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THE ROLE OF RENAULT AUTOMOBILE

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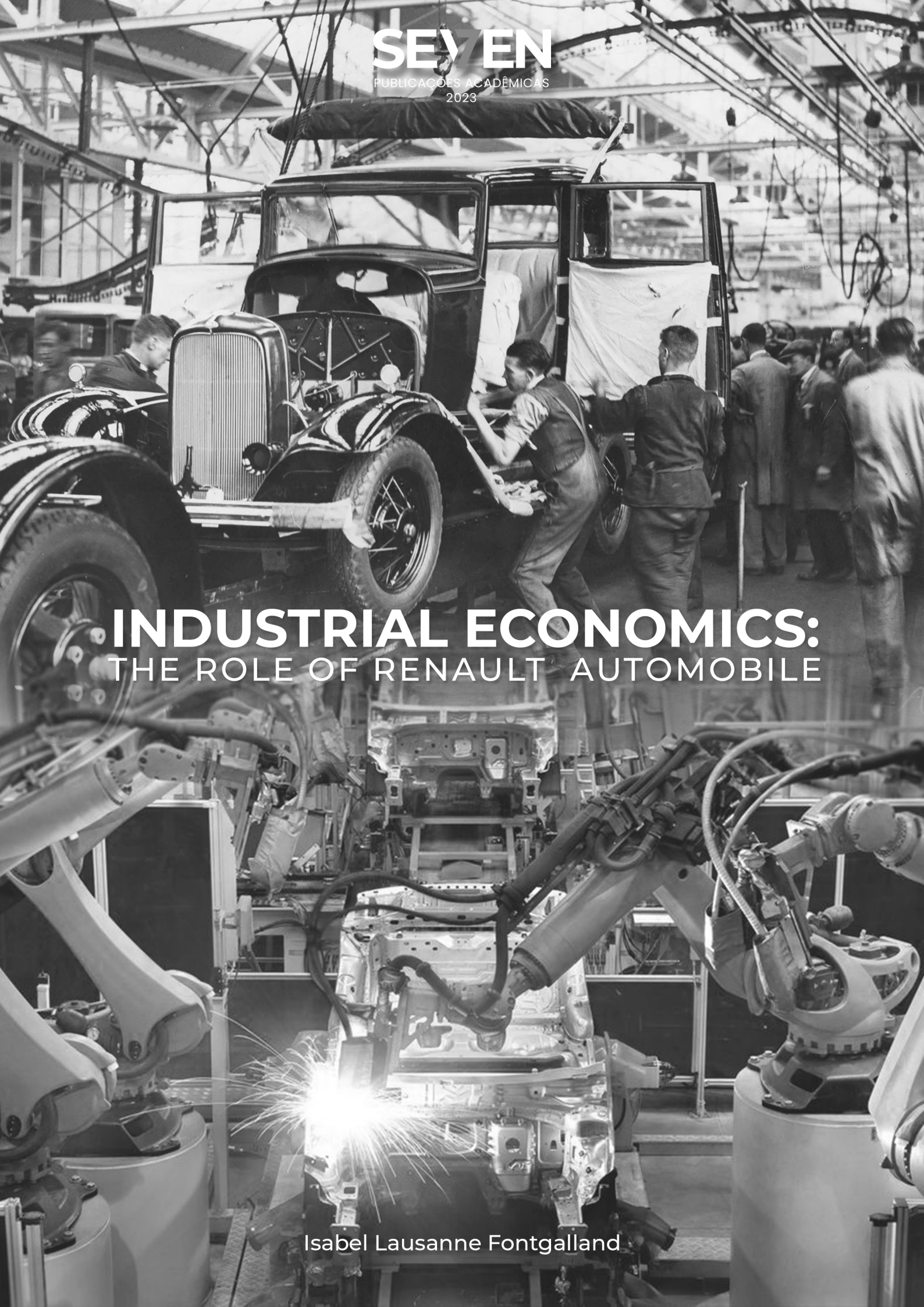

INDUSTRIAL ECONOMICS:
THE ROLE OF RENAULT AUTOMOBILE

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Preface

To create prodution and market, industrial companies are required to perform support functions (such as finance, quality, training, etc.). With the evolution of technology and the emergence of a new company profile, certain reflections have emerged, on the one hand, on a new knowledge that will have to be mastered, and on the other hand, on the probable evolution of qualifications.

The technological advances so often evoked as accelerated changes in the means of production have caused both the disappearance and appearance of a large number of trades as well as the internal transformation of some. This adds comes to the debate on the extent of organizational changes and the emergence of one or more new flexible organizational models. *In this manuscript, we are interested in show the repercussions of the flexible (re)organization of production and its contents regarding of in-locus training.*

New parameters lead us to training problems: work organization, assignment of men to jobs, general management of new training perspectives, theoretical knowledge, acquisition of usage of professional practices, and diversities of the plant position.

Our reasoning invites us not to remain in a vicious circle that consists of seeing flexibility only as a mechanism for increasing added value but rather to consider its result coming from technological development that disrupts company in its essential functions, transforming in organization.

The change of technology, and consequently of organization, are considered in our study as a condition for the survival of the firm: if it does not follow the evolutions, it has a good chance of being eliminated. Embarking on various possible paths is the same than multiple risks (GREENAN, 1995).

The mobilization of potential that results from learning how to network and organize makes us discover the automotive sector. Our work focuses on the theme of training resulting from the (re)organization of work in autonomous cells implemented in the Renault company.

The automotive industry

The automotive sector has long inspired the theories that make up the great tradition of the scientific organization of work, from Taylor to the new theory of the firm – know is the evoluticionarism (WARING, 1991 in BOYER et al., 1998). Various factors have been fixed outside the technological boundaries of the firm, often resulting from the intensification of competition.

The search for new forms of governance of the firm and the generalization of management criteria, focused on profit optimization, reveal new potentialities opened by the marriage of information technologies and telecommunications.

The development of new technologies and their applications in the automotive industry[1] continues to call into question the organization of this activity: whether at the level of products, processes, or upstream and downstream sectors. The success of some countries in the automotive sector confirms the mastery of technology as well as an adaptation to the global context. Following this logic, we have chosen to present the case of the Renault company, first examining its development vis-à-vis its technological line: the flexible bottom hybridization model; secondly, the influence of new technologies on organizational change and finally, on direct and indirect training procedures and methods.

In this regard, we evoke the hypothesis of PERRIN (1993), according to which, during the production process, the organization manages knowledge about itself through the forms and dynamics of solicitation of individual and collective skills, development, accumulation, and appropriation of knowledge and know-how resulting from the very functioning of the organization. Thus, the search for knowledge goes hand in hand with competitive forms and dynamics. In other words, the appropriation of knowledge and know-how comes from the functioning of the organization. We propose to analyze this dynamic through the construction of the notion of "cognitive principle."[2]

From this notion of cognitive principle, we retain a particular nuance linking qualification to two poles: formal and continuing training. This qualification is acquired through the accumulation of cognitive experiences and the participation of agents in the restructuring of tasks.

In all of our work, we have considered the flexibility of the firm as an involvement that is required day by day in practically all sectors of it, proving to be an innovative phenomenon. Flexibility finds purpose in the search for new training. At Renault, the changes that the company has undergone require reflection on its conduct, its skills, its strategic choices, and, of course, the quality of human reSources training.

Taking into account this range of ideas, we formulated three questions:

- What training has been required by the labor market since the arrival of new technologies?

[1] See the identity card of car companies in the annex.

[2] According to Perrin (1993), the cognitive principle must be understood as the set of production modalities articulated with the organization, of knowledge and know-how, and their cumulative implementation in the organizational dynamics itself.

- The labor market, as a dichotomous device, involves various approaches to the future of training. What are the new approaches?
- When does the company decide to change its trainer profile?

Questions about training

The training needs are considerable. Currently, the market trend is to find a new way of running the business, and more precisely, by relying on new technologies that favor the development of reliable and fast communication systems and interconnections.

According to NELSON (1991), The nature of the firm is expressed by heterogeneity. From this, it is deduced that skills emerge from a process of constituting the basis of "knowledge" and know-how vis-à-vis notions of learning, the tacit nature of knowledge, uncertainties, routines, irreversibility, accumulation, etc.

The issues that caught our attention concern the level of content of the training provided through a new organizational process. In our opinion, these contents lead to considerable changes that subsequently require the development of capacities and logic of training that are not focused solely on the transmission of knowledge itself, subject to lose and erosion. The automobile, as a strategic sector in economic activity, serves as a motive for an accumulation of knowledge from a particular learning process, namely the production of knowledge in autonomous islands. According to DOSI (1988), it is constituted as an instrument for the endogenization of technical change based on the expansion and updating of knowledge.

Several authors have tried to answer the question of how to develop training "concerning the market ."One of the explanations highlights the difficult journey of the company during the gradual transition to a flexible economic environment.

COHENDET (1996, p.29) considers that "the dominant intuition of the economic literature is that the incorporation of information technologies into the production process promotes a more qualified workforce and also gives a competitive advantage to companies."

The debates around organizational flexibility show the need for the organization to continuously produce knowledge about itself and its environment. LE BAS (1993, p. 20) notes that "a firm is a machine accumulating knowledge," which is linked to a logic of economies of scale. The rise of reflections on the learning organization and the debates around the notion of competence reflect the new place given to the human factor in this dynamic.

According to SOGLIO (1993, p.66)[3] "the situation we are currently experiencing is the result of a series of historical transformations, which have affected the functioning of what has been called

[3] J. SOGLIO (1993) in "un programme de recherche sur les métiers de l'emploi", June, 1993 (DARES).

the *labor market*. Until now, the literature has focused on analyzing aspects concerning the transformation of workplaces as a result of technical and product changes". These upheavals require, however, the definition of a new way of managing the relations between the internal functioning of industrial organizations and their economic environment.

