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Marc Maurice, Hiroatsu Nohara

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***The Social Construction of Occupational Identity of Technical Workers:  
Results of Denkiroren (Japanese Electric/Electronic Industry Trade Union) International  
Survey<sup>1</sup>***

**Marc MAURICE**

**Research fellow at LEST-CNRS**

**Hiroatsu NOHARA**

**Research fellow at Aix-Marseille Université and LEST-CNRS**

## **Introduction**

This short report aims at describing the social construction of occupational identity of a growing actor in the union activity, that is a white-collar technical workers. They are named as technical workers, technicians, engineers or company researchers in different countries. Why do we need to restrict this report to this professional category

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<sup>1</sup> This work stemmed out of a research program initiated in the mid-1980s, in cooperation with the Denkiroren (Japanese Electric/Electronic Industry Trade Union), by an international team that included members from Japan (Prof. Isikawa), France (Dr. Maurice), Germany (Prof. Fricke), England (Prof. Thurley), Italy (Prof. Consoli) and Sweden. These six national teams conducted a pilot national survey and then met to initiate an international comparative study using a common analytical framework and methodology. Each team tended to focus on the issues most relevant to their own country. The German team was primarily interested in the role of engineers in introducing new technologies. The French team was focused on the differences between Japan and Western Europe in terms of how organizational combinations determine the qualification process, the type of specialization, and the mode of "knowledge transfer". The Italian team's focus was on how changes in technical knowledge and organizational structures affected the balance of power between trades and departments. The Swedes started from the "work process" to see how this type of analysis could be applied to engineering design, development and research. The problem of labor market shortages and the apparent alienation of young electronic engineers from the R&D departments of large industrial companies were major issues for the Japanese and British teams. Following the agreement on the common questionnaire after much discussion and compromise, this initial team launched -10 years later- a second survey in 1995, then the third in 1999, while expanding the participating countries to 16. This research summary is based on the results of the third survey.

(technicians, engineers and company researchers) with regard to the division of labour and the trade union commitment?

This occupational category (compared here with manual workers) is of interest in several respects.

Their numbers are growing, particularly in the industries that were the subjects of the survey (electronics, computers, and telecommunications), while the manual workers, at least in the advanced countries, are tending rather to shrink, as are the clerical and administrative workers. They are also the main engine of technological innovation. The competitiveness of each national economy is then depending more and more of their creativity. These trends are clearly evidence of a restructuring of the classic division of labour (inherited in part from Taylorism and Fordism) that is itself associated with complex technological, economic and organisational phenomena.

This raises some important questions, notably:

- to what extent are these changes affecting the forms of social relationships in the workplace and trade union influence within firms ?
- to what extent are these changes associated with new forms of work organisation ?
- what position do the expanding occupational categories (which include researchers, now being employed in increasing numbers by large companies) occupy within the wider society ?

Unfortunately, all fourteen countries could not collect the data on the technical workers (technicians, engineers and company researchers). Considering our problematics, we decided to limit our analysis only at countries in which the numbers of technicians and engineers were significantly present in relative terms<sup>2</sup> (cf. Table 1).

**Table 1**

**Numbers of technicians and engineers as % of total number of employees surveyed**

COUNTRY	TECHNICIANS	ENGINEERS	TOTAL	As % of total number of employees surveyed	
CHINA	(N) 183	14	197	(N.549)	35.9 %
KOREA	(N) 249	13	262	(N.745)	35.1 %
SPAIN	(N) 12	38	50	(N.168)	29.7 %
FRANCE	(N) 21	53	74	(N.105)	71.5 %
ITALY	(N) 151	51	202	(N.764)	26.4 %
JAPAN	(N) 160	301	461	(N.981)	47.0 %
SLOVENIA	(N) 80	84	164	(N.635)	25.8 %
<b>TOTALS</b>	<b>(N) 657</b>	<b>557</b>	<b>1411</b>	<b>(N.3947)</b>	<b>35.7 %</b>

Nota; the data are from the third international comparative survey on the consciousness of technical workers, Denkiroren 1999.

