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Work Organization and Training Systems for Technical Employees: A Comparison of Japan, the U.K. and Germany*

By

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Abstract

Using a unique comparative survey of Japanese, German and U. K. firms, this paper examines the pattern of work organization and training systems for software development engineers. The results indicate that Japanese firms tend to organize software development work in teams more and use specialists on development projects less than German or U. K. firms. Also, task assignment is based less on technical considerations. With regard to training systems, Japanese firms place more emphasis on within-firm training and actually train a higher proportion of their software development engineers. Japanese firms' work organization and training patterns for technical white-collar workers follow what has been described for production workers.

Key Words

human resource management, training practices, work organization, R & D workers, international comparison, Germany, Japan, United Kingdom

Introduction

This purpose of this paper is to compare firm practices and policies regarding work organization and training systems for technical employees—more specifically software development engineers—between Japan and two European nations, the United Kingdom and Germany. While team-based work organization with broad job categories and internal development of human resources are often cited as characteristics of the human resource system in large Japanese firms, most of these conclusions are based on in-depth case studies (Dore, 1973; Shimada and MacDuffie, 1986). Quantitative substantiation of differences between Japan and other countries has lagged behind the generalizations based on findings from the qualitative observations made in these studies (see Morishima, 1995 for a review).

Moreover, existing comparative research has almost exclusively concerned production employees in the manufacturing sector. Consequently, we know very little

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about how firms design the human resource system for their white-collar employees. However, as in many industrialized nations, the proportion of white-collar employment in Japan is increasing, and the importance of the human resource system for white-collar employees is also on the rise. Evidence must be accumulated on the differences between Japan and other nations in the human resource system for white-collar workers.

Conceptual Framework

There is an increasing acceptance of the notion that organizational technology and human resource management systems are closely intertwined (Shimada and MacDuffie, 1986; Morishima, 1995; Snell and Dean, 1992; Kochan and Osterman, 1993). The reasons for this interest almost always relate to the expectation of greater organizational effectiveness through the development of the fit between the design of work organization and sets of human resource practices that enable firms to derive maximum effectiveness out of the re-designed work organization. Thus, the expectation is that in order to be successful, firms create a correspondence between how work organization is structured, on one hand, and how human resource management systems are designed, on the other. Yet, except for a few notable studies (e.g., MacDuffie, 1995; Osterman, 1995), there has been very little empirical research on this relationship.

Human resources researchers have often relied on two theoretical models to explain the existence of the relationship between organizational technology and human resource management systems: human capital and human ware. The human capital model, originally developed in economics to study the economic value of education and training, has recently been applied to a variety of human resource management practices in general (Snell and Dean, 1992; Lazear, 1992).

In this framework, human resource management practices constitute investment in human capital and are justified only when the target employees produce future returns via increased productivity (Snell and Dean, 1992). Since firms are likely to undertake additional investments up to the point at which the marginal cost equals the marginal return, the extent of human capital investment (that is, in this case, human resource management practices) depends on the value of the contributions made by employees. According to the human capital framework, the value of the contributions made by employees is determined by the type of technology used in the production process. Thus, one major characteristic of the human capital model is that technology is exogenously determined and, in turn, determines the extent to which firms invest in human resource management practices. Figure 1-1 depicts the mechanism underlying the human capital model in producing the correspondence between technology and human resource management practices.

In contrast, the human ware model (Shimada and MacDuffie, 1986) takes the view that both technology and human resource management practices are jointly determined. This model presupposes that neither technology nor human resource practices precede the other. They are jointly determined to bring about the best possible economic performance. Authors such as Shimada and MacDuffie (1986) and Koike (1988) argue that organizations sometimes even employ less advanced technology to derive the maximum joint value of technology and human resources. More specifically, the level of automation is sometimes left rather unsophisticated in order to utilize the

contributions made by the discretionary work behavior of front-line employees (Koike, 1988).

Moreover, this model also assumes that there is a set of emergent strengths that appear as the result of interactions between organizational technology and human resource management practices (MacDuffie, 1995). It argues, therefore, not only that the value of human resource contributions is determined by technology but also that the value of technology is determined by the type of human resources the firm has the luxury of deploying. Thus, the correspondence between work technology and human resource management practices is created since firms attempt to design the two components as a consistent set to derive maximum joint outcomes of technology and human contributions. Figure 1-2 depicts this relationship.