Theoretical state of play

The object of our study is the company and its training apparatus. The productive environment in autonomous cells allows us to see the particular relationships of production**,** where agents contribute and react actively to the choice of organizational mechanisms. Our investigation falls back on the triangle: flexible organization, training, and dynamics of information.[4] As a support for understanding a new model of learning organization implemented at Renault: elementary work units (UET).

From a functional point of view, the limited rationality of the agents can cause a problem in the information network defined within the UETs. It can be said that skills are certainly evolving but in an environment characterized by uncertainty. This can be mitigated by a new governance structure that coordinates specific ways of sharing cooperation: called the horizontal hierarchy.

From an operational point of view, the elements involved are information technology and the new hierarchical configuration that aim to combine quality and lower cost (which leads the company to a much faster adaptation of the products and processes implemented). Thus, these two means seek to satisfy a specific and variable demand.

COHENDET (1989, p.27) explains in this context the action of the company:

"The company manufactures several products with at least one factor of production in common. In this case, where production processes are no longer independent of recent developments, the composition of outputs is as important as the scale of production in determining costs. The key concept of these reflections is the highlighting of the notion of economies of variety (or "field" or "range"); There are (positive) economies in variety when the cost of combining two (or more) production lines in a production unit is lower than that of producing them separately."

The properties highlighted above thus allow the possibility of the constitution of a productive structure which makes compatible the increase in the efficiency of production and the increase in the variety of products by expanding the range of products manufactured. It allows the company to extend

[4] According to Bruno (1989), "In the early seventies ... flexibility has become the favorite theme of industrial relations, thus adding to that of wage negotiations... *So* this model of the development and evolution of personnel management and industrial relations strategies... A closer look at the interweaving of microeconomic behavior and the environment provides some answers. It is indeed the relationship with the environment (*in our chosen triangle)* that gives its value to a given choice of the organization" (p.35).

its decision-making horizon and to assume, under certain conditions, the risks inherent in changes in the internal organization (Cohendet & Llerenna, 1989, p.30).

The concern of this new production formula is to find the following:

- The more complete temporary production sequences underlying the multiplication of operations carried out in the same working day;
- Better optimization of the time sequence between operation time and circulation time during cost streams optimizing the firm's investments.

However, this implies organizations are influenced by the structure of qualifications and technological change. From this, we propose our first hypothesis: the *most important technological change is the organization*. It affects the employment behavior of the company through its impact on the broadening of the technical knowledge base, from which we derive our second hypothesis, which concerns the involvement of the company in a new stream of training. These two hypotheses confirm technological change as a learning process that acts at the ex-ante level. Conversely, the growth of the workforce and the evolution of the structure of qualifications are sensitive to the nature of the organizational changes and skills that cross the company.

Technological innovation and organizational changes also implement the evolution of skills. According to COHENDET (1996, p.35), "Technological changes are rather motivated by a strategy of product differentiation, whereas organizational changes are more strongly linked to the quest for quality. Orientations towards the flexible business model as well as towards *technisation* (industry size, firm strategy, and results) are associated with a significant and diversified investment in advanced production technologies."

In this case, technology may carry certain organizational criteria, but conversely, its efficient use may also involve certain combinations: skills, tasks, and machines, which are not included in the user manuals. In addition, the search for certain objectives, such as flexibility or the technique itself, can encourage both the adoption of certain technologies and changes in the organization of the workshop.

New information technologies, by reducing the company's internal and external communication costs, offer new organizational possibilities. In addition, these technologies modify cognitive skills (ability to conduct analytical reasoning or synthesize information, ability to express themselves) or interpersonal skills (ability to interact with other individuals to be supervised). These changes in skills can also be associated with new forms of organization in which stronger worker involvement is sought.

We can then establish a technological triangle between evolution, organization, and skills for understanding UETs. This triangle makes it possible to understand technological innovation as an incorporation of information technologies**.** These correlations are therefore organized by an information and communication structure. In other words, decision-making power is distributed within and between these units. In this regard, the changes most often described in the literature over the recent period are those of decentralization and increased organization favoring greater flexibility. This flexible business model allows for better mobilization of skills, as well as more reliable coordination.

In the flexible business model, decentralization highlighted by AOKI (1988) allows for faster decision-making, while integration accelerates its implementation. Decentralization and horizontal coordination are a way of properly integrating a break with the functional divide between decision-making units and tasks. The analysis of this information makes it possible to find the "private domains" of each of the stakeholders, so the hierarchy plays a central role in the sharing of tasks between operators, technical improvements, and stopping and restarting production.

The different hierarchical levels are a possible result of the set of transformations just examined. The development of the sphere of responsibility and work arrangements leads to a change in hierarchical relationships.

Autonomous work teams (ETAs) are a management system that codifies the work and responsibilities of operators at the collective level. Its implementation has already been familiar since 1982. In 1995 the company gave rise to the Basic Work Units – EUT (elementary unit task but in french UET) with two innovative elements that maintain positive and significant links, namely: collective skills and autonomy.

The automotive industry undoubtedly represents a step forward in the industrial fabric. The questioning of a sequential approach is much more assertive, in particular through the "product-process" articulation and the more present valorization of cognitive synergies by contribution and cross-fertilization of expertise capacities.

The idea of an organization in autonomous cells encompasses an organization of communication, circulation, and transfer of experience that leads to new learning. Nevertheless, it raises questions about the conduct of the qualification in terms of training.

Our problem is therefore born from the concern to understand the mechanisms that will restructure the training action frameworks and the behavior of agents in the transfer of information within the UETs.

These arguments led us to develop the following questions:

- The new transformations of the professional foundations vis-à-vis the methods of flexibility adopted;
- The management of technical and organizational changes in "project teams" and the implications in the production of new knowledge and skills;
- New know-how in the quest for new permanent training in the UETs.

We have laid the foundations of a simple determinism that links organizational change in the absence of professional change and generates new paradigms of the labor market as a succession of almost chemical reactions.

Our study is based on a "tri-polar" relationship where the main approach is to observe that organizational change can be achieved from technological change while reassessing the qualification framework. A possible result of our research is the highlighting of these three dimensions, mentioned below, which each have their logic and action:

Thus, the company presents two changes: one technical from the new technology implemented and the other organizational resulting from a continuous training process. The latter is the center of the new vocational qualification. The endogenization of technical change ultimately implies an accumulation of knowledge from a renewal of the learning process.

Methodological tools

To analyze these new vocational training perspectives in the spirit of a continuous process of organizational flexibility, we used RENAULT data (RNRU) and internal reports listed in the RESSOR database (Groupe de Recherche en Socio-Economie), as well as survey documents conducted at GERPISA (Groupe d'Etude et de Recherches Permanente sur l'industrie et les Salariés

de l'Automobile - réseau automobile) and GIP (changements industrielles), constituting elements of a cyclical nature.

We had access to the Renault Billancourt archives as well as social and financial reports (1995-1998), which helped us to lay the foundations of the economic structure in which the company took its place. Other research provided by GERPISA was also consulted.

Data from other organizations, such as ANACT, INSEE, and CCFA, have been compulsorily composed under the behavioral title to better besiege technological changes and investments in education.

RENAULT'S HISTORY[5]

Renault Frères, a company founded by Louis Renault in 1898, was designed for the manufacture of automobiles and the exploitation of patents, such as the first *direct-drive transmission*. Before the arrival of the First World War, Renault come to have 5,200 employees and production in 1913 of 10,000 cars distributed worldwide. After the post-war period (First World War), the company maintained the same level of research, and its operations showed different forms of transport. Fully integrated production with production-circulation mechanisms was the sign of captive selling (captive shop) becoming the basic principle of the company. In 1922, Renault became a public limited company, and, in 1939, with 36,000 employees, it marketed 20,000 trucks, 45,000 cars, and 45,000 pieces of equipment, the majority of which were engines for the aircraft industry, self-propelled trolleys, and other equipment. In 1945, at the end of the Second World War, the company was nationalized, and only 20% of the original was preserved.

From its membership in the state, the responsibility of the body of the enterprise was determined according to the concept of worker participation. This new organizational orientation establishes an ambiguous system of operational flexibility.

During these early years, Régie Renault devoted itself to rebuilding its potential and satisfying growing market demand, even taking into account the lack of financial reSources. The executive directives set organizational restructuring objectives, namely: industrial development, hierarchical decentralization, and international competitiveness. Opting for the advancement of technical solutions such as *electromechanical control and machine transfer*, Renault reached 35% of French production and became the leader in exports. The opening of new capital in Europe as well as in other

[5] Based in Jean – Louis LOUBET (Renault, cents d'Histoire – Paris, Editions ETAI, 1998), Anne Sophie PERRIAUX (Renault et les sciences sociales 1948-1991 Editions Selo Arslan, 1998), and Archives RNRU.

countries allows the company to seek alternative markets in Europe, Mexico, Australia, South Africa, and Japan.

In 1950, international competition was stronger. Renault then followed the laws of the market and gradually changed strategies towards an assembly of local models and new technologies.[6]. This new environment prompted him to adopt a basic strategy, emphasizing single-line production and concentrating on domestic consumption of the domestic market.[7].

In the mid-60s, Renault undertook new maneuvers of technical and organizational change, i.e., the expansion of basic production lines through the flexibility mechanism of the higher production lines. This new process extends comparative advantages to all branches of the company, and a very important range of technical innovations has been launched in Europe. Nevertheless, judicious investment policies require a major rationalization of production, leading the company to take into account the *joint venture production plants model***.** Since then, Renault has distributed its models in 26 countries.

The 70s signal an increase in the coverage models of the set of production lines: the mega-models. In this period, Renault gradually developed another structure for the installation and marketing of its vehicles, which led it again to the forefront of the sector in France, with 75% of national production[8] .