<sup>2</sup> The percentage of technicians and engineers in the seven countries, namely China, France, Italy, Japan, Korea, Slovenia, Spain, studied here is considerably higher than that obtained for all fourteen countries in the survey -35.7 % compared with 27.4 %- which provides empirical justification for our choice.

Our main hypothesis, based on previous international comparison<sup>3</sup>, is to consider occupational categories in each country as « social construction ». From this point of view, a technician, an engineer, or a manual worker, does not have necessarily the same professional or social identity, in France, Japan, or in China, because the process of « socialization » of these categories can be different from a country to another; and that can have indirectly an influence on the divisions of labour in the companies. Also, we will keep in mind that perspective of analysis to comment the result of the international comparative surveys.

In the next section, we shall present some key results of this comparative survey in the following order:

- Part 1: the occupational situation of technicians and engineers (in comparison to that of manual workers).
- Part 2: the position of technicians and engineers in social relationships in the workplace.
- General conclusion.

### **Part. 1 - The occupational and educational situation of technicians and engineers relative to that of manual workers**

In the various parts of this chapter, the technician and engineer categories will be described and analysed in comparison with the manual categories.

Why have we adopted such an approach? We have already underlined the relative nature of the occupational categories that are normally used in firms.

#### **1.1. Employment and task structures of manual workers, technicians and engineers**

**Table 2**

#### **Employment Structures**

<b>Country</b>	<b>Manual</b>	<b>Clerical</b>	<b>Technician</b>	<b>Engineers</b>	<b>Supervisory</b>	<b>Manager</b>	<b>Total</b>
SPAIN	46.0%	9.0%	7.0%	23.0%	11.3%	3.6%	100 (N.118)
FRANCE	5.0%	5.7%	21.0%	51.0%		18.0%	100 (N.105)
ITALY	55.0%	13.0%	20.0%	7.0%	3.0%	1.0%	100 (N.764)
JAPAN	18.3%	22.0%	16.3%	30.7%	8.2%		100 (N.981)
CHINA	47.5%	2.0%	33.0%	3.0%		3.0%	100 (N.549)
KOREA	55.0%	5.6%	33.4%	2.0%		11.7%	100 (N.745)
SLOVENIA	48.0%	13.0%	13.0%	13.0%	3.0%	6.0%	100 (N.635)

Nota: Op. cit.

<sup>3</sup> M. Maurice, F. Sellier, J.J. Silvestre, The Social Foundations of Industrial Power. A comparison of France and Germany, The MIT Press, Cambridge, 1986. 1982. C. Lanciano, J.J. Silvestre, Maurice M, H. Nohara. Les acteurs de l'innovation et l'entreprise : France-Europe-Japon. l'Harmattan, pp.272, 1999,

Table 2 shows the relative size (in percentage terms) of all the occupational categories in the various countries studied in this chapter. We shall not examine in any greater depth the trends already noted above; it should be pointed out, however, that it is three countries with market economies (France, Japan and Spain) that have the highest shares of engineers. Conversely, of the five countries with high shares of manual workers, three have a post-socialist system (Korea, China and Slovenia). The two countries with the lowest shares of manual workers are France<sup>1</sup> and Japan, which also have the highest shares of engineers.

It should also be noted that substitution effects may exist in some countries between the jobs (and tasks) of certain categories, for example between manual and clerical workers, between skilled manual workers and technicians or even between technicians and engineers, as we shall see in our analysis of task structures.

## **1.2. Distribution of tasks among the various categories:**

The survey questionnaire included a series of ten different tasks, ranging from machine operation and assembly to engineering tasks and product and process development.

So, it is possible to measure how the various tasks are distributed between the three categories investigated here (manual workers, technicians, engineers); since one employee can be engaged in several different types of task, what emerges is a sort of indicator of the extent of multiskilling.

