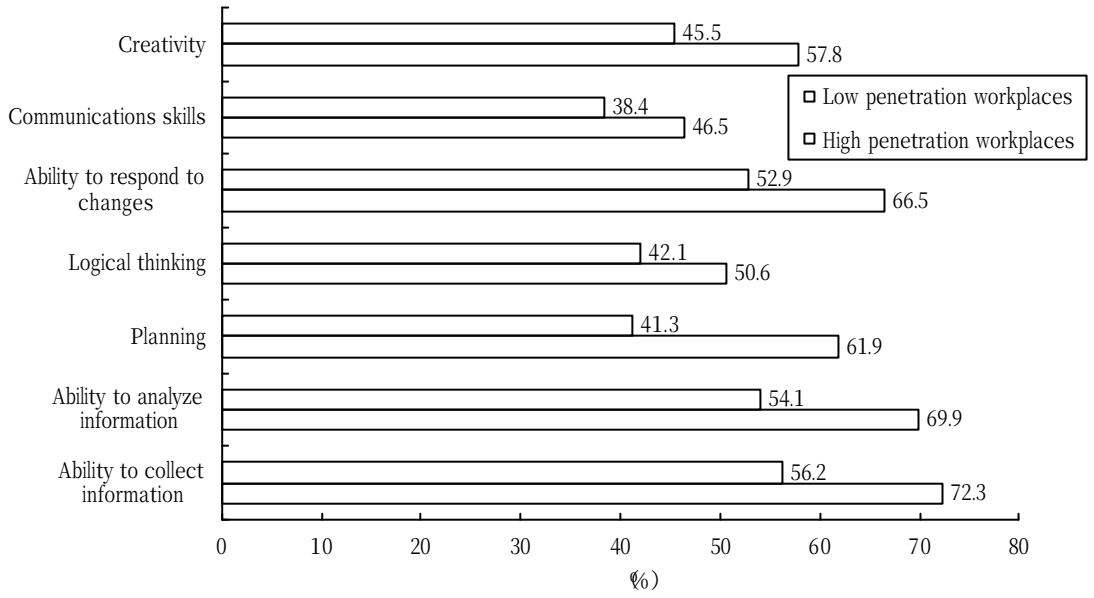
Many respondents mentioned the ability to collect necessary information for carrying out work, the ability of analyzing information, and the ability to respond to changes as skills that became increasingly important in the past three years. About 80 percent of the respondents also said that these skills would continue to be important in the coming years. Close to 80 percent of the respondents also stated that creativity for generating new ideas and the ability for planning would become more important in the future.

The percentage of employees who recognized the rising importance of different skills in recent years and for the future was higher among those working in "high penetration" workplaces. In particular, with respect to the ability to draw up plans, to collect information, and to analyze information, there was a large gap in the percentage of employees who recognized their rising importance in "high penetration" and "low

penetration" workplaces (Diagram 3).

These results indicate that as ICT spreads in the workplace, employees would be required not only to have the skills to operate ICT, but more importantly to have the ability to effectively utilize ICT as a tool for addressing various issues related to work. Conversely, a worker's chances for gaining favorable employment opportunities once ICT has spread will depend on whether the worker is able to acquire the ability to fully utilize ICT in this broad sense.

Diagram 3: Abilities of growing importantance in the last three years (MA)