An acceleration of production automation took place at this time based on six principles:

- Quality and recreation of manufactured products;
- Reduction of manufacturing time of new vehicles;
- Flexibility and versatility of manufacturing facilities;
- Increased productivity;
- the exchange of working conditions and advances from the organization of work, and
- Development and use of flexible and information technologies.

In this spirit, there is an intensive implementation of new technologies as well as a sectoral micro-division[9].

In this complexity of activities, Renault's size began to cause *scope* problems due to an uncertain economic context, especially in the mid-70s (the first oil shock). Based on these facts, the company underwent a new restructuring. In 1976, a crisis in the coordination of production due to a

[6] It is the passage of the semi-rigid system (Taylorism) into the spirit of Fordism or post-Fordism.
[7] It was at this time that the family car, and well-awaited car of the woman that debuted in the market, passed to be the center of thought of the sales department.
[8] about the diversification of chains such as machinery, sheet metal, design office, methods office, parts distribution, etc.
[9] in appendix

decentralization of control of the company (closely concerning supervision, the design office, the methods office, the marketing of vehicles, and the official executive division of Renault) called into question the organization as a whole. A new structure emerges with an automotive division based on an operational flow in the form of departments, which are themselves redistributed into research and development, industrial department (manufacturing and suppliers), distribution and international affairs, functional departments (IT, industrial planning and quality analysis), production and productivity program, finance department, quality control, and management. The progress of this procedure manager of the company has also reorganized the design and methods office (now DTP), which are also controlled in a certain way by the new functional areas. The central methods have made a kind of *joint venture* with the central personnel function by involving the factory in the new organizational perspective. Here is the new layout of the General Management:

- the central planning department;
- the Department of Scientific and Technical Activity (Information and promotion of exchanges, tests, and experiments in aspects of technological innovation);
- Identification of flexible procedures;
- external scientific relations (with other countries and other companies in the sector);
- The General Department of Industrial Relations responsible for studies and analyses of major personnel problems

This organization satisfies the demands of technological and organizational change in terms of information and executive control, highlighting a lighter management structure. This promotes more advantageous skills in terms of scope economy and decision strategies. The other optimal conditions appeared a little later and could be evaluated regarding the ease of basic technology choices and more balanced supervision, particularly despite the vagaries of the international market.

The crisis of 70 affects the world economy and the automotive sector in particular. Renault was able to maintain itself as a leader in the trade of passenger and commercial vehicles and tractor machines for farms, totaling a production of 2 million in 1980. In Table 1, we can look at the company's balance sheet at the time.

Table 1: Company balance sheet

Branches	French companies	Shelf companies
Renault automobiles	111.641	52.820
Renault veh. Industrial	32.266	562
Renault Automation or systems and automation	2.219	0
Renault mac. Agricultural	3.208	53
Renault Entr.industriels	15.815	0
Renault headquarters	1.191	57

Total Industrial and Commercial Sector	166.340	53.492
Renault Branc. Financier	2514	1.104
Total Staff	168.854	54.596

Source: RNRU (1980)

The Renault group continues to expand in France and abroad (see Table 2). Following the new technological trends, the company adopted a new production plant through the expansion of a new production policy based on the firm-network mechanism used in other automotive industries in Europe and the United States.

Table 2: Staff 1980-1984

YEARS / COUNTRY	1980	1981	1982	1983	1984
France	155.494	161.700	163.980	166.034	168.854
FOREIGN	58.231	58.105	53.281	49.810	54.596
TOTAL	213.725	219.805	217.269	215.844	223.450

Source: RNUR 1980-1984

During the 80s, Renault faced the demands of the market with a hybrid production system, which was combined with the quality of local training institutions (national education institutions). The legacy of corporatist industrial relations and the versatility associated with the implementation of a flexible system led to a hybrid process (see definition of the hybridization process in the automobile in section 1.3, chapter 1) at the end of this decade.

Renault's operations division policy changes the structure into two axes: 1) manufacturing and 2) the vehicle sales division. This involves a separation between manufacturing and the reorganization of productive operations functions. From there, a new debate emerges: *subcontracting*. The new operation is carried out "upstream" and "downstream," dividing the production and marketing sectors. These conditions together lie in place in an internal network. This directly promotes the emergence of a new internal organization chart[10] highlighting the methods more than the central design office. "These reflections led to the organization of small autonomous units within the workshops; It was at

[10] in the appendix

this time that the central method directorate launched a program project related to spare parts management.

In 1982, Régie Renault increased the number of these subsidiaries (22 countries) and became the European market leader, remaining the sixth largest car producer in the world. She holds 217. 269 employees (111,878 in France).

With the generalization of new computer-assisted technologies, work becomes more abstract, which leads to increasingly rare direct interventions. This raises a more collective work exercised within modules, cells, islands, zones, networks, teams, etc. The quality has become more remarkable regarding the final product (car) and customer service. Managing the renewal of one's stocks is cautioned, especially to better respond to market fluctuations, which are increasingly demanding in terms of diversity and deadlines. Versatility is the key word that develops within the company concerning considerably the training of recent-hired agents.

The evolution of the economic context in the second half of the 80s marks the exacerbation of competition and the crisis, which has led to a reformulation of industrial objectives, in particular those of the introduction of just-in-time flows and product quality. "Renault has contributed to an automated factory model, bearing high costs at each stage of production (foundry, forging, assembly)" (DQDE)[11]. This made it necessary to reorient the maintenance policy towards the reliability of the installations. This reorientation began around 1988 with local initiatives. It became widespread around 1990 with the dissemination of the principles of TPM (Total Productive Maintenance) as an essential vector of this change.

For ten years, has been searching for the *General Management of Renault,* created Renault's techno center[12] - 7500 people from all fields work in the quest for efficient management in terms of projects. The changes made are aimed at the provision of reSources upstream, from the pilot production of the system to marketing. The aim is to involve human reSources in the behavioral adaptation of agents as well as the evaluation of methods and tools according to training and technology.

The company has therefore undergone significant transformations forged in the spirit of the Toyotist hybridization model; today, these changes induce more transversality. MIDLER & GAREL (1993) describe the new organizational arrangements taken into account:

- Development of project structures responsible for ensuring the mobilization and coordination of the various actors involved in development. Project actors are

[11] This was removed from the archives of the Direction d'études of the Renault Quality Institute, created in 1989.
[12] See the Technocentre in the appendix

multiplying and gaining autonomy and power: project managers, project directors, business managers;

- Evolution of development schedules to allow future project directors to intervene upstream to anticipate problems and suggest solutions as soon as possible;
- A multiplication of collective work processes to supervise, encourage and help cooperation between different experts. This is the physical meeting of the actors of the project (co-location or plateau) of the work in multidisciplinary groups, carrying out a sub-set of the project ...;
- A coherence of project management and the career management of individuals to ensure the memory and continuity of responsibilities during development and from one project to another;
- Involvement throughout the development of the entire network of economic actors involved in the production and distribution of the new product through "co-development" or "design" approaches between contractors, contractors, and suppliers.

In this regard, one of the difficulties that has arisen is the impact of ongoing transformations on professional and organizational practice - business structures. These developments function as a frontal conflict between the basic logic of the company and the training currently required, point out MIDLER & GAREL (1995).[13]

The current method used by Renault consists of cutting the vehicle into about forty lots, and each batch is placed in sectors called: EUT (Elementary Work Units). They are managed by managers, mainly from engineering and also suppliers.

From the first voiturette created by Louis Renault, through the 4 CV in 1946, the Renault 16 in 1961, to the Clio II, the company perpetuates the status of being at the forefront of the automotive sector in France. In 1998, Renault's worldwide sales exceeded 2.2 million vehicles, and its turnover amounted to 244 billion francs. Renault generates 61.4% of business abroad with a total workforce of 138. 321 people[14].

[13] MIDLER &GAREL in Conconcurrent, cognitive processes, and economic regulation, Revue Française de Gestion, 1995.
[14] See in the appendix the Board of Directors and Executive Committee and Executive Committee as of 31/12/98

CHAPTER I

1 Organizational paths: the company's journey towards versatility

The study of the OST (Scientific Organization of Work), from Taylor to the new models of flexible organization, raised questions and answers at the beginning of this research. The analysis of certain periods in the history of the Renault company has highlighted the imperative of certain variables dealt with here: the skills of the firm, the departmental planning, the functional definition of the firm, the distribution of tasks, the structuring of methods and design offices, etc.

Despite diverse architectures in such diverse historical contexts, the OST is making its way through management crises to those that have changed the profile of the current worker.

Automation has been a remarkable fact since the beginning of this century, prompting transformations in the scientific organization of work. The role of manufacturing workshops is changing, as well as the act of manufacturing. The latter is no longer only an act of transformation of matter, but it integrates two dimensions at the same time: the first concerns a new organizational current, and the second reaches a reflection on management tools. As a result, the participation of highly skilled workers is changing, and the paths leading to these jobs are diversifying.

These trends in the organization of work result from a desire to reintroduce the concept of responsibility for managing the means of production at the more decentralized level of productive knowledge (ZARIFIAN, 1986). The emphasis we want to bring links the quality of vocational training to trends in the evolution of technical knowledge and know-how.

The transformation of technical production systems then gives rise to a threefold transformation of the content of economic activity: work-sharing *methods, groups/skills, and continuing training.*

The ability to learn includes multiple concepts, such as those of a new process, a new tool, or a new organization, thus becoming criteria for efficiency. A new research topic appears between the learning of new work collectives and new training. This is not exclusively technical but inherent in everyday industrial life, its history, its crises, and events (ZARIFIAN & VELTZ, 1993).

From there, two methods of (re)organization are highlighted. The first is taken according to the distribution-consumption ratio, taking into account just-in-time production (Fordism), and the second (Toyotism) refers to the hierarchical process, including aspects of functional partition.

The first idea gives access to a certain positioning of the classification concerning the distribution of the wage bill: The second is related to the implementation of production and the division of the workforce into different occupations.