It would seem that several countries stand out by virtue of the degree of multiskilling among their labour forces; this applies particularly to Japan (other research has also highlighted this fact), and to a certain extent to Italy, China and Korea.

The example of Japan is fairly illustrative, since there is a total of 1,579 "tasks" divided between 641 individuals (33 manual workers, 156 technicians and 301 engineers). This produces an average of 2.46 tasks per individual.

The results for each category are as follows:

- Manual workers                      431: 180 = 2.39 tasks
- Technicians                            415: 160 = 2.60 tasks
- Engineers                                733: 301 = 2.43 tasks

Of course, such an empirical procedure is a purely formal exercise, but it does point the way to some interesting hypotheses that would have to be verified by more qualitative case studies previous as we did in previous French/Japanese comparisons.

It should be noted at this point that the survey sample in Japan (981 individuals) has a lower share of manual workers than those in the other countries (except France); the percentage of manual workers in the Japanese survey is in fact only 18.3% of the total numbers in the survey (and 27% in our sub-sample that comprises just three occupational categories).

This characteristic undoubtedly reflects the fact that the basic production tasks in these types of industry (electronics and electrical engineering in the broad sense of the

term) are often subcontracted, which reduces the number of manual workers employed by the principals. This practice is systematised in Japan.

Conversely, enterprises in countries with a “dirigist”, centralized or socialist system, where management and production are more internalised and centralised, employ larger numbers of manual workers (of the countries in our sub-sample, this is the case in Korea, Slovenia and China).

Other, more qualitative aspects of the division and distribution of tasks by occupational category in Japan can also be highlighted. Thus some of the detailed tables show that manual workers, technicians and engineers can be all engaged in each of the various types of tasks, which may indicate the existence of certain forms of cooperation or complementarity between the three categories. From this point of view, France and Spain seem more "specialised", with a closer correspondence between certain types of tasks and particular occupational categories (although this remains a tendency rather than a hard-and-fast rule).

In the case of Japan, the "technician" category (which has been shown in other studies to have a weaker sense of professional identity than the manual worker or engineer categories)<sup>4</sup> seems to act as a link between the other two categories, although its members are closer to manual workers for some types of tasks (e.g. in maintenance and quality control) and closer to engineers for others (e.g. programming, and product and process development). The distribution of engineers across the whole range of tasks seems to be equally noteworthy, even though they outnumber technicians in certain areas, such as R & D, programming and software, as well as machine operation, maintenance and administrative work. This wide span of activities in Japan seems to confirm what other studies have also revealed, namely that engineers are highly mobile within a wide range of different functions, which contributes to the "generalist" training they receive in addition to their original training in a particular discipline.

Some of the characteristics observed in Japan are also found in Italy:

- involvement of all three categories (manual workers, technicians and engineers) in all types of tasks;
- the "mediating" role played by technicians (who are more numerous in Italy than in Japan, where engineers tend to dominate);
- engineers, fewer in number than in Japan, tend to concentrate for preference on product and process R & D, programming and software, as well as on "supervisory" or "middle management" roles.
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On the other hand, Korea, China and, to a lesser extent, Slovenia have a lower proportion of engineers but higher shares of manual workers and technicians. Even if engineers are still involved in most kinds of tasks, the role of technicians seems to be more extensive, and in some areas they work alongside manual workers. This is the case not only in production tasks but also in quality control, maintenance and

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<sup>4</sup> Nohara. H (1998), *Socialisation des Ingénieurs et Construction de Leurs Compétences : Comparaison Internationale*. Omar Seul. L'Impact du modèle Japonais sur l'organisation du travail et sur les relations de travail en France et au Japon, Chlorofeuilles Edition, pp.109-126.

programming. They also seem to play a fundamental role in administrative and "supervisory" tasks.

