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Reflections on the form of existence of innovative actors - national diversity of division of work: comparison France, Germany, Japan.

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Periodically, in France, successive governments feel the need to define or redefine a policy for the development of technology and innovation. To do so, they rely on mission reports entrusted to experts. The most recent of these was Henri Guillaume's "Rapport de mission sur la technologie et l'innovation"¹ (Mission Report on Technology and Innovation), published in March 1998 at the request of Claude Allègre, Minister of National Education, Research and Technology, and Dominique Strauss-Kahn, Minister of the Economy, Finance and Industry.

It is undoubtedly a good sign that these different ministries are associated with the definition of a policy concerning technology and innovation. Everything will depend, however, on the way in which the relations between these different actors are established. Recent diagnoses, those of this last report and others, in particular those of the "Commissariat Général du Plan", and those of the "Observatoire des Sciences et des Techniques", are on the whole convergent: strength of research in the public sector, weakness of the development of techniques and innovation in the private sector, and relations to be improved between the public and private sectors. This is not the place to develop these different features of the French system of innovation, which are already well known.

Rather, referring to recent research involving France, Germany and Japan, we will propose some reflections on the "actors of innovation" within firms. This appears to be one of the shortcomings of the expert reports we have just mentioned, which seem to me to adopt the positions of classical economics, where the "actors" are most often absent, to the benefit of

¹ <https://www.vie-publique.fr/sites/default/files/rapport/pdf/984001353.pdf>

structural data, often macro-economic data, which can be modelled or formalized in econometrics. In this case, concrete "actors" are reduced to abstract "agents" inserted into production relationships in terms of investment or resources -even if qualified as "human"; they are thus de-socialized and take on a universal character, just like the economic laws that govern them. In this perspective, it is not surprising that innovation itself has been treated according to the same logic. However, new approaches in the economics of innovation have developed, more open to the dynamic aspects of innovation processes, referring to the forms of collective learning among the different actors, and to the structuring effects of the institutions that contribute to the diversity of "national innovation systems" (Nelson 1993, OECD 1997).

The societal analysis of innovation developed by LEST researchers (Lanciano C., Maurice M., Nohara H., Silvestre J.J. 1993), contributes in its own way to the renewal of these approaches.

From this research, we shall retain only a few "stylized" features that make it possible to highlight both the diversity of innovation systems and, above all, the institutional and organizational characteristics that contribute to the "construction of the actors" that underpin these systems.

What kind of innovation are we talking about?

It is a global approach to innovation that is not limited to technical dimensions alone; these are in fact only one of its components, associated with various processes: organization, learning, and/or the transmission of knowledge and know-how.

Consequently, it is not enough in a given country (or at the European level) to define innovation policies for them to be effective. Without denying the incentive or support effects of such measures, they are not sufficient. The economic efficiency of these resources in terms of innovation or creativity depends, according to our societal approach, on the "productive combinations" in which they operate, and on the quality of the relations between the different actors, public or private, national or international, who contribute to the construction of the "innovation space" of a country or a group of countries.

In this perspective, the dynamics of innovation and its economic efficiency are associated with the capacity of the different actors to develop and mobilize the material and immaterial resources that participate in various ways in innovation or creativity. It is because these relational processes have a structuring effect that they can be considered as "actors" in the innovation space that characterizes a country. To illustrate these somewhat abstract reflections, we will refer to some of the results of the research mentioned above

Different forms of division of labor in French and Japanese companies. This was revealed by an international survey in which LEST and UCC-CFDT participated in 1995 and 1999².

² This is one of the surveys year 1999 initiated by Denki Rengo, the Japanese union of electrical and electronic construction industries. A part of survey results was published in the following report: Marc Maurice, Hiroatsu Nohara. The Social Construction of Occupational Identity of Technical Workers: Results of Denki Rengo (Japanese Electric/Electronic Industry Trade Union) International Survey. [Research Report] LEST-CNRS, France. 1999.

From the results of this survey, we will only consider here the forms of division of tasks between workers, technicians and engineers working in electronics and computer companies. The differences observed in the two countries reflect the logics of organization and management of "human resources" which contribute, among other things, to characterizing the "innovation space" in each case.

The questionnaire made it possible to indicate how each of the professional categories was distributed in the set of tasks selected³.

Whatever the limitations of this empirical approach, it points to fruitful hypotheses that other, more qualitative, LEST research has already been able to verify.