This group is representative of different groupings that have taken place in the Renault company through its development. It corresponded to certain types of professions, attached all the same to the automation-knowledge conflict.

The transformations during the 70s and 80s linked automated industrial transformation and the qualifying social organization of work. For this reason, we note the imposition of hierarchical character as a representation of socio-professional groups in the sense of an organizational elaboration of technical change.

In the context of organizational transformations, current techniques are complex to establish standard behavior. The analysis of organizational content becomes more complex, and in a way, in-game production systems contribute to a new perspective of training and flexibility.

To return to the sequential process of this chapter, we will first highlight the technical-organizational history of the company (sec.1.1). In a second step, we will take a way of explaining the evolution of the concepts and methods of organization, which will be called postclassical models. These are related to technical integration and organizational changes (section 1.2), characterizing Renault's methods of production rationalization. Next, an analysis of the company as a hierarchical network is required. It will allow us to understand the definition of the new hierarchical profile of the Renault company (section 1.3).

An analysis of the penetration of certain models is made. The influence of new technologies seems to us to reflect the sequence of specialized functions. Finally, it is possible to describe the passage of the company through different automation courses, according to their level and their degree of integration into its policy.

1.1 Functionalist Paradigms and organizational analysis

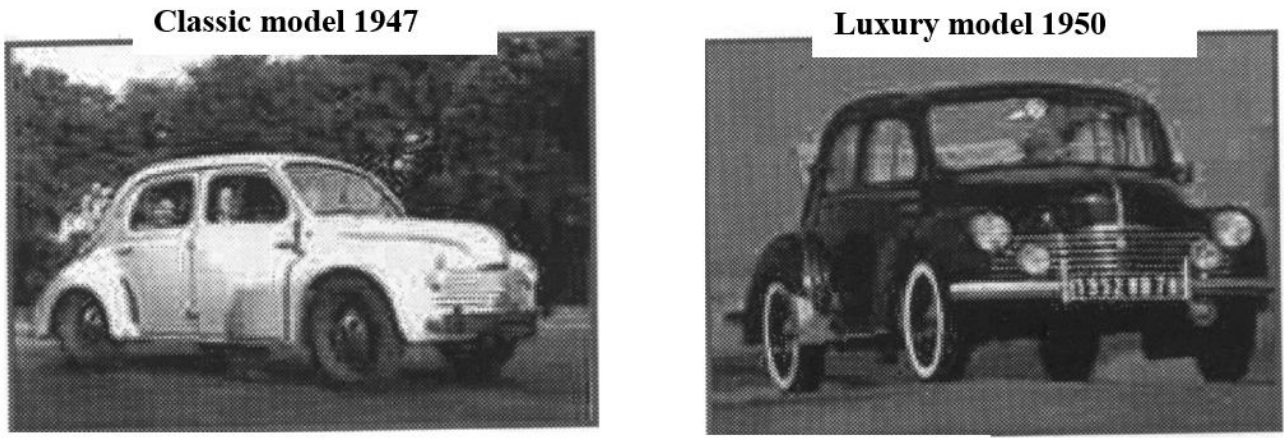
1.1.1 Introduction

From 1946 to 1961, more than one million "4 horses" were produced worldwide. This is a feat due to a wide range of models that have been able to meet different needs.

- Pre-production models – Renault engineers made several prototypes and models before selling the "4 horsepower" to individuals.
- Models from 1947 to 1950 – The first models of "4 horses" crisscross the roads of France. Diversity is starting to show.

- Models from 1951 to 1961 – During these years when the "4 horses" was at its peak, many models appeared to the delight of sportsmen.

Figure 1: The models of the 4 hp



This led us to distinguish three key periods in the management of industrial production, revealing the development of the automotive industry.

The first period is decisive for subsequent history and concerns the emergence of all the techniques known as the scientific organization of work (OST). Its main contribution is the redefinition of the status of workers' work. According to BERCOT (1990, p.297), "the manufacturing work of skilled workers is strongly modified from the introduction of automation ."This changes the relationship between material transformation and product design conditions. This period, *Taylorism*, is mainly characterized by a movement of integration from a triple point of view: technical, organizational, and relational integration".

The second period was marked, in particular, by intense experience in the enrichment and expansion of tasks. The organization of production is modified based on the particular priorities of enterprises within their work structures. The advance in terms of the integrated organization takes into account the entire system, giving priority to global and transversal production objectives. *Fordism* implements large series around "autonomous" islands of assembly as well as working groups and evaluation professions. The act of manufacturing becomes an act of equipment maintenance, production management, the definition of methods, and quality control.

The third period concerns *Toyotism*. This movement is linked to the two previous forms of integration. This period is defined as "just-in-time" production. The work teams are formed to ensure the production flow triggered by the orders downstream of manufacturing and, therefore, the production itself. Order/customer orders, taken as production commands, also play a role in internal scheduling.

In Table 3 we detail the operation of the three operating models identified in these periods.

Table 3: Procedures

Operations and Functions	Taylorism		Fordism		Toyotism
	Classics	Computerized	Classics	Automated	
Manufacturing designs	Design office	Ditto	Ditto	Ditto	Ditto
Scheduling	Design office	Design office + OM workshop + IT management	Design office Foremen	-	by manufacturing workers with assistance design office
Productive operations manufacturing	Manual labor	Manual labor	Manual labor	Automatic channels	Manual work with or without assistance from automatic machines
Circulation of material parts	Mechanical rigid conveyors buffer stocks	Computer-managed network conveyors	Mechanical conveyors	In-line or networked mechanical conveyors	Manual with or without conveyors
Control	CM and specialized agents	IT supervision and control CM	CM and specialized agents	CM and specialized agents + computer control	Manufacturing workers at the place of manufacture
Method of setting times	Time allocated	Time allocated	Time allocated	Time allocated	Time allocated
Productivity trade-off/ Flexibility	Low flexibility/high productivity	Good flexibility/high productivity	Flexibility/High productivity base	Flexibility/High productivity base	Good flexibility/productivity

Source: CORIAT, B. (1990) L'atelier et le robot, pp.102, Ed. Bourgois.

1.1.2 The Fordist project

The Fordist system explores the possibility of a mass organization of work. It is based on the possibilities of work organization introduced by the invention of the conveyor that transports parts from one place to another during production. Workers can therefore be confined to fixed positions, and it is all assembly line work that is thus born, setting the rationalization of work to a higher level. "the OST then reaches a project dimension summarizing the technical and human operations of production in the same model of forecasting and rational management of work" (SAINSAULIEU, 1987, p.36).

We must first consider who, at that time, the notion of know-how was attached to the idea of operational qualification. VELTZ (1992) proposes to characterize know-how according to three criteria: dimension, basis, and dynamic; See:

- Dimension: know-how is exhaustive when it covers all the stages of a process or when its implementation involves knowledge of it. Conversely, it is partial if it is possible to master one step of the process while ignoring the rest of that process.

The typical example of partial know-how is that of the specialized worker of an assembly line who knows only his workstation; that of exhaustive know-how is provided by the versatile production worker, who supervises several operations and knows the operation of several devices.

- Basis: Empirical know-how is immediately based on the practical and informal relationship between the operator and his machines and the product. The emergence of analytical know-how presupposes a scientific detour, a prior intellectual approach. The worker has a rational knowledge of the technical elements of the process. Analytical know-how presupposes some training before the start of work.
- Dynamic: We are talking about innovative know-how if the implementation of know-how significantly changes the technical conditions of the production process: design of new operating procedures and modification of the product.

The analysis of the automotive sector allows us to understand the transition from exhaustive know-how to partial know-how by narrowing the fields of action and knowledge of executive workers; from empirical know-how to analytical know-how by increasing codification of the content of work: from innovative know-how to adaptive know-how, by sterilizing the innovative capacities of direct workers.[15].

1.1.3 Renault and the FORD model

It is indisputable that standardized production and mass consumption characterized the most expansive period of the automobile. At that time, the creation of automatism and homogeneity of products was in full effervescence. From there, new concepts emerge, one of them is the idea of a uniform market.

Régie Renault generates a factory model that bears high costs at each stage of development (foundry, forging, machining, assembly), with high production rigidity, as well as large stocks at all these stages.

After its nationalization in 1945, still, under the wing of the government of General de Gaul, the first manager of Renault, Pierre Lefaucheux, implemented the Fordist strategy in the company. Marketing then displays a production based on the Fordist system. The 4 CV is launched, and with

[15] Automatism has had important consequences on the qualification of workers. It has led, for example, to the de-skilling of occupations (vis-à-vis its content) and the need to adopt new, more abstract, and mathematical languages. It is, therefore, the adaptation to the automatism of empirical know-how about adaptive know-how that we are talking about (VELTZ, 1992, 335).

it, a slogan targeting low-income families. This is what makes this model the symbol of prosperity of France (FRIDENSON 1979, FREYSSENET, 1998).

The reorganization of work requires more than 25,000 hours of overtime (FREYSSENET, 1998) - this is the Renault-Fordist machine in operation. Everything has been done to guarantee the solidification of the 4 CVs in the French market. The production lines, as well as the tasks, were established in a rigid way respecting the criteria of productivity. The latter was fixed in advance by the methods office and calculated according to their nature and the working group.

The specialized sheet metal is partially automated, as well as all the auxiliary sectors. Finally, the nerve center of the plant is based on the machine-to-machine transfer model. The invisible hand (methods office) controls all the group's subsidiaries in Billancourt. This is the *boom* of the mass production model.

Always subject to severe statistical comparisons (established outside the workshop), the production is obliged to accomplish tasks beyond the profile of its production. This historical moment is called: production managed by *Industrial engineering.*[16]

Nevertheless, in 1960 the challenges were stronger; it is turnover and absenteeism on the rise. Two other models appear as a sign of modernity in the automobile – the Volkswagen Beetle – using the classic Sloanist model and the 14CV hybrid vehicle. Ultimately, these events overturn Renault's future. However, the domestic car elected by France, 4CV, remains first giving support to the investment flow of diversification of other models within the company.