④ Problems related to work and workplaces with the Diffusion of ICT

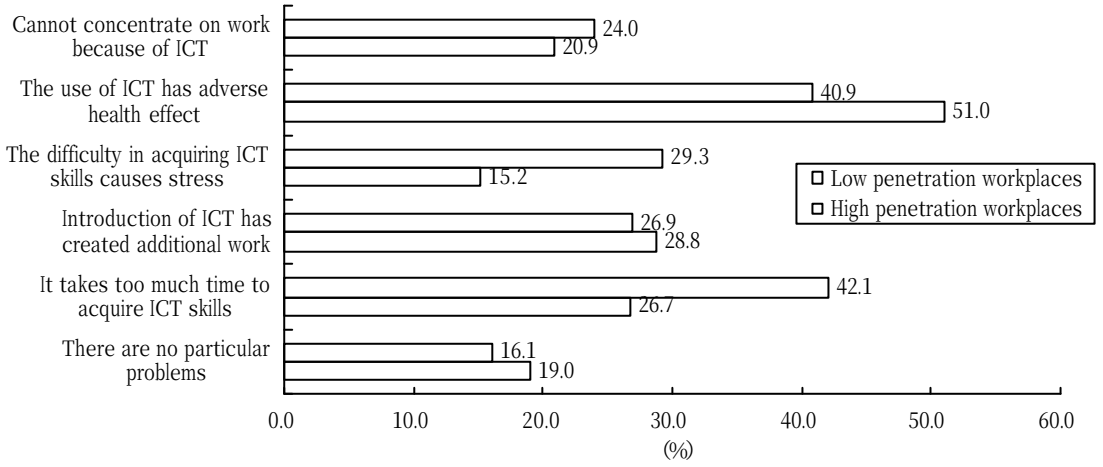
We have thus far examined the changes brought about by the diffusion of ICT on work and workplaces. It is also evident that many workers feel that these changes are causing problems. In our survey, only about 20 percent of the respondents felt that the diffusion of ICT had not caused any particular problem, while more than 80 percent of the respondents said there were. In particular, about a half of all respondents mentioned that continuous use of ICT during work had a negative effect on their health. Moreover, not a few workers felt that it took too much time to acquire the skills to use ICT and that the diffusion of ICT had created additional work.

Problems arose differently depending on the penetration of ICT in workplaces. At "low penetration" workplaces, the percentage of workers who said acquiring skills for ICT took too much time and the percentage of workers who mentioned adverse effect on

health was about the same. Moreover, a larger percentage of employees felt stress from difficulty in acquiring ICT skills than in "high penetration" workplaces. At "high penetration" workplaces, on the other hand, about a half of the respondents replied that the use of ICT for work had a negative effect on their health, but the number of employees who had trouble acquiring ICT skills was relatively small. The percentage of workers who felt that the diffusion of ICT had not caused any problem was about the same in both categories of workplaces (Diagram 4).

The above results suggest that firms and offices of low ICT penetration rate with plans to introduce ICT in greater scope in the future will need to provide sufficient ICT training and mental support for employees during the process of introduction, because there is a significant risk that introduction of ICT may decrease work efficiency and motivation to work. Similarly, at workplaces with high penetration of ICT, firms will need to take appropriate steps in personnel management so that the changes in the working environment and increase in employees' work loads as a result of introduction of ICT do not have an adverse effect on employees' health.

Diagram 4: Problems caused by the spread of ICT (MA)



(3) Evaluation and treatment of white-collar workers

① Review of systems of employee evaluation and treatment

Against the backdrop of prolonged economic recession and uncertainty of the business climate, Japanese firms have been abolishing, in the last ten years, a system of employee evaluation and treatment that is based on seniority and length of service and replacing it with a new system that focuses more on employees' ability to execute work

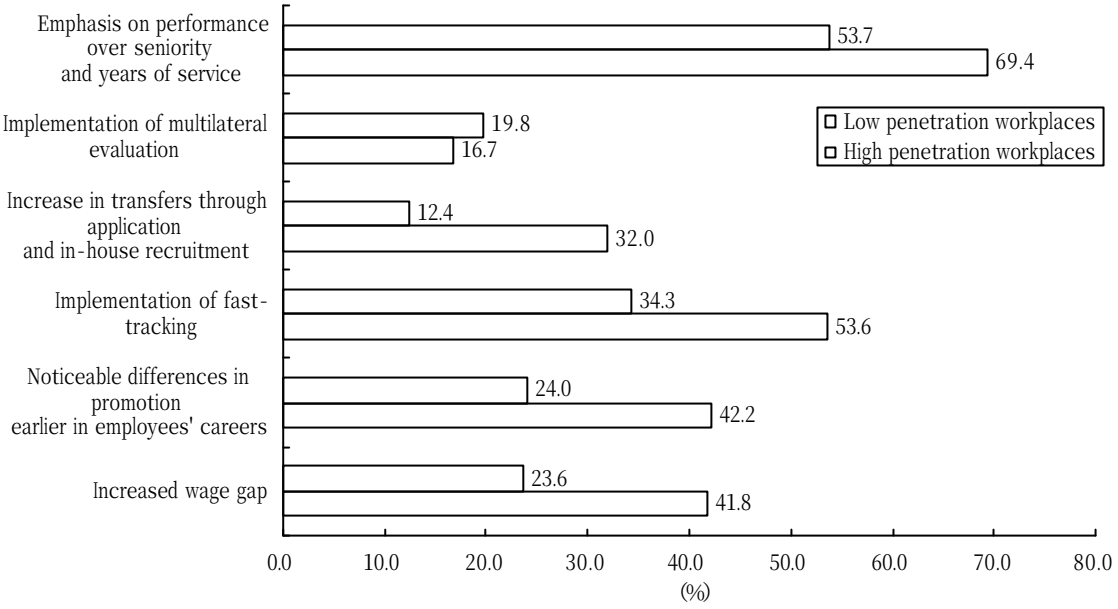
and their performance.