Although product and process development tasks are less highly developed in China and Korea, it seems to be technicians rather than engineers who are primarily responsible for them.

These data are undoubtedly less than robust, which makes any attempt at assessment or interpretation very difficult. Nevertheless, they do open up various fruitful avenues of research that might be pursued in other studies of this kind.

In any event, they reveal the diversity of production and employment systems and perhaps also the "choices" that are still possible in the management and organisation of work.

They seem also to reflect "societal effects", not only in terms of "nations" but also of "political and economic system or regime". This question is also worthy of investigation in its own right, particularly at a time when the notion of "globalisation" is attracting so much attention.

### **1.3. The relative mobility of the various occupational categories (manual workers, technicians and engineers) and educational levels**

In order to analyse how the various occupational categories under investigation here have been constituted, it is necessary to analyse, on the one hand, their level of school or university education and, on the other, their mobility both inside and outside their current firms.

#### **A) Relative levels and types of education of manual workers, technicians and engineers**

The questionnaire included four levels of education:

- 1. Compulsory education
- 2. Lower middle level
- 3. Higher middle level
- 4. University education

Each country adapted these four levels to its various educational paths. Some results are of interest in any comparison of occupational categories.

Firstly, stratification between the four educational levels is relatively variable from one country to another, even though some common trends can be detected. Thus in most countries, the educational attainment of manual workers goes beyond the basic level of compulsory education (level 1), with most of this category being concentrated in level 2 (lower middle) and some in level 3 (upper middle), irrespective of country or political/economic system. The two exceptions are Spain and Slovenia, where 70% and 55% respectively of manual workers have not been educated beyond the compulsory level.

Educational levels are more dispersed for technicians in most countries, although they are concentrated to a certain extent in the middle levels (2 and 3); in Spain, France, Italy and Slovenia they tend to be in level 3, while in Japan and Korea they tend rather to be concentrated in level 2. China is something of an exception, with 43% of technicians in level 4 (university) and 23% in level 2. This may reflect a distinctive institutional characteristic in the educational system, or indicate that some manual workers move up to technicians' positions which, as we shall see, does indeed happen in some countries.

As far as engineers are concerned, here again there are differences between the countries, even though the commonest trend is for them to be concentrated in level 4 (university or equivalent). However, there are some exceptions:

- Spain, with 42% in level 4 and 58% in level 3;
- Korea, with 31% in level 4 and 69% in level 2.

It is true that the number of engineers surveyed in both these countries was small (38 and 13 respectively).

The distinctive characteristics noted above can undoubtedly be explained either by the institutional particularities of the various education systems or by the way in which the categories themselves are constructed in each country. But it is important to have in mind that: between occupational categories and level of education there are many intervening « variables », often different from a country to another.

The "social construction" of the three categories under investigation here may also, as we shall see, reflect forms of mobility and promotion within firms that can be revealed by comparing the first job held with that held at the time of the survey.

## **B) First job compared with current job**

As the distribution of occupational categories among the various levels of education shows, there is in most countries a certain degree of mobility within firms or by promotion from one category to another; internal labour markets clearly exist, even in those countries in which the management of the workforce is strongly influenced by formal educational qualifications.

In order to simplify the presentation of the results obtained for this question, we shall use only the most significant categories (the cross tabulations could only be done on the basis of the three categories used here: manual workers, technicians and engineers); workers who started off in their first jobs in the manual category might have been promoted subsequently to the clerical, technician or engineer categories, and the same applies if course to the other two categories (i.e. technicians and engineers).

We will highlight here the divergences between first job and current job (if there were no mobility, such divergences would not of course exist).

Certain consistent patterns in the inter-category mobility flows must be underlined here. It is manual workers who have the highest stability rate, although this may actually conceal promotions within the category itself, from unskilled to highly skilled worker,



for example. The stability rate is around 90% (and as high as 94% in Japan, Korea and Slovenia).