The example of Japan is quite demonstrative in this respect, since we can count on a total of 641 individuals (including 180 workers, 160 technicians, and 301 engineers) a total of 1579 "tasks" corresponding to the actual work of these three categories of employees. Formally, this represents an average of 2.46 tasks per individual. The breakdown by category is as follows:

Workers: 2.39 tasks
Technicians: 2.60 tasks
Engineers: 2.43 tasks

Let us recall that the same individual, whatever his professional category, could perform several types of tasks among the ten retained. Such an evaluation may appear arbitrary, but it reflects the forms of work organization in Japan, where workers, technicians and engineers may be required to perform the same types of tasks (in production, maintenance or R&D).

In contrast, in French companies there is a stronger correspondence between professional categories and types of tasks. This is indicated by the average number of tasks per individual, which is only 1.3 in France, while it is 2.4 in Japan and 2.9 in Germany.

In other words, according to these results, there is a greater "specialization" of tasks in French firms than in Japanese and German firms. This is confirmed by other observations made in the course of other research, which highlight different social phenomena associated with each other. There are indeed interdependent links between the forms of division of labor between workers, technicians, and engineers, and the way of conceiving the innovation process in each country.

Let us sketch out here the coherence and logic underlying the previous argument. To do so, we will start with the exemplary case observed in Japan: there is a wider distribution of tasks between categories, even if we can admit that this is only relative (a worker, even a qualified one, cannot completely replace a research engineer!) Indeed, there is less separation between the tasks assigned to the different professional categories than in France. Thus, in Japan, there is overlapping or redundancy in work assignments, and this is part of a form of collective learning, as we shall see.

³ The survey questionnaire included a series of ten different tasks, ranging from machine operation or assembly to maintenance, engineering or product or process development. The same employee - whether a worker, technician or engineer - could perform several types of tasks; this made it possible to assess the potential versatility of each professional category and to deduce - by hypothesis - the probability of cooperation between them.

In other words, contrary to what can be observed in France, the notion of “assigned job task” (inherited from certain forms of Taylorism and Fordism) as a criterion for work assignment does not have the effectiveness to stabilize individuals in a status as is observed in the "French-style" management system⁴.

Studying in particular the careers of Japanese engineers, it appeared to us that, in this case, one gradually becomes an "engineer". This means that during the first years of their professional life, within the same company⁵, the Japanese engineer undergoes a long period - at least ten years - of apprenticeship in the company about its products and its production methods, before reaching a position of hierarchical responsibility (such as that of *kachô*, corresponding to that of manager in France). This also means that an engineer at the beginning of his or her career has a relatively low salary, compared to French standards⁶. This corresponds to a form of incentive to learn the various components of the company through mobility in various departments, even if the production sector is most often the starting point (Koike 1996).

In the case of research and development engineers, who may be assigned to a project team, it is not uncommon for them to move back and forth between production and the research laboratory, which is sometimes located close to the workshops (Work Laboratory). In the same way, mobility of both skilled workers and engineers can take place between the client company and its subcontractors, or even with its customers. This is one of the ways of innovation that we have often observed.

Through these movements of people, there are exchanges of skills and know-how, which are conducive to product or process innovation. Such exchanges are simply an extension of those initiated within the company, both in SMEs and in large companies. This is indeed one of the structural characteristics of the way Japanese companies operate, of which the forms of task distribution between workers, technicians and engineers, already mentioned, represent both one of the foundations and one of the expressions.

In this respect, it should be noted that these movements of people reflect the importance attached to the horizontal mobility of employees, ideas and technologies; this encourages cooperation, collective learning and therefore technological creativity. It is therefore understandable that the versatility of both skilled workers and engineers represents one of the strong components of their skills, which also explains why they can each perform several types of tasks, sometimes with a certain redundancy. Some of the features we have just mentioned can be found in other forms and according to different logics in German companies where similar forms of mobility have been observed within the production workshops and work teams. But in this case, the "collectivization" of skills and know-how is established and developed from a more structured "qualification space" than in Japan. In fact, it is a question

⁴ Some historians believe that this corresponds to the period of learning in Japanese companies during the process of industrialization, when there was a great deal of fluidity of work and jobs in the production workshops, with engineers and workers sharing their own skills (Okuda 1985, Warner 1994).