In our survey, the largest percentage of respondents, who made up about half of all respondents, mentioned an increasing emphasis on performance over seniority and length of service as a criterion for employee appraisal as a change in firms' personnel evaluation and treatment practices in the last three years. Other changes that many respondents pointed out were a growing wage gap among employees, fast-tracking of employees, and noticeable differences in promotion earlier in employees' careers. All of these changes contribute to widening the differences in treatment of employees.

As we have already seen, ICT may become an effective tool in highlighting differences among individual employees. Existing studies in Japan have also shown that a large number of workers foresee the diffusion of ICT as promoting this trend. The results of our survey indicate such forecast to be valid. The percentage of respondents in "low penetration" workplaces who said there was an increasing emphasis on performance over seniority and length of service as a criterion for employee appraisal was 53.7 percent, while the percentage of respondents giving the same response in "high penetration" workplaces was higher at 69.4 percent. Moreover, the percentage of respondents who replied that there were moves to promote differences among employees in terms of promotion and wages was also higher among respondents in workplaces with high PC penetration (Diagram 5).

One of the reasons ICT advanced firms are reviewing their system of employee evaluation and treatment in ways that will better reflect the difference in employees' performance is that ICT can be used as an effective tool for evaluation. On the other hand, it can also be said that the changes in work brought about by introduction of ICT are also promoting this trend. At workplaces with high penetration of ICT, workers are required to have a higher level of knowledge and skill in the performance of their work, and it is becoming increasingly important that they have the ability to plan projects and exercise their creativity. As such, it is likely that the differences in employees' performance will become evident more readily, while factors such as age and length of service weigh little in employees' performance. It can be interpreted, therefore, that ICT advanced firms are setting up systems of employee evaluation and treatment that reflect employees' performance without regard to their age or length of service in anticipation of the changes in the nature of work.

Diagram 5: Changes in the system of employee evaluation and treatment (MA)



② Disclosure of personnel information

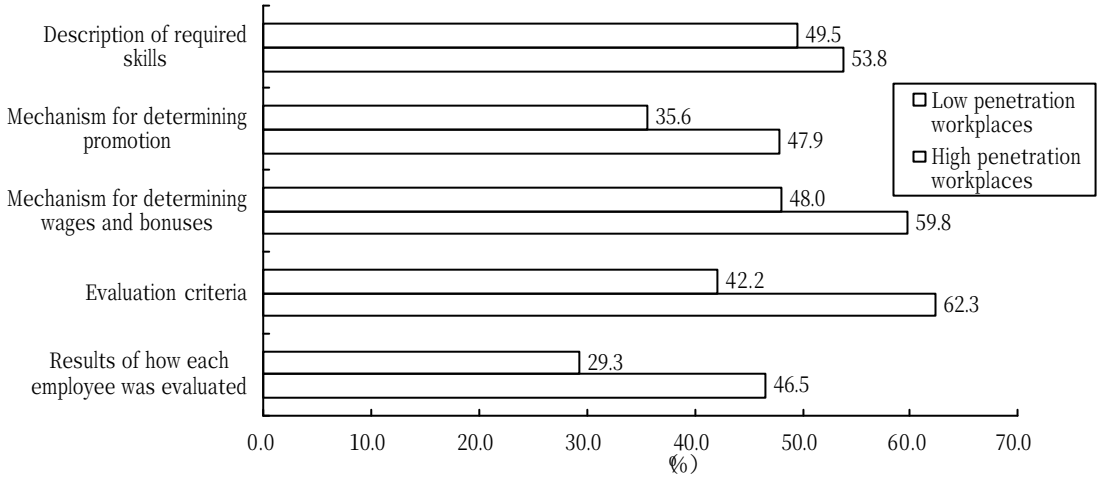
When implementing a system of employee evaluation and treatment that emphasizes employees' performance and ability over their age or length of service, it is particularly important that the agreement or understanding of individual employees is obtained regarding their assessment and treatment. In this regard, disclosure of personnel information on evaluation and treatment is one of the measures that should be employed. In our survey, we tried to clarify the extent to which personnel information is disclosed at workplaces that are moving towards adoption of a system of performance-based employee evaluation and treatment. We also attempted to find the relation between the extent of information disclosure and the diffusion of ICT.