In 1973, the model went into crisis and led to a draconian policy affecting Renault's production and turnover. As we can see from Table 4, stock rates are increasing as well as turnover. This calls into question the coordination of the company and causes the redefinition of a new hierarchical organization chart[17]. The variety of production and diversification are poles envisaged in the company's interest policy, suggesting the quest for a new organizational profile and investment strategies. In this period, too, the company's scoping objectives (productivity, scale yields, and skilled labor) led to questions about the capacity of each department and its respective tasks. From here, a new distribution of functions is envisaged, and a new organizational chart is defined.

[16] Journal des ouvriers – archives RENAULT 1954.
[17] in the appendix

Table 4: Main statistics of Renault (1945-1979)

Years	Commercial production				Labour Force (a)	Turnover (b)	Net turnover (c)	Gross turnover (c)
	M	D	e	E-outside Europe	Régie Renault S.A	Régie Renault S.A	Régie Renault S.A	Régie Renault S.A
1945	12036	12036	-	-	23250	36	-	-
1946	28842	28842	12614	-	29050	77	-	-
1947	44484	44484	26059		36471	123	-	-
1948	65317	65317	26375	-	39770	305	-	-
1949	106079	106079	37658	-	44233	474	-	-
1950	131903	131903	46590	-	48519	570	-	-
1951	163944	163944	48316	-	52470	959	-	-
1952	169543	169543	36437	-	52138	1178	-	-
1953	160102	160102	39830	-	50337	1151	-	-
1954	198932	198932	52078	-	50400	1338	-	-
1955	219622	219622	64887	-	52235	1424	-	227
1956	264044	259825	68868	4219	57467	1696	-	269
1957	317443	313425	112744	4018	58981	2162	-	486
1958	409185	405436	165947	3749	62010	2532	-	376
1959	494160	487044	297287	7116	65657	3131	-	480
1960	542927	521969	276563	20958	61432	3227	-	112
1961	393163	353218	183970	39945	58313	2962	-	379
1962	565555	536955	229949	28600	65036	3703	-	317
1963	668867	639797	219514	29070	63575	4438	-	419
1964	551755	497555	164058	54200	58899	4268	-	598
1965	590431	551904	226305	38527	62902	4536	-	529
1966	737979	648354	243566	89625	66171	5534	-	596
1967	777468	695148	295586	82050	66882	5886	22	821
1968	807407	714314	339635	93093	76060	6468	20	593
1969	1009372	898486	415211	110886	86348	8539	151	737
1970	1159745	1040112	561006	119633	97261	10674	5	350
1971	1174314	1040321	527181	133993	98091	10674	-197	-474
1972	1318827	1155507	549777	162820	100001	12087	74	720
1973*	1414563	1209342	604034	205221	101415	13777	57	870
1974**	1487528	1291196	649044	196332	100478	16173	36	-1069
1975***	1391948	1128972	562707	262976	103614	18264	-551	-956
1976	1659973	1365442	640905	294531	110406	25778	610	-382
1977	1737707	1398550	624106	339157	110485	28696	12	-1196
1978	1718398	1372084	613927	346314	108586	34011	158	27
1979	1899470	1544995	730771	354475	106740	42185	470	699

Notes
* - data for the sector as a whole has been ignored
** - increase in stocks (1st oil crisis)
- fall in production with a significant increase in turnover rates and a decrease in turnover.
a – labor taken into account on 31 December, taking into account formal contracts;
b- turnover in millions of francs
c- Gross and net turnover in millions of francs
M – Total production
D- Domestic production
e- vehicles exported to Western Europe
e- outside Europe - vehicles exported outside Western Europe
- the absence of data
Source: Renault Annual Reports in FREYSSENET 1998

1.1.4 Crisis of Fordism – the emergence of a new model of industrial coordination

According to CORIAT (1979), from a macroeconomic point of view, the Fordist rationalization of the work process could only develop through an incessant process of industrial restructuring. They have made it possible to readjust certain elements: industrial and commercial bankruptcies, the elimination of production units, the concentration of capital, etc. The most explanatory factor of the system is attached to the stability and rigidity of the production process. Based on these requirements, the process took into account other criteria:

- Market characteristics;
- The potential aspirations of the demand.

The thesis of the disqualification or polarization of qualifications (sec. 1.2, chap. 1) appeared in the years 1950-60, presenting the causes of the crisis already established. It was based on the idea of technological evolution towards marginalization or even the elimination of the role of the human operator in work.[18]. [19] This assertion is consistent with the following:

- A transfer of part of the responsibilities from those who prepare the work to those who perform it: from work composed of prescribed tasks, we move to a work that is somehow self-prescribed based on instructions. The operator organizes his work himself. This presupposes a certain responsibility and motivation: other forms of command of work deviating from the Taylorian model (obedience, discipline, supervision/execution) also becoming necessary, which are no longer defined so much in terms of tasks to be performed but in terms of instructions to be respected, objectives to be achieved and, functions to be fulfilled within a system.
- The need for other skills that are not only acquired in training (whether initial or continuing). Indeed, beyond the definition of new training contents, these transformations call into question the idea that skills correspond to two subclassifications: the behaviors of autonomy, initiative, and responsibility that depend more broadly on the overall process. A second class is related to training and cognitive practices in the sense of the contents of attention, memorization, representation, abstraction, logical reasoning, and problem-solving.

[18] The waste and misfortunes of the seventies reveal a useful method to solve the problem brought about by Taylorism (and all forms of automation of work) is undoubtedly flexibility. This contains essential criteria for the implementation of social issues.
[19] Sociology claims that human labor can be excluded from the production process: man-machine war.

In our opinion, standardization was compatible with the diversification of the industries of the time (especially automotive,[20] Chemical and food industries). Basic elements have made it possible to maintain mass production and to differentiate it gradually – corresponding, first, to a policy tending towards flexibility and, secondly, to the diversity of the productive fabric as an effective means of resisting changes in demand without calling into question the functioning and organization of the large competitive enterprise. (Du Tertre, 1989).

1.1.5 Fordism – crisis and the Emergence of a new qualification content at Renault

Renault and other Fordian production industries were developed from robotization, related to the automation of manipulations, assembly line conveying, and assembly operations, with the introduction of robots. The speed of execution and the regularity of the partial and adaptive know-how has reached the division of workers' tasks. "In a general overview, the problem of the dynamics of qualifications has accompanied the need for the implementation of new skills by highlighting basic and continuing training" (RNUR, 1989).

The whole organization setup is based on three main conditions:

- as regards operators: full versatility and availability;
- for machinery: total availability (reduction of breakdowns);
- concerning products.

The productivity of labor vis-à-vis labor operations has been improved by the setting in motion of gestures within the concrete process (the first axis defined by Taylorism) in the direction of the relationship between growth and profitability (De TERSSAC, 1989).

The specialization of operators by technological meshes has had considerable effects in the event of absenteeism. This mesh constitution has made it possible to ensure a horizon of quantitative growth in the volume of products produced and, thus, absolute growth in the mass of global value. Vertical integration is observed from the beginning of the management of actions in the production chain.[21] .

The management of value and the industrial contract as elements of transformation of the mode of organizational regulation has had an essential advantage: the definition of an objective at the beginning of the control process to avoid a sustainable revitalization during the period of the control cycle (medium and long-term planning). This highlighted the problem created by the homeostatic or

[20] Renault's adoption of this policy is more explicit in Jean-Louis LOUBET's book Cents ans de Renault, ETAI (1998)
[21] The mesh system includes primary production trees facilitating the alignment of production, sometimes at the level of stock supply and sometimes at the level of distribution.

externality, which disrupted the cost function and all the elements related to the skills of the firm (CORIAT, 1993, ZARIFIAN, 1993).

Among the movements that affected work and skills, some brought with them the prospect of re-skilling, thus breaking previous characteristics and trends. Automation, therefore, offers prospects for technical changes that are related to it but that do not necessarily materialize them. Overall, these blockages highlight the legacy of Fordism, which still determines the social game over know-how, the functioning of the labor market, and the very conception of production.

An important element, but one with questionable characteristics, in this area, concerns the position of employers. On the one hand, there is the crucial character of workers' intervention in production (generator of crises, such as absenteeism and turnover), and on the other, the knowledge and mobilization of their know-how. This calls into question the hierarchical organization and what it entails, i.e., the division between workers as an expression of a blockage placed by know-how.

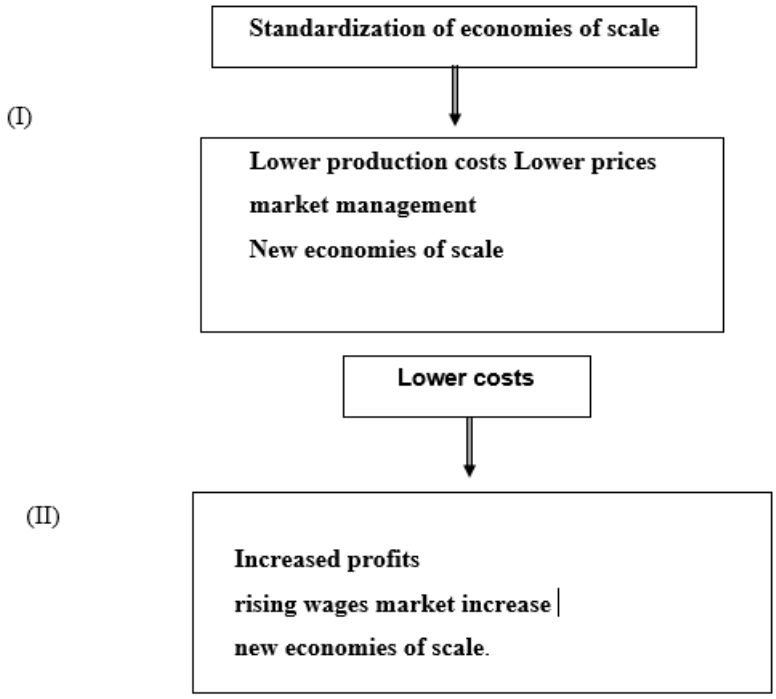
Finally, the Fordian mode of production has itself created obstacles to the emergence of the new qualification proposed in its definition.[22]. Indeed, there is a certain scattering of production between several companies: standardized mass production in the dominant company, many peripheral functions in subcontracting companies, or suppliers of goods and services (this is the current spirit in the automobile). They are linked to the development of equipment, functions, and prototypes of many other functions specific to the development of true global technical mastery. Fordism gives priority to the speed of execution and regularity, preferring, in a way, the intensity of work to its quality. This remained possible in an economic context of non-saturation of needs of increasing expansion of demand.