Engineers also have a tendency to be stable within their category. However, there are differences between countries with a higher stability rate (Japan, with 98%, France, with 80%, Slovenia, with 76% and Spain, with 68%) and those where it is lower (Korea, 46% and China, 21%). In these last two cases, more so than in the others, this undoubtedly reflects the fact that many engineers achieve their status through promotion from other categories.

Thus 50% of those currently in the engineer category in China were promoted from the technician category, and 29% from the manual worker category. The same phenomenon can be observed in Korea, with 15% having been promoted from the manual category and 15% from the technician category. Promotion to engineer status from the technician category (and, more rarely, from the clerical category) also occurs in other countries: 24% from the clerical category in Spain, 18% from the technician category in France and 18% in Slovenia.

These results undoubtedly reflect the importance attached to the vocational training either of technicians or of engineers in the various countries. The higher the rate of stability in a particular category, the more clearly it indicates a strong occupational identity acquired through training (e.g. Japan, France, particularly for engineers, and also for technicians in Korea, China and Slovenia).

The combined influence of the education and vocational training system and the forms of company management helps to shape these forms of promotion or mobility. However, this combined influence varies in accordance with national systems; this is in fact one of the spheres in which a certain « societal effect » may manifest itself, bringing into play both the mechanisms of the labour market (internal and external) and the education system specific to each country.

### **First summery**

What emerges ultimately from this part is the social and occupational differentiation between the three main categories we have been comparing: manual workers, technicians and engineers.

This differentiation highlights the relative heterogeneity of these major components of the wage-earning class, at a time when the manual category is declining to the benefit of the white-collar categories. However, these latter categories are themselves becoming increasingly diversified as the division of labour becomes more complex and manufacturing and service activities are restructured. This may well mean that future studies will have to take greater account of them than in the past.

## **Part. 2 - The position of technicians and engineers in social relationships at work place**

In first part of this report, we attempted to locate the three occupational categories in the structure of work.

Each category was observed to have in some extent its own identity, with technicians often seeming to be positioned midway between manual workers and engineers.

How are these differences going to be expressed in social relationships at the work place?

Among different questions supporting that question, we made a choice to only consider one about the varied perceptions of interests of occupational categories on management, and trade-unions representatives.

Because the complexity of that question, we are led to limit the presentation of the results at **the perceptions** (by the manual workers, technicians and engineers) of the **management at firm and company level**, and of **the trade union representatives at company level**.

As far as the interests of management are concerned, the general tendency is to distinguish between those interests shared by employees and management at plant level and those employees may share with management at company level; in general terms, employees are closer to the first than to the second.

Overall, however, manual workers tend to identify their own interests with those of management to a lesser extent than either technicians or managers.

Thus the perception of the conflict of interests is more marked among manual workers than among technicians and, in particular, engineers. This divergence is even more marked in respect of management at company level, as if employees tended to assume a certain degree of common interest with the management to whom they are directly answerable.

In the individual countries, of course, there are deviations from these general tendencies.

Thus it is Spanish employees who tend to perceive their own interests as most closely linked with those of management at plant level; the average identification rate was 71%, and 79% in the case of engineers. In this case, however, the company in question is a cooperative, where social relations are likely to be highly specific.

It is French and Italian manual workers and technicians who are most aware of the conflict of interests with management, whether at plant or company level. In this latter case, however, Italian engineers are even more critical of management at company level than are manual workers and technicians.

Once again, the position of Japanese employees is more balanced, although they too follow the general trend. Their responses usually lie somewhere between the two extremes, indicating partial identification or partial opposition to the interests of management.

As far as Chinese employees are concerned, their attitudes tend once again to contrast sharply with those in the other countries. Identification with management interests tends to prevail over opposition, irrespective of category. Does Chinese management have a specific status which is closer to that of workers than in many other countries?

The two other countries, Korea and Slovenia, produced contrasting results. Korean workers are closer in their attitudes to management to their Japanese

counterparts, with responses that tend to lie between the two extremes; nevertheless, they are slightly more opposed to management at company level.