About 50 percent of the respondents said that criteria for evaluation were disclosed in their workplaces, while about the same percentage of respondents stated that the mechanism for determining wages and bonuses was disclosed. In comparison, the percentage of respondents who replied that results of individual employees' assessment were communicated to the assessed employees and that the mechanism for determining promotion was revealed were slightly lower at around 40 percent. The degree of disclosure, with some exceptions, is proportionate with the PC penetration rate at the workplace (Diagram 6). In particular, there is a large gap between "high penetration" and "low penetration" workplaces in the percentage of respondents who answered that

criteria for personnel appraisal were disclosed and that the results of the appraisal were revealed to the appraised employees.

The reason more information is disclosed in "high penetration" workplaces is not because ICT is more established within such workplaces as a communication tool. For example, the percentage of respondents who had the results of their assessment revealed to them through the use of ICT only accounted for 2.3 percent even at "high penetration" workplaces. It would be more appropriate to say that a progress in disclosure of information on employee evaluation and treatment has been made because it is recognized as an effective method for gaining the agreement or understanding of employees at "high penetration" workplaces where a system of performance-based assessment and treatment is more widely introduced.

Diagram 6: Disclosure of personnel information (MA)



③ Acceptance of evaluation and treatment

To what extent do white-collar workers feel how they are assessed and treated to be acceptable? The changes in the acceptance of their assessment and treatment in the last three years were summarized in Table 1. The figures in the table were obtained by subtracting the percentage of respondents whose acceptance of assessment and treatment "declined" in the last three years from the percentage of respondents whose acceptance "increased."

The percentage of respondents with higher acceptance was greater than the percentage of respondents with lower acceptance only with respect to setting of goals. For other items on assessment, income, and so on, there were more respondents whose

acceptance decreased. This trend was observed in both "high penetration" and "low penetration" workplaces. The only difference was that the degree of disapproval was less at "high penetration" workplaces.

From what we have learned so far, the trend towards evaluating employees based on performance was more advanced in "high penetration" workplaces than in "low penetration" workplaces. It would not have been surprising, therefore, if there were more employees who were dissatisfied with introduction of a new system of evaluation and treatment that was different from the past system. In reality, however, there were less dissatisfied employees at "high penetration" workplaces than at "low penetration" workplaces. This is probably because efforts were being made at "high penetration" workplaces, at the same time the system of evaluation and treatment was reviewed, to gain the understanding of employees through disclosure of information.

Table 1: Changes in acceptance of assessment and treatment (1999-2001)

	High penetration workplaces	Low penetration workplaces
Acceptance on setting of goals	16.1	19.0
Acceptance on the results of assessment	−0.7	−4.6
Acceptance on how the results of assessment are reflected on treatment	−2.1	−12.4
Acceptance on current income	−13.9	−26.9
Acceptance on evaluation of efforts that did not show on performance	−14.3	−15.7

(4) Utilization of atypical employment

Atypical employees (part-time employees, limited-term contracted employees, temporary employees, and dispatched employees) are employed at many of the workplaces for which the white-collar workers who participated in our survey work. About 70 percent of our respondents said there had been atypical employees in their workplaces since 1999. On the question of jobs undertaken by atypical employees, the highest percentage of respondents mentioned routine jobs and assistance for performance of core jobs. On the other hand, not a small percentage of respondents, at about 30 percent, replied that atypical employees were engaging in jobs requiring specialized expertise and skills. As mentioned earlier, as employment of atypical