1.1.6 Skills at Ford

The Fordist model allowed the large-scale production of standardized goods at reasonable prices, massively accessible to buyers**.** The Source of this performance was sought in the rationalization of the gestures of operators on production lines (individual phenomenon).

This dynamic can be summed up in two characteristics of the virtuous circle (DOCKES, 1992):

[22] According to Veltz (1992), two serious crises of Fordism, where development stagnates the process of qualification of the workforce and the 2nd when of the first oil shock, companies have accumulated problems of stocks incompatible with demand.



1.1.7 The Toyotist Project [23]

Toyotism is defined using different characteristics:

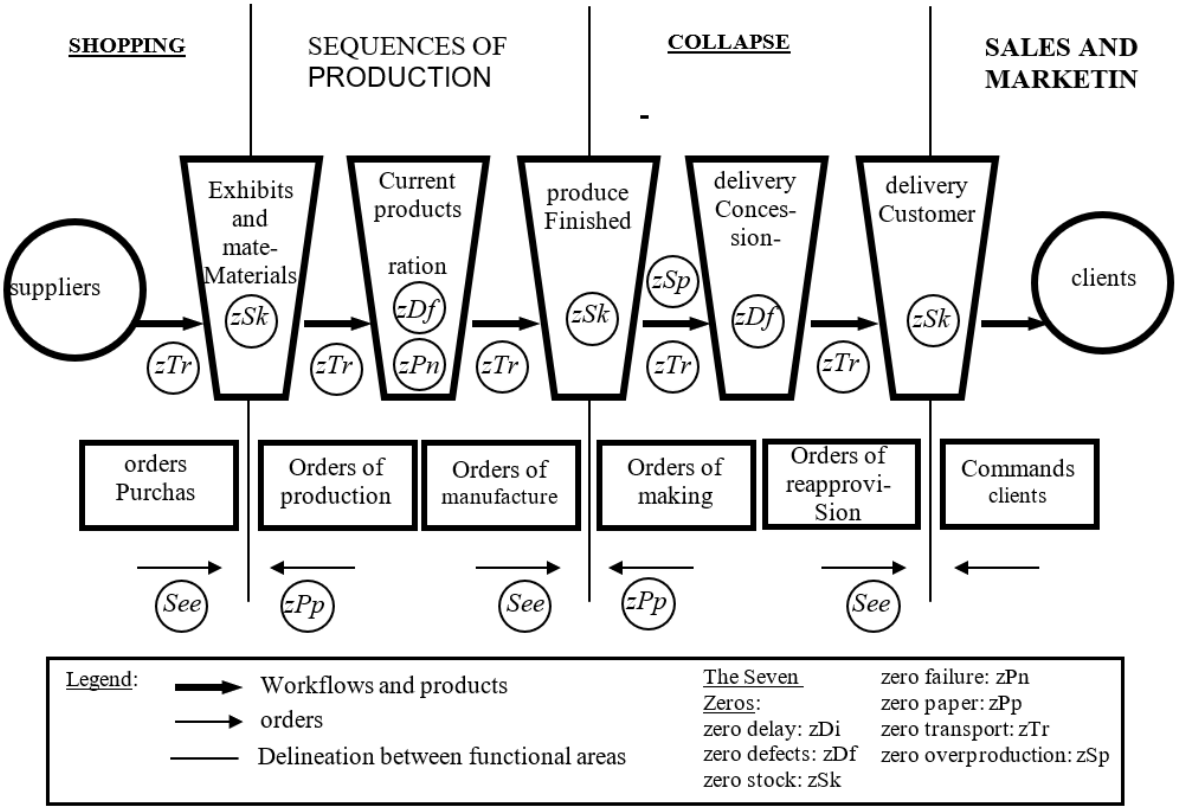
- The mass production of diversity in the face of the variety of demand; thus, diversified products are manufactured in a volume sufficient to maintain the advantage of experience in production (CORIAT, 1990);
- The reallocation of time in production, time-sharing functioning as a series of pre-defined standards; the just-in-time (JIT) production master plan not exceeding the forecast three-month horizon (GIARD, 1988);
- Teamwork: the new human organization in production is based on the horizontalization of relations between individuals, a shortening of hierarchical ranks, a sharing of information, allowing the coordination of functional units, at the level of workers (AOKI, 1991);
- The new concept of quality integrating production with highly decentralized management. It is both an element of competitiveness (product quality) and decentralization.

According to BERANGER (1987) the condition for success is the quality approach that is exercised upstream. Finally, through the concept of total quality, it is a question of promoting and

[23] The implied principle is the call by the downstream, which could be summarized as follows: "Production is organized ... Now based on the order of sales and changes in the structure of demand, production, and supply, with minimum stocks at all levels. The whole is organized ... according to a dual procedure of upstream-downstream production guidelines, following orders organized in the sense going back (BARDELLI, 1991) relatively resistant to change. On the contrary, the Toyota system is very malleable; it adapts well to the most difficult contradictions of diversification.

controlling the pressure of deadlines on the one hand and avoiding on the other hand the waste specific to the Fordian model that constitutes high scrap rates.

Figure 2: Interconnection of production and order flows in the "jute on time"



Source: BARDELLI, P. Implications of JAT production on the organization of automotive equipment companies – Nancy, Cahiers ERESTRATE-IAE, 1991 -

The concept of just-in-time (JIT) means that at each phase of the production process, the necessary parts arrive in the desired quality, on time and in the desired quantities (decided before production). It is opposed to the classic standard method, which consists of planning each phase of the process independently of the others and pushing the parts from one phase to the next, thus resulting in an accumulation of parts that degrade the profitability of the company (decided at the time of production). The trend objectives are the seven zeros and the JAT.[24]

[24] These are five zeros (zero delays; zero defects; zero stock, zero breakdowns; zero paper meaning a minimum of intervention by bureaucratic structures and two others commonly added: zero transport and zero super production, which thus make it the model of seven zeros (GIARD, 1988).

1.1.8 The Principle of Toyotism

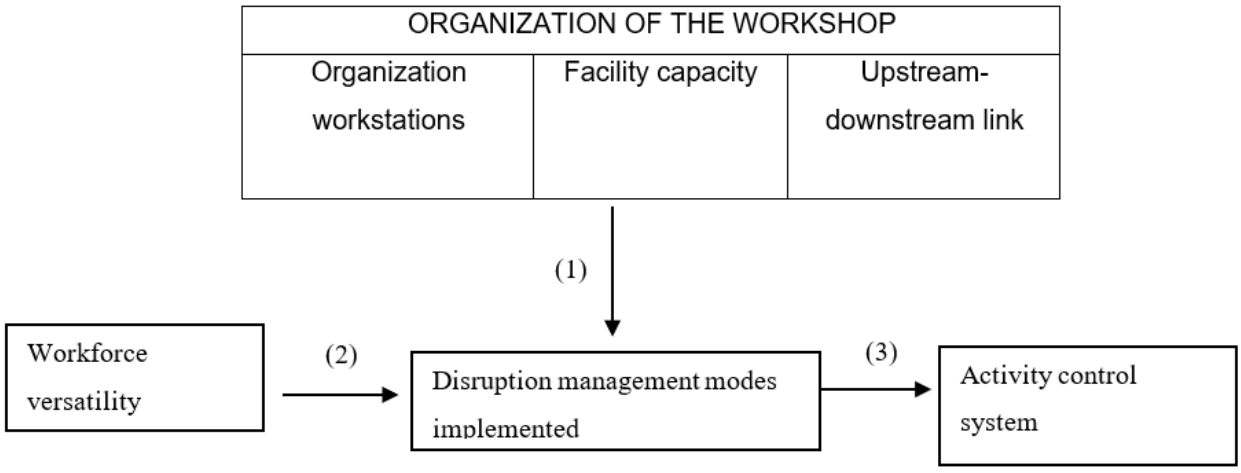
It is about guiding the way of producing. "The call is downstream." Production is now organized according to the order of sales and changes in the structure of demand to production and supply of stocks. The implementation of this approach is based on information.

1.1.9 The example of the JAT at Renault

Renault's organizational trajectory tends towards the ideal type of Japanese development, as generally described in the literature [Womack et al., 1992, MIDLER (1993, 1995)]. The Japanese model involves integrated organization at internal and external levels through cooperation between methods and design offices, highlighting strong technical knowledge upstream (feasibility) and downstream ("development") (MIDLER & GARES, 1995, p.92).

The organization in the workshop was set up, considering a steering system oriented more toward the environment, called the *flexible workshop.*[25]. This concept implements a change in the behavior of the entire company leading the mobilization of services upstream-downstream, at the same time as conducting inventory management in reactive just-in-time management. At the workforce level, operational managers control demand data as well as the internal market (fluctuating workforce). Through Figure 2, we observe the interactions described above.

Figure 3: Organization of the workshop



Source: MIDLER (1980) p.137

[25] In the literature, we have also found the term "flexibility of the workshop," meaning flexibility.