Figure 1-1. Human Capital Model

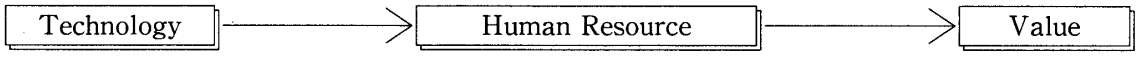
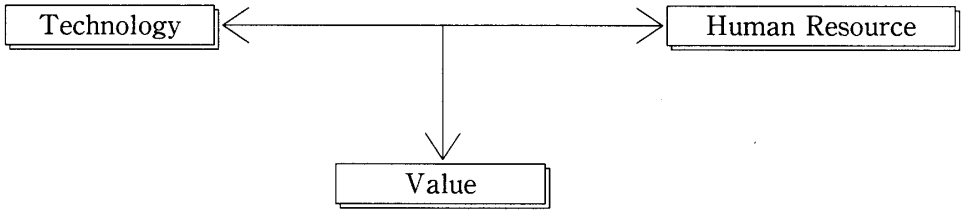


Figure 1-2. Human Ware Model



Team Organization and Human Resource Development

Among the many elements of work technology and human resource management practices, this paper examines the relationship between work organization and human resource development practices in three industrialized countries. Work organization, which refers to such aspects as the degree to which work is organized on the basis of teams, whether job specifications are narrowly or broadly constructed, and whether assignment of people to jobs is flexibly determined or not, is heavily influenced by the character of the training system and the type of skills it provides. In return, the design of work also influences the existence and nature of the training system within the firms by determining the type of necessary skills. For example, specifically-defined jobs with little team work may require high-level skills, but, due to standardization of work procedures, these skills may be obtained relatively easily in the external labor market. Team-based work with broad job categories often interrupts standardization of work procedures and requires employees to learn to conduct the work in a firm-specific way.

Recent researchers on Japanese human resource management have advanced a view that one key element of the Japanese system is the combination of team-based work organization with broad job categories, on one hand, and internal development of human resources, on the other (Shimada and MacDuffie, 1986; Koike, 1988; Morishima, 1995). According to these authors, the team design of work with broad job categories in Japanese firms has demanded high quality human resources with a wide

range of skills, which are supplied by internal training systems designed to improve employees' skills throughout their careers. Such a system is often contrasted with a human resource system where work is designed specifically for individual workers and does not demand an internal training system to broaden and upgrade employee skills continuously.

Thus, a key issue examined in this study is the relationship between team-based work organization with broad job categories and extensive internal training systems for highly technical white-collar workers such as software development engineers in Japan, in comparison to other nations. Data used in this study were obtained from a unique comparative survey of firm practices for software development engineers in Japan, the U.K., and Germany. Software development engineers are those employees charged with the task of designing, programming and testing the company's software. These employees occupy higher positions than simple programmers, as the quality of these employees determines the competitiveness of software development firms. Human resource management regarding these employees, therefore, is likely to be a competitive concern for firms in this industry.

Data

The data were collected as part of a larger comparative study of software development effectiveness in Japan, the U.K. and Germany. The questionnaires included a series of questions related to the human resource systems within firms. Only the portion of the data relevant to the present interest will be analyzed here.

In the Summer and Fall of 1993, questionnaires were sent to 100 software development firms in each country. Lists of software development firms, obtained from industry associations in these countries, provided the populations from which samples were drawn. Software development firms were defined, for this study, as those engaging in software development as one of the major lines of business and employing at least 50 software development engineers. To increase sample homogeneity, small firms which employ fewer than 50 software development engineers were excluded in the sampling process. In Japan and the U.K., the survey was conducted with endorsements from these countries' industry associations, and in Germany with no such official endorsement. The difference is clearly reflected in the response rate: 70% in Japan, 59% in the U.K., and 17% in Germany. On average, the sample firms employed 208 software engineers (Japan=265, U.K.=146, Germany=224). Most of the Japanese firms were affiliated larger computer hardware manufacturers (78%), while most of the U.K. and German firms were independent software developers (84%).

The questionnaires for this study were constructed using information collected from published sources and pilot interviews conducted in Japan, the U.K., and Germany. Since Japan was the main focus of comparative analyses, the questionnaire was initially written in Japanese, and translated into English and German later. The English and German versions were checked for face validity by software development engineers in each country. The exact translation/back-translation procedure was not followed, since the questions almost always tapped on factual aspects of the HR system. Two researchers who were familiar with all three languages and software development worked on the comparability of questions and finalized the questionnaires.