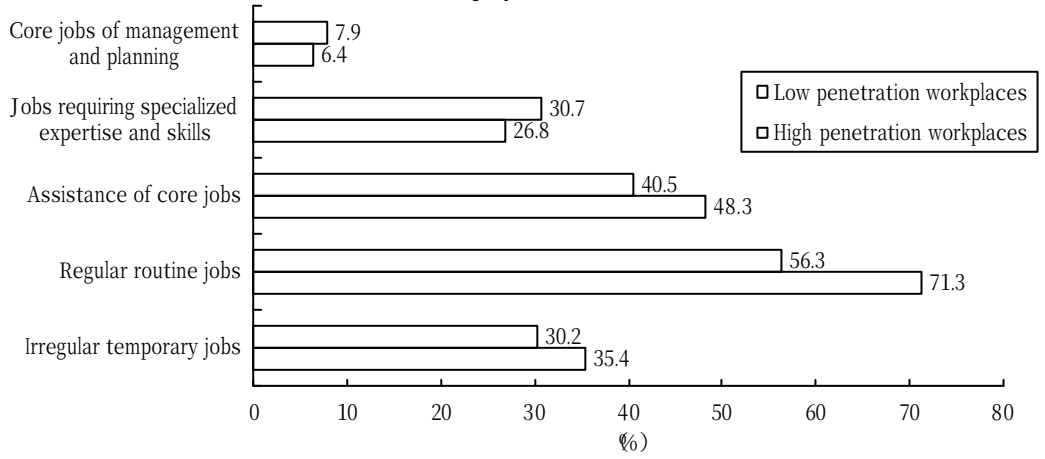
employees is becoming an established practice among Japanese firms, these firms are hiring them not only for routine and auxiliary jobs as before, but increasingly for jobs for which the firms' regular employees do not have the appropriate vocational capacity to perform.

Does the diffusion of ICT have any effect on the hiring of atypical employees and on the types of jobs they are employed to perform?

On the employment of atypical employees, 88.8 percent of respondents at "low penetration" workplaces said atypical employees had been employed in their workplaces since 1999. In comparison, 75.3 percent of respondents at "full penetration" workplaces gave the same response. In other words, the percentage of respondents who replied atypical employees had been employed declined as the PC penetration rose. The results of our survey show that the employment of atypical employees tends to decrease at ICT advanced workplaces.

On the question of the jobs performed by atypical employees, 71.3 percent of respondents at "high penetration" workplaces answered that atypical employees were engaged in "regular routine jobs," while 56.3 percent of respondents at "low penetration" workplaces responded likewise. The percentage of respondents who said they were responsible for "jobs for assisting in core jobs" were also higher among employees in "high penetration" workplaces (Diagram 7). It can be said that atypical employees are more likely to be engaged in auxiliary marginal jobs at ICT advanced workplaces.

Diagram 7: PC penetration rate and jobs undertaken by non-regular employees (MA)



It can be surmised from the above results that introduction of ICT accelerated the speed of routinization and simplification of jobs at ICT advanced workplaces. It is

conceivable that the move to replace regular employees with atypical employees for performance of some of the jobs was started earlier at such ICT advanced workplaces. However, once quantitative and qualitative adjustment of jobs was completed, the number of atypical employees was gradually reduced. It is also probable that atypical employees, who were already employed in large numbers in ICT advanced workplaces, were subjected to displacement as a result of the prolonged recession, which further promoted the reduction in the number of atypical employees. On the other hand, it can be said that at "low penetration" workplaces where ICT has not yet spread as much, ICT is currently being introduced, the attendant job reorganization is being carried out, and atypical employees are being actively employed.

IV. Summary

What effect does the diffusion of ICT have on work, workplaces, and firms' personnel management? And what problems might arise as a result? In this paper, we have given answers to these questions through a survey conducted on white-collar workers in Japan. Obviously, more detailed analysis is required to elucidate the impact of ICT even if we were to restrict our subject to the white-collar workers in our survey. Nonetheless, a summary of the results of the survey and examination of their implications would not be futile in our effort to understand the relation between ICT and decent work.