⁵ According to the *Denki Rengo* survey, in 1995, 87.5% of employees (workers, technicians, engineers) were still with the company that had recruited them.

⁶ Entry-level engineers (4 years of higher education or more) have a salary level close to that of blue-collar workers of the same age (20-24 years). Their wages, up to the age of 35, remain lower than those of very experienced workers (Nohara 1998).

of complementarity between skills acquired from a common base, which of dual apprenticeship, shared by the skilled worker (Facharbeiter), the foreman (Meister) and the graduate engineer (from the higher technical schools). Here again, horizontal mobility favors cooperation and versatility, while respecting the identity of the statuses, whose legitimacy is based more than in Japan on recognized diplomas, partly acquired within the company.

R. Boyer, in a book with E. Caroli (1993), highlights the competitive advantages of Germany over France, particularly in terms of technical innovation. These authors emphasize the "cooperative" character of the German production system, which they associate with the "cooperative" character of the training system (dual apprenticeship). The France/Germany research of LEST (1982) already underlined this feature, while further highlighting the interdependencies between the dimensions of work organization, training and social relations within German firms. Boyer and Caroli (1993) deduce from their analysis the advantage of the German system for "small and incremental innovations", those generated by the relations between workers, direct management and engineers⁷.

These "stylized" remarks, based on national statistical data, do not, for the most part, sufficiently integrate the processes of "socialization of actors" on which the societal analysis of innovation developed by LEST researchers is based, among others. In this case, the distinction between "small innovations" and "fundamental innovations" is called into question (as most economists of innovation do, by the way), and they rather highlight the interdependence between R&D actors and those of production or marketing in their relationship with the customer. There is therefore no discontinuity in the innovation process, as has sometimes been thought, at least if we consider technical innovation itself.

On the other hand, the French situation tends to be different in this area from both Japanese and German firms. The weaknesses of French firms (with rare exceptions) correspond to the difficulty they often have in mobilizing and collectivizing the skills and know-how of different professional categories in real collective learning processes (Amable, Barré, Boyer 1997),. This is what German companies achieve through a cooperative educational system - associating "school and company" - and a system of social relations based on negotiation between "partners". This leads in other ways to results close to those observed in Japan: valuing direct production work, developing polyvalent qualifications, product quality and incremental innovation based on a system of mobility and cooperation between actors in production, R&D and marketing.

The "French exception" - in this field - has its own "coherence" which refers to different logics of "actor construction". All the expert reports show that France is very well placed according to indicators of the scientific level of research and researchers; it ranks among the top four or five countries for R&D efforts. Its weakness lies rather in the innovation of industrial techniques, as if there were a gap between the laboratories of the CNRS or other public organizations and the R&D laboratories of private companies. Progress has undoubtedly been made in recent years in this respect, but it has not yet reversed the trends mentioned above.

Do we not note the permanence of the initiating role of the State in this field, even when it is a question of encouraging private companies to innovate in order to be even more

⁷ R. Boyer and E. Caroli (1993).

competitive? Here again, we are dealing with structural data that cannot be changed "by decree", regardless of the good intentions and overtures of a Minister of Research. Change - in terms of innovation in particular - must be conceived in a coherent manner, integrating the educational and training system, the system of social relations at work, and the productive system itself. Without forgetting, however, that there is no "system" without actors. It is therefore not enough to define new policies that theoretically commit institutions or structures, it is also necessary to change or modify the actors themselves, their forms of socialization and social relations, in other words, their identity and their capacity.

As we have seen, one of the advantages of Germany and Japan in terms of innovation lies in the importance of horizontal relations between actors, whereas in France it is rather the vertical, hierarchical relations that tend to prevail.

The social and professional distance that separates the skilled worker, the technician, from the engineer or the executive, is undoubtedly an obstacle to the exchange of skills and know-how, and to cooperation between the sphere of production and that of research and development. This explains, in part, the difficulties in industrializing the results of scientific research and the relative weakness of technological innovations. The German and Japanese experiences show in which directions changes could be envisaged in the training of actors as well as in the forms of organization and division of tasks between the professional categories more directly concerned by technological innovation, without claiming to "imitate" the so-called "German model" or "Japanese model".

Such changes must be in keeping with the history and culture of each society, which is still called upon to maintain its identity in spite of globalization; this can go hand in hand with international cooperation agreements, particularly in the field of innovation.

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