This method combines (1) and (2) in an organization in semi-autonomous groups (see sec. 1.2 Chapter 1), allowing an optimal result at the economic level, technical factors (the organization in various workshops), and human factors (the trained workforce).

The independence of posts and the qualifications of operators led to a new mode of adaptation and the possibility of substitution among staff, which was based on a "certain" versatility of technical infrastructures and qualifications, making it possible to renew the installations for the assembly of mechanical components, according to demand, in the workshop (MIDLER, 1980, p.132-133).

MIDLER (1980) describes the nine main workshops (we will mention the 2 main ones) for the manufacture of vehicles that were affected by the reallocation of posts during this period:

1° module – 6 workshop modules have been assigned to the assembly of basic vehicles;

2° module – 3 workshops have been modified to complement the production of the components of different models, including 20 conversions of substations between 2 types of vehicles, 31 transformations of substations between 3 types of vehicles, and 17 transformations between 3 types of vehicles.

The transformations required to achieve a change in production at this time involved two additional conditions:

- Existence of overcapacity about overall need;
- Existence of discrepancies between upstream and downstream units which have made it possible to regulate stocks. The central idea is, therefore, to develop an organization in workshops chained globally to rigid units.

Through Table 5, we observe the first results of the flexible production model: the increase in turnover and the reduction of the company's debt.

Table 5: Main Renault statistics (1980-1991)

Years	Commercial production				Labour Force (a)	Turnover (b)	Net turnover (c)	Gross turnover (c)
	M	d	e	e-outside Europe	Régie Renault S.A	Régie Renault S.A	Régie Renault S.A	Régie Renault S.A
1980	1999591	1659099	760879	340492	105319	49864	303	-1102
1981	1764702	1479691	640156	285011	103613	53620	-875	-1173
1982	1921307	1674416	757954	246891	103759	65752	-2563	-1577
1983	2035133	979425	192332	219805	102528	73560	-1576	-2579
1984	1740737	1607441	887177	138264	98153	72105	-11324	-7246
1985	1637634	1499979	881149	137636	86122	72644	-11241	-4242
1986	1754332	1537123	779867	217209	79191	82992	-7355	1635
1987	**1831390**	**1621146**	**809589**	**219244**	**75911**	**93333**	**2314**	**7580**
1988	1850667	1630786	807739	219876	71898	99802	7316	9222
1989	1966724	1717279	837608	249445	70720	113731	6932	7268
1990	1776717	1571264	784112	205184	68713	110694	1223	3282
1991	1790709	1587787	829298	202292	63644	112297	2467	2530

a – labor taken into account on 31 December, taking into account formal contracts;
b- turnover in millions of francs
c- Gross and net turnover in millions of francs
M – Total production
D- Domestic production
e- vehicles exported to Western Europe
e- outside Europe - vehicles exported outside Western Europe
Source: Annual Reports of Renault in Freyssenet 1998
1987- marks the period of reconstruction of the company in terms of investment in health

1.1.10 The flexible background of Toyotism

The model is based on a very strong integration through the establishment of a homogeneous rational structure for determining costs, prices, and profits, called: the virtuous circle of sincere cooperation (Womack et al., 1992). This presupposes the integration of the productive fabric to be managed in just in time.

The support of this mode of operation is the homogenization of flows and technologies. The flexible result comes from the combination of distributed (non-concentrated) homogeneous equipment and mobile, versatile and polyfunctional individuals (Everaere, 1994). It is the JAT that homogenizes flows and technologies. It connects the workshops, the factory to its suppliers, and the factory to its customers.

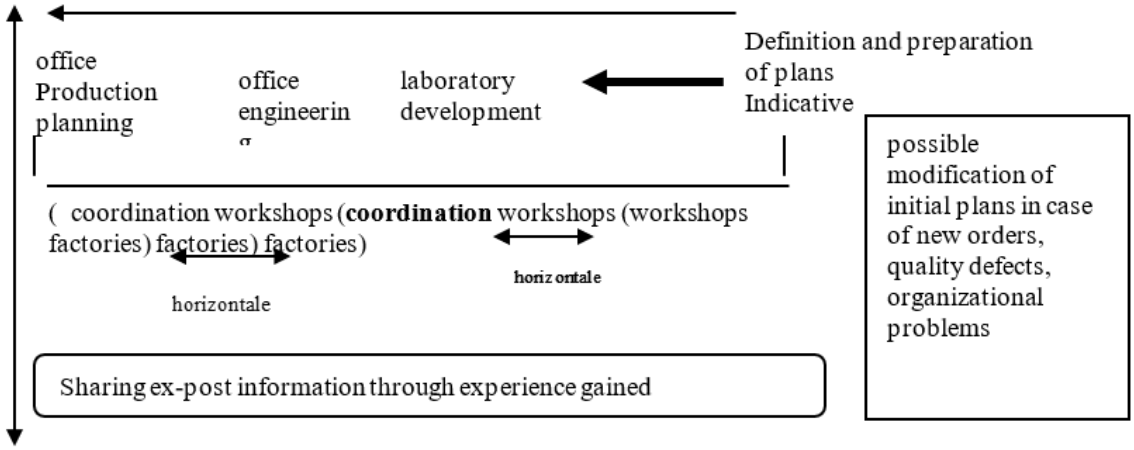
Within the company, the technological components of the JAT (kanban) constitute the factors of coherence and technical homogenization, that is to say, the new ways of managing human reSources and the social components. Externally, the effectiveness of the JAT results from several constituent elements of the organization. The organization is understood as a horizontal and vertical communication channel.

At Renault, the JAT is "an industrial management principle" to reduce overall production costs, thanks to a continuous improvement approach, while eliminating: operations without added value, stock malfunctions, and delivery conditions.

Currently, through the cellular production device, the workstation has linked itself to a logic of rationality of flow regulation which also implies the "rationality of minimum operating times."

The adjustment of work teams into autonomous teams respects the regularization of the production flow. Production is caused by downstream orders. In this context, flexibility is linked to serial information, linking the entire operational circuit. From there, a new organizational level is implemented regarding the availability of technical information associated with the routing of the downstream station vis-à-vis upstream (Figure 3).

Figure 4: Horizontal coordination



Source: based on AOKI - Japanese Economics, p. (1991)

Thus, the flexibility obtained allows an increase in productivity through the adjustment and repositioning of the workforce based on organizational changes. The concept of flexibility links advanced flow planning with production versatility[26]. Productivity is achieved by the multifunctionality of modular and variable tasks, in quantity and kind, on work islands.

SUMMARY OF SECTION 1.1

This section highlighted the standard models. The idea of technical and organizational change is considered here from the example of Renault.

We discussed, in the first place, the evolution of industrial automation, in particular the automobile, towards the management of networks of various knowledge. After intensive and qualitative strategies, extensive and qualitative strategies should be adopted. The new organization

[26] Local scheduling under the constraint of global optimization of the production flow

required a more skilled workforce, requiring heavy and specialized investments. From long cycles and centralized routines, the company has moved towards short operating cycles and adaptive strategies in terms of demassification, flexibility, decentralization, etc. The new role of the workshops then modifies the act of manufacturing, driven by market innovations (worldwide and internal). We have been able to observe here the different dimensions of reflection on the tools of work organization.

For the most part, these changes represented a step forward in terms of management rules allowing operators to continue working on another reference. Moreover, they have revealed a complex vision of the management, at the same time as they question the hierarchical framework (autonomy of operators).

1.2 Multi-Purpose Workforce Management – The Emergence of Multifunctionality in EUTs

1.2.1 Introduction

Some movements associated with work and qualifications have brought prospects for re-skilling, thus breaking with previous characteristics and trends (standard model). The emergence of new modes of coordination based on technical and organizational changes emphasizes the search for new training. It is considered from two axes: the first being industrial training and the second being the stock of knowledge as an individual investment.

In this section, we will try to present the relationship between increased knowledge and versatility concerning the automotive sector and, in particular, Renault. We will focus on new organizational architectures and changes to shop floor management routines.

1.2.2 The calculation of productivity according to qualification

The automated (robotic) workshop breaks with standard designs (sec. 1.1). Gradually, the training presents itself as a capital – economic. The development of the new qualification lays the foundations for standard production by creating new ones and fostering new groups with professional experience. In this sense, we can understand *training* as a driving force that leads to the acquisition of knowledge during initial and sometimes continuous learning.

1.2.3 Labor Productivity and factor cost formation

Labor productivity then justifies reduction actions per unit of product at lower cost, which takes into account a particular factor of production, namely labor capacity (BALSAN et al., 1996).

Labor productivity is based on micro-distributions of tasks. They are carried out by setting gestures in motion within the concrete process. A sequence, production-consumption, makes it possible to ensure a horizon of quantitative growth of products produced and, with them, absolute growth of the overall value. This value translates into "the determination of costs by factors of production" (BECKER, 1993).

1.2.4 Know-how and qualification during the 70s

The organizational change applied in the 70s encompasses a set of elements that favored an out-put and in-put information network in a microeconomic framework around the firm. These elements are presented as (d'IRIBARNE, 1986):

- the organization of circulations and transfers of connections between machines;
- the opening of new production lines;
- supply management;
- specialization of functions;
- the parcellation of spots;
- time and motion measurements.

From this three specific characteristics are confronted:

- the labor market;
- information technology;
- professional qualifications as a reference for competencies.

The first element, the labor market, is treated as a structural and segmented field. The second, information technologies, is understood as the basis of the actor's professionalism in the mastery of technical systems. The third element is expressed by the ability and by workers' mastery to grasp and interpret the phenomena that take place during the productive process (symbolic or abstract forms).