Table 1. Work Organization[a]

No. of Firms Surveyed	Japan 70	Germany 17	U. K. 69
Team Organization			
Q1: Degree to which information sharing among project members is emphasized[b]	3.32	1.93	2.44
Q2: Degree to which coordination among project members is important	3.47	2.80	3.15
Q3: Degree to which task assignments among members are interchangeable	3.49	2.73	3.06
Q4: Degree to which members work on the same task collectively	4.67	2.73	3.55
Job Specificity and Role Specialization			
Q5: Degree to which job contents are specified in written form	2.91	2.53	2.33
Q6: Degree to which members are clearly informed of what their duties are prior to beginning their task assignment	2.82	2.46	2.18
Q7: Degree to which specialists are used in project teams	4.65	5.64	5.49
Q8: Degree to which the firm attempts to hire experts/specialists	2.97	4.07	4.77
Q9: Degree to which employees' job specifications are considered in task assignments	3.66	5.07	4.52
Q10: Degree to which the match between employee qualifications and project characteristics is considered in task assignments	3.09	4.76	3.88
Reward System			
Q11: Degree to which individual performance is the basis of reward	2.32	3.60	3.38
Q12: Degree to which group (project) performance is the basis of reward	4.43	2.00	2.53

Note: a. All questions used 7-point scales.
b. In all questions, target employees are specifically defined as software development engineers.

Table 2. Amount of Training Provided by the Firm[a]

No. of Firms Surveyed	Japan 70	Germany 17	U. K. 69
Q1: Degree to which internal HRD is emphasized[b]	5.27	3.14	3.02
Q2: Degree to which OJT is used for training	4.93	4.14	4.97
Q3: Degree to which Off-JT is used for training	3.75	5.73	3.46
Q4: % of employees eligible for internal training	93.5	53.0	47.4
Q5: % of employees who receive company-provided Off-JT programs	89.6	55.6	64.3
Q6: No. of days of Off-JT per year per employee	5.0	2.5	3.4
Q7: No. of areas in which training is provided by the firm (out of 10 listed in the question[c])	8.2	2.5	5.1
Q8: Degree to which training is offered as part of a pre-scheduled company program	4.55	2.27	3.07
Q9: Degree to which individual employees can choose training content	2.56	4.00	4.25

Note: a. All questions used 7-point scales, unless otherwise indicated.
b. In all questions, target employees are specifically defined as software development engineers.
c. The ten were: programming, project control, product knowledge, customer and industry, decision making and leadership, interpersonal communication, budgeting, marketing and legal issues.

Results

Work Organization

Results of the survey relevant to our research question are shown in Tables 1 and 2. The results in Table 1 show the differences in work organization among the three countries. Regarding team organization, the hypothesis is that Japanese firms tend to show higher levels of team organization than firms in other countries. Team organization[1] was measured by four questions on the degree to which: information sharing is emphasized among project members, coordination among project members is important, members' task assignments are interchangeable, and members worked on the

[1]Preliminary interviews indicated that software development is mostly conducted in five- to 10-member project groups. Thus, our questions mainly refer to the degree to which team organization is used in these groups.

same task collectively. Higher numbers indicate that firms have higher levels of each characteristic.

As expected, the general pattern of results shows that Japanese firms tend to more greatly emphasize information sharing among members and consider coordination important. In addition, tasks were more interchangeable and not as clearly separated among members. The most significant differences were shown in the degree to which information sharing is emphasized and task separation among project members exists.

The next area examined was the extent to which job definitions are specific and member roles are specialized. The specificity of job content was examined by two questions: the degree to which job duties are clearly specified in written form and that to which employees are told exactly what they are supposed to do in each project. The hypothesis is that Japanese firms would show lower degrees of specificity. The results, however, do not corroborate this hypothesis, showing relatively small differences between countries. Japanese firms are as likely as U.K. and German firms to specify the job contents of software development engineers.

The next two questions tap on the use of specialists. Specialists were defined in the questionnaire as those employees who have special qualifications in some area related to software development. The first question refers to the degree to which specialists are used in projects, and the second to the degree to which the firms prefer to hire specialists. The differences between the two questions are interesting. In terms of assignments to projects, Japanese firms are only slightly less likely than German or U. K. firms to use specialists. However, these specialists appear to be made internally, since Japanese firms are much less likely to emphasize hiring specialists than firms in the other two countries.