Slovenian employees, on the other hand, tend rather to identify their own interests with those of management, particularly at plant level. Should these attitudes be interpreted as a hangover from the previous Yugoslavian system of joint worker-management control?

The following question on the interests that employees might have in common with trade union representatives at company level will help us to develop these interpretation further.

Just as one might be surprised to find evidence that certain groups of employees identify with the interests of management, so it hardly comes as a shock to find that most employees identify their own interests with those of trade union representatives at company level. Once again, however, this general tendency has to be qualified.

What was less expected were the scores obtained from the responses, which in some cases were close to those obtained for the questions on identification with management interests. This was the case with Japanese and Slovenian employees. On the other hand, French and Italian employees identify more closely with the interests of union representatives at company level. Spanish workers, for their part, identify even less strongly with union representatives than they did with management. However, as we have seen, the cooperative that constituted the entire Spanish sample has no real trade union.

Chinese employees, as might be expected, identify with management interests to more or less the same extent as they identify with those of trade union representatives. This would seem to reflect a sort of "communitarianism" that has yet to be interpreted (a task that will no doubt be undertaken in other chapters in the present volume).

It should be noted, finally, that engineers in some countries again seem to lag behind manual workers and technicians, and tend to adopt a more distant attitude. This is particularly the case in Spain, Italy and Korea.

## **General conclusion**

The purpose of this short report was to compare technicians and engineers with manual workers to highlight the growing diversity of the wage-earning class. Furthermore, the international comparative perspective adopted here has made it possible to gauge the extent to which this phenomenon is spreading and to identify the forms it is taking.

Let us begin by noting some trends that are common to all the countries in our sample.

The technician and engineer categories certainly have their own occupational identity, with a particular position in the division of labour, and with their own perception of the differentiation of interests in the firm or the company.

But some gradation exist between technicians and engineers. Technicians are intermediate category between manual workers and engineers. That position can be

interpreted in reference at the educational and vocational system in each country; and also due to the forms of mobility within firms through promotion.

Thus a certain proportion of technicians have gained promotion from the manual category, while some engineers may have started off as technicians.

We observed one other interesting result: there is a certain degree of correspondence between categories of tasks and occupational categories (manual workers, technicians, engineers), but there are some variations from one country to another. Certain tasks may be performed by different occupational categories, or the same category may perform a variable range of tasks. In other words, there is greater interchangeability between the categories in some countries than in others, which encourages both multi-skilling and inter-category co-operation<sup>5</sup>. That phenomenon enable greater flexibility to organise or manage the division of labour within the firm. That opens up new perspectives for human resource management and social relationships to work.

Finally, the mutual perceptions of interests, especially between occupational categories, union's representatives and management, reveal some differences among categories and also among countries with different socio-economic regime. For instance, technicians have generally an intermediate position between manual workers and engineers with regard to the perceptions of interest differences, and social relationships within the firm and company. And, if the perceptions of engineers -in term conflict of interests- are less radical than other occupational categories, that do not means necessarily engineers accept the value system of the company. Referring to other surveys, on that occupational category, engineers have often specific position in term of collective action and union commitment. So, it is an important issue for unions in the future to fit the aspirations of that growing category.

From a theoretical and methodological view point, we can underline the interest, for the international comparison, of the notion of « social construction of actors »<sup>6</sup> The previous presentation on the technicians and engineers within the division of labour, in different countries links up that notion.

In this perspective of analysis the occupational categories are not necessarily concerned as universal or strictly comparable from a country to another, since there are « socialized » and « organized » in different ways within the division of labour.

That result questions the thesis of convergence of societies often associated with the « globalization of the economy ».

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<sup>5</sup> For instance, that last trend is more developed in Japan than in France.

<sup>6</sup> Lanciano C, Maurice M, Nohara H, Silvestre JJ (1992),

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