In a clear link with the introduction of ICT, the importance of core jobs of management and planning and jobs requiring specialized expertise and skills is rising at the workplaces of white-collar workers in Japan. The workers who are assigned to such jobs are regular employees who are called "*sei-shain*" in Japanese (full-time employees who have concluded an employment contract with their firm without specifying the term of employment). For other atypical employees, the likelihood of being asked to engage in routine or auxiliary jobs increases as progress is made in introducing ICT in a workplace. This trend, however, is expected to continue only up to a certain point. In our survey, there were indications that when advancement of ICT in a workplace reaches a certain point, auxiliary jobs are absorbed in ICT as one of its functions and the jobs undertaken by atypical employees will be diversified. Analysis on the impact of ICT on atypical employees is limited in this paper, but we should focus more on examining its impact on regular employees. It may be added that considering the increase in atypical workers in advanced countries, the question related to the

impact of ICT on atypical workers is expected to become an important research topic in the future.

With the changes in employees' jobs, the abilities required in white-collar workers are also changing. As white-collar workers are more likely to engage in advanced jobs as a result of introduction of ICT, they are required to have the abilities particularly for planning and for collecting and analyzing information. This means the diffusion of ICT not only requires workers to be able to use PC software, e-mail, and the Internet, but also to have creativity and the ability to solve problems using ICT. The question of whether workers will be able to acquire the ability to utilize ICT in this broader sense is crucial to workers working in an ICT environment. On the other hand, there are workers who feel stress because of the difficulty in acquiring this ability, particularly in workplaces in which ICT has just begun to be introduced. There are also many workers at workplaces where ICT has already been introduced who complain of health problems because while ICT has improved efficiency in performing work, it has also increased the work load. In creating favorable employment opportunities through the introduction of ICT, it will be essential for firms to deal with the personnel management issue of providing physical and mental care to workers when introducing ICT in workplaces.

Against the backdrop of the prolonged economic recession, intensification of international competition, and rising market uncertainty resulting from maturation of the consumer society, most Japanese firms have been reviewing their system of employee evaluation and treatment in the last ten years. In short, it is a move to change the mainstream system in Japan of evaluation and treatment that laid emphasis on employees' age and number of years of service to a new system that gives priority on individual employees' abilities and performance. Past surveys predicted that introduction of ICT and of a performance-based evaluation and treatment system would advance in parallel, and the results of our survey support this view. It should be noted, however, that this parallel advancement is not so much the result of the active use of ICT as a tool for employee assessment and treatment promoting the introduction of a performance-based system. Rather, firms are reviewing their system of employee evaluation and treatment because the introduction of ICT has made work more sophisticated. This has brought greater variance in employees' performance and reduced the significance of such factors as employees' age and length of service.

As discussed above, the review in Japan of the system of evaluation and treatment in ways that better reflect individual employees' performance is more advanced in ICT advanced workplaces. Contrary to expectation, however, workers' dissatisfaction or

disapproval of the system change has been better contained at such workplaces compared to less ICT advanced workplaces. It can be surmised that this is because the system review has been coupled with introduction of systems of in-house transfer application and in-house staff recruitment and with disclosure of personnel information. Insofar as our survey has indicated, while workers' dissatisfaction or disapproval has been successfully checked at ICT advanced workplaces, it has not been possible to increase their approval of how they are evaluated and treated. For a new ICT-adaptable system of evaluation and treatment to win the positive approval of employees and become established as a useful system, there must be measures to secure fairness and other complementary measures.

(Notes)

[1] "atypical employees" covers part-time workers, dispatched workers, contract workers and so on.

[2] The subject of our survey was white-collar workers working for 1,500 Japanese firms, from all regions of the country, that had been established for more than 10 years and that had more than 100 employees. Three hundred firms were randomly selected in each of five company size categories (firms with 100 to 299 employees, 300 to 499 employees, 500 to 999 employees, 1,000 to 2,999 employees, and 3,000 or more employees), bringing the total to 1,500 firms. Seven copies of the questionnaire were sent to the personnel department of 1,500 firms. The personnel department of each firm was asked to distribute the questionnaires to white-collar workers in such departments as sales, personnel, strategic planning, and accounting. Ultimately, we were able to obtain 1,225 effective responses (effective response rate: 11.7 percent). The survey was conducted from March 4 to 16, 2002.

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