In the next two questions (Q9 and Q10), the degree to which employees' job specifications and project characteristics are used to allocate individuals to task assignments in software development projects was examined in two different ways. Japanese firms appear to pay much less attention than German and U.K. firms to job specifications and project characteristics in assigning individuals. Task assignments in Japanese firms appear to be made on the basis of some other factors.

Thus, the overall conclusion in the job specification and role specialization section is that while Japanese firms specify job contents and use internally-bred specialists in projects, task assignments are not necessarily based on the contents of employees' jobs and on the match between their qualifications and project characteristics. These findings raise questions about the role that job specification and role specialization play in the Japanese human resource management system. There is a debate regarding whether Japanese firms do specify job contents clearly and develop specialists (see, for example, Koike, 1993), or leave job contents unspecified and attempt to develop generalists (see, for example, Ishida, 1990). The present results indicate that while Japanese firms may specify job contents and develop specialists, they do not utilize the match between specific jobs and specialized skills to make task assignments.

Finally, as part of work organization, the degree to which individual and group performance are used as bases for employee reward was examined by the last two questions in Table 1. As expected, individual performance is more emphasized in the U.K. and Germany, whereas group (project) performance is emphasized more in Japan. The difference is more pronounced in the result regarding emphasis on group performance. Some authors (for example, Lawler, 1990) have argued that Japanese team

work organization is supported by a reward system with relatively higher emphasis on group performance. The results in this study indicate that this may be true, although individual performance is not entirely ignored in Japan.

Training System

The training systems of the Japanese, U.K. and German firms were examined by questions on the extent to which internal training was provided. Results are shown in Table 2. The first question refers to the extent to which the firms emphasize internal development of human resources. Internal development was defined as efforts to provide necessary skills through firm-provided OJT and Off-JT, rather than through external mechanisms such as educational and training institutions, and other firms. As expected, the Japanese firms place much higher importance than German or U.K. firms on the internal development of human resources. While Japanese firms' tendency to develop their human resources internally has often been pointed out in previous literature (Koike, 1993), the data indicate that the same tendency exists even for highly technical workers such as software development engineers.

The next two questions refer to the use of two types of training methods, OJT and Off-JT. The results indicate that OJT is emphasized by firms in all three countries with similar strength. Japanese firms are not different from those in the other countries. In contrast, the emphasis on Off-JT is pronounced in Germany and relatively weaker in Japan and the U.K. German firms appear to consider Off-JT an important method of training their software development engineers. Firms in Japan place a relatively stronger emphasis on OJT than Off-JT.

The next four questions turn to more objective measures of internal training provided by the firm (although the information is still obtained from the questionnaire). With regard to the percentage of employees eligible for internal training, a large difference exists. On average, 94% of the Japanese software development engineers are eligible for internal training, whereas in Germany only 53% and in the U.K., 47%, are eligible. Similarly, with regard to the percentage of software development engineers who receive company-provided Off-JT, the Japanese firms stand out from firms in the other two countries. Thus, Japanese firms consider a much larger proportion of employees as eligible for internal training and also actually offer Off-JT programs to them. The difference between Japan and the other two countries, when combined with previous findings, suggests that firms in the other two countries hire "specialists," trained and qualified individuals who need no further training and, therefore, do not classify them as "eligible" for internal training.

The next two questions refer to the actual extent of internal training and corroborate these findings. First, the average number of days of Off-JT is 5 per year per employee in Japan, as opposed to 2.5 in Germany and 3.4 in the U.K. Second, the number of areas covered by training is much wider in Japan, with an average of 8.2 areas out of 10, as opposed to 2.5 in Germany and 5.1 in the U.K. The results for Germany are interesting given that German firms place a very high level of importance on Off-JT as shown in the answers to question #3. It may be that German firms often contract out their training to external institutions which provide training only in a small number of areas, as suggested by previous authors (Kochan and Osterman, 1993). Also, although not shown in Table 2, the data indicated that in Japanese firms, non-technical areas such as decision-making and leadership, marketing and legal issues

were as likely to be taught by firms as more technical areas such as programming and project control skills. In contrast, German and U.K. firms were unlikely to choose issues that were not directly related to software development.

Finally, the last two items tap on the characteristics of the training programs. The results regarding the first question indicate that Japanese firms tend to offer their internal training as part of a pre-scheduled company training program. It has been noted that Japanese firms offer a well-planned training schedule for their employees throughout their careers (Imano, 1993). The present results are consistent with this view. Consequently, as the answers to the last question in Table 2 indicate, employees are not likely to have much choice in what they are trained. The degree to which individual employees can choose their training content is much smaller in Japanese firms than in firms in the other two nations. Extensive internal training in Japanese firms is offered as part of pre-scheduled, pre-packaged training programs.

Conclusions

This study compared general patterns in work organization and training systems in Japan, the U. K. and Germany, mainly with an intent to describe the differences between Japan and the other two countries. Unlike previous research in comparative human resource management which has often used production workers in the manufacturing sector for comparison (Shimada and MacDuffie, 1986), the focal employees chosen for comparison in this study were software development engineers.

Yet, the analyses presented in this study generally indicate the existence of team-based work organization and high degrees of pre-scheduled internal training in Japanese firms, relative to firms in the U.K. and Germany. Japanese firms are more likely than German and U. K. firms to respond that their software development project members need information sharing and coordination, that member roles are interchangeable, and that members often worked on the same task collectively. These are quite similar to team production concepts often associated with Japanese manufacturing. Japanese firms also reported lower tendencies to hire specialists and use employee qualifications and project characteristics (and the match between the two) as the basis for task assignment.

In addition, Japanese firms reported higher degrees of emphasis on within-firm training than firms in the other two countries. Training was offered in more areas than that offered in the other two countries, and the number of workers eligible and actually receiving internal training was much higher. Finally, Japanese internal training systems were more pre-scheduled and did not allow much choice on the part of the individual employee.

As noted earlier, this pattern of results has often been found in previous research on the Japanese human resource system, but using different occupations. The results of this study indicate that Japanese firms structure their human resource systems consistently, whether the target employees are production workers or employees who have highly technical jobs such as those used in this study. Whether this pattern of correspondence or fit occurred as a result of the process assumed under the human capital or human ware models cannot be determined on the basis of this analysis. However, given that in many manufacturing firms, team organizations are explicitly designed to take advantage of skills and knowledge possessed by front-line employees,

the same story may also apply to the software development engineers. Further research on the human ware model is needed.

References

Dore, Ronald P. 1973. *British Factory—Japanese Factory: The Origins of National Diversity in Industrial Relations.* Berkeley: University of California Press.

Imano, Koichiro. 1993. "Career Formation of Japanese Engineers." In Kazuo Koike, ed., *An International Comparison of Professionals and Managers,* JIL Report No. 2. Tokyo: The Japan Institute of Labour, pp. 32-41.

Ishida, Hideo. 1990. "Transferability of Japanese Human Resource Management." Mimeo., Keio Business School, Yokohama.

Kochan, Thomas A. and Paul Osterman. 1993. *Human Resource Development and Utilization: Is There Too Little in the U.S.?* MIT Industrial Liaison Program Report, No. 2-42-93.

Koike, Kazuo. 1988. *Understanding Industrial Relations in Modern Japan.* London: Macmillan.

————. 1993. "Human Resource Development Among College Graduates in Sales and Marketing." In Kazuo Koike, ed., *An International Comparison of Professionals and Managers,* JIL Report No. 2. Tokyo: The Japan Institute of Labour, pp. 42-64.

Lawler, Edward E. III. 1990. *Strategic Pay.* San Francisco: Jossey-Bass.

Lazear, Edward P. 1992. "Compensation, Productivity and the Economics of Personnel." In David Lewin, Olivia S. Mitchell and Peter D. Sherer, eds., *Research Frontiers in Industrial Relations and Human Resources.* Madison, WI: Industrial Relations Research Association, pp. 341-380.

MacDuffie, John Paul. 1995. "Human Resource Bundles and Manufacturing Performance: Organizational Logic and Flexible Production Systems in the World Auto Industry." *Industrial and Labor Relations Review* 48(2): 197-221.

Morishima, Motohiro. 1995. "The Japanese HR System: A Learning Bureaucracy." In Larry F. Moore and P. Dev Jennings, eds., *Human Resource Management on the Pacific Rim: Institutions, Practices and Attitudes.* Berlin: Walter de Gruyter, pp. 119-150.

Osterman, Paul. 1995. "Skill, Training, and Work Organization in American Establishments." *Industrial Relations* 34(2): 125-146.

Shimada, Haruo and John Paul MacDuffie. 1986. *Industrial Relations and "Human Ware": Japanese Investments in Automobile Manufacturing in the United States.* Working Paper No. 1855-86, Sloan School of Management, MIT.

Snell, Scott A. and James W. Dean, Jr. 1992. "Integrated Manufacturing and Human Resource Management: A Human Capital Perspective." *Academy of Management Journal* 35(3): 467-504.