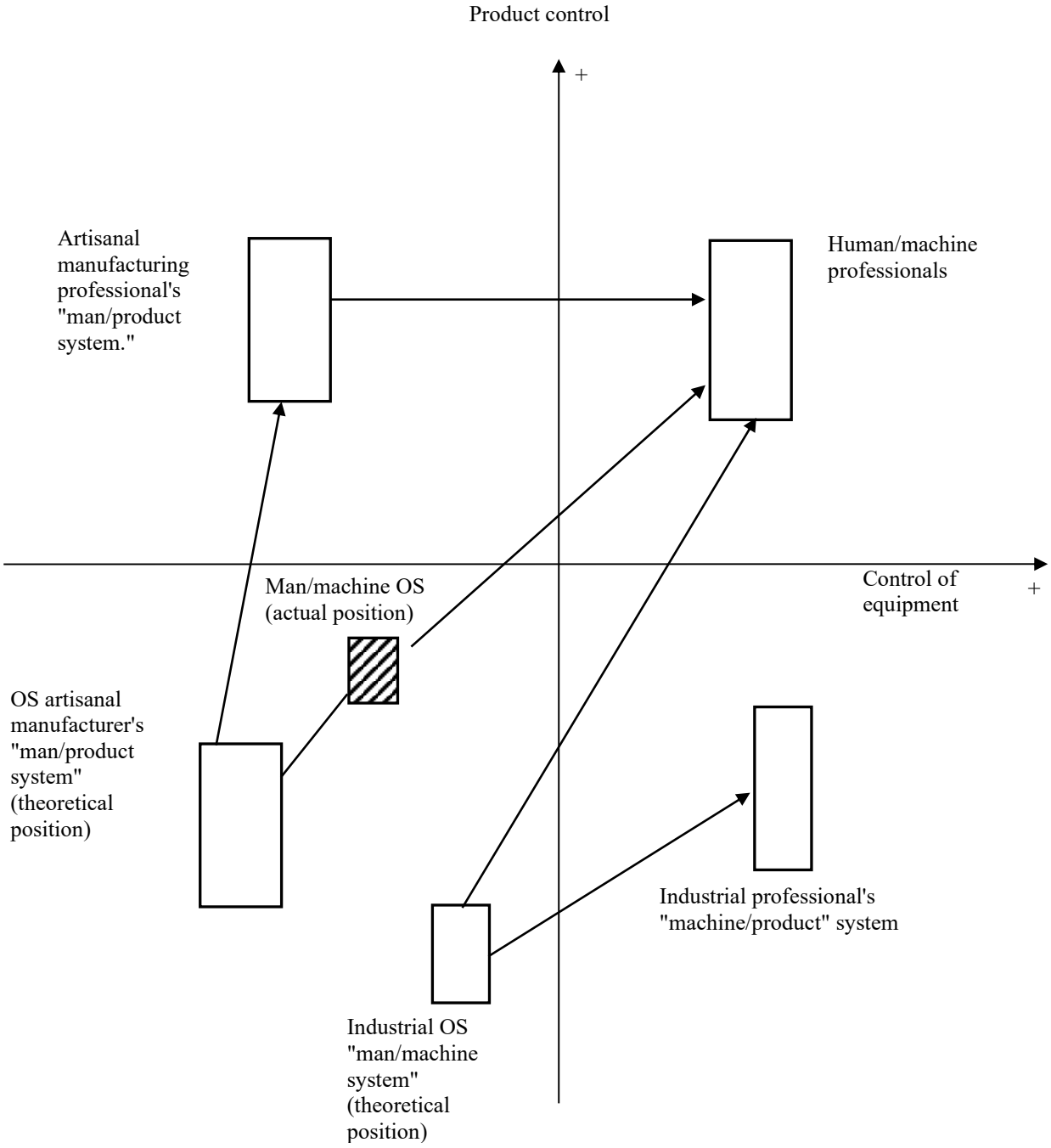
Figure 4 presents the evolution of the relationship between professionals and technical work systems, composed of:

- The man-product system (in the sense of productivity);
- The man-machine system (competence);
- The machine-product system (automation);
- The machine/product system (Integrated Professions).

In the case of Renault, the basis for the design of automated systems integration is linked to process compartmentalization, which marks the evolution of functions and the content of qualifications. This compartmentalization by sections has allowed an increase in knowledge as well

as a microparcellization of tasks. This specialization is by the intervention time and the intensity of the work.

Figure 5: Evolution of workers' occupations according to the technical work systems



Source: d'Iribarne (1988) Competitiveness, social challenge, educational challenge, p. 69

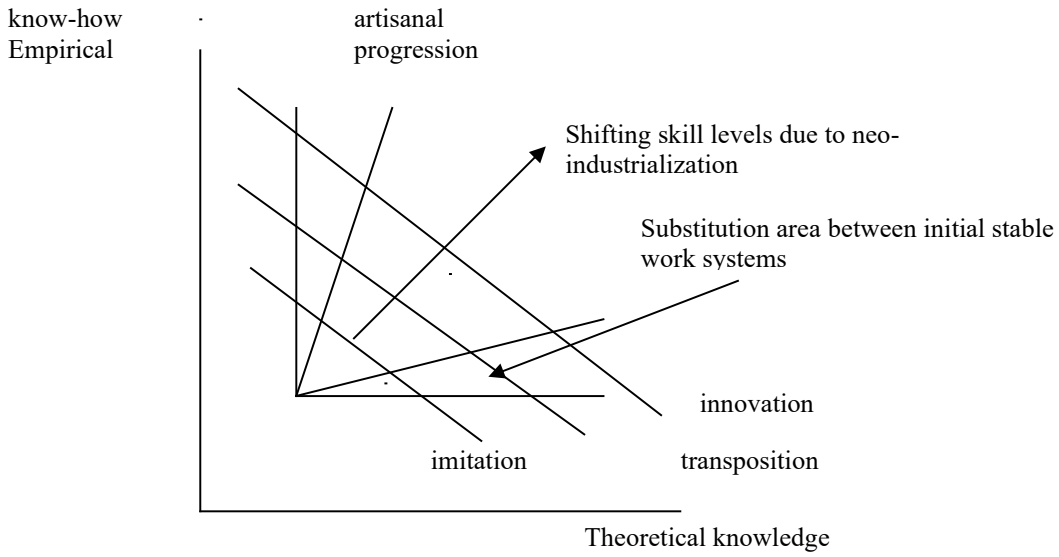
The first stage addressed corresponds to a traditional liberal activity between the professional and the labor market (man-product system). It is accompanied by a development of regulated professions and calls on employees trained by an apprenticeship path endogenous to the company.

The second stage characterizes large bureaucratic formations[27] (man-machine system). The standardization of services and procedures and the exploitation of information.

Integration between workers and information technologies (integrated professions of the machine/product system) presupposes good technical and social reliability, all the more important as the reduction of room for maneuver resists the vagaries of the market. This raises the apprehension of the new technological parameters.[28] , [29].

The division of labor has two dimensions: on the one hand, into executive tasks (themselves broken down into standardized and, in principle, stabilized basic standardized tasks), and, on the other, into design tasks concentrated in key areas which are easy to control. This has given design offices and methods a privileged status. Initially, the work is divided in its own right into three levels: a new level is inserted between the maintenance, stamping, sheet metal sectors, and the central sector. In the second step, a merger is made: the skills produced increase by modifying the field of intervention (see Figure 5).

Figure 6: Evolution of skill forms in stable work systems



Source: made from Iribarne (1986)

[27] A bureaucratic organization is a form of organization of administrative groups (offices) which, in the context of division of labor and specialization of professional activities, defines the roles, attributions, and interventions of each group (d'Iribarne pp.65).

[28] The parameters are divided into two: the first is that of the structure of the workshop vis-à-vis the flexibility of the organization (unchained shifts, overcapacity, upstream-downstream autonomy), and the second: is that of exploitation (direct and indirect labor, quality and training) MIDLER (1993 p.141).

[29]The search for other technological paradigms that is the result of a set of so-called fundamental research was called, in the mid-70s, the new technologies of information processing. They then came into force, allowing the advantages to be mastered at the level of dissemination as well as at the level of flexibility (d'Iribarne, 1986, p. 75).

In this context, Renault's versatile model highlights the notion of hegemonic democracy: the methods office on the organization of work in the workshop (section 1.1). The interest at the time in the use of skilled labor encouraged measures to combat the "perverse effects" linked to the increase in "hidden costs ."Thus, some costs attributed to training and quality are the result of the management of absenteeism or the diversification of flexibility in the workshops as an institutional standard of increasing performance (CORIAT & BOYER, 1993).

Table 5: The evaluation of chains in the workshop – example of Renault

Technical-organizational changes	Change in the level of demand	Diversification	Absenteeism
Isolated long chain	- -	- -	- -
Long chain with separate position	- -	+	+
Isolated parallel short chains	-	-	- -
Parallel short chains and separate extensions	-	+	+
Stand-alone stationary workstations	+	+	++

- - Very heavy and difficult regulation
- Quite difficult regulation
+ Fairly easy regulation
++ Automatic regulation
Source: MIDLER (1980), p.138

From the study by MIDLER (1980), we can understand (cf. Table 6) the skills required resulting from a renewal of professionalism vis-à-vis a technical-organizational change employed. These transformations are carried out by recombining old knowledge and adding new ones. Indeed, the renewal of technologies and forms of organization does not take place at the same depth in previous structures and movements (d'IRIBARNE, 1986).

1.2.5 What do New Technologies consist of?

The diffusion of various techniques related to the development of computing during the 80s takes "the use of new technologies" as a necessary, favorable and quite complex economic environment.

To better understand this idea of the development of professions in the previous scenario (that of Renault), new technologies have led to a standardization of procedures integrating procedures for processing, managing and storing information (see Figure 6). The control of these automated systems is integrated to adjust services and procedures and increase new performance. Non-standardized

procedures are treated by exception, depending on the compression circuits. In this context, the technical functions are complemented by those of management. Their combinations are defined as follows:

1 - a master's degree in technical supervision which implements the programming of a work decided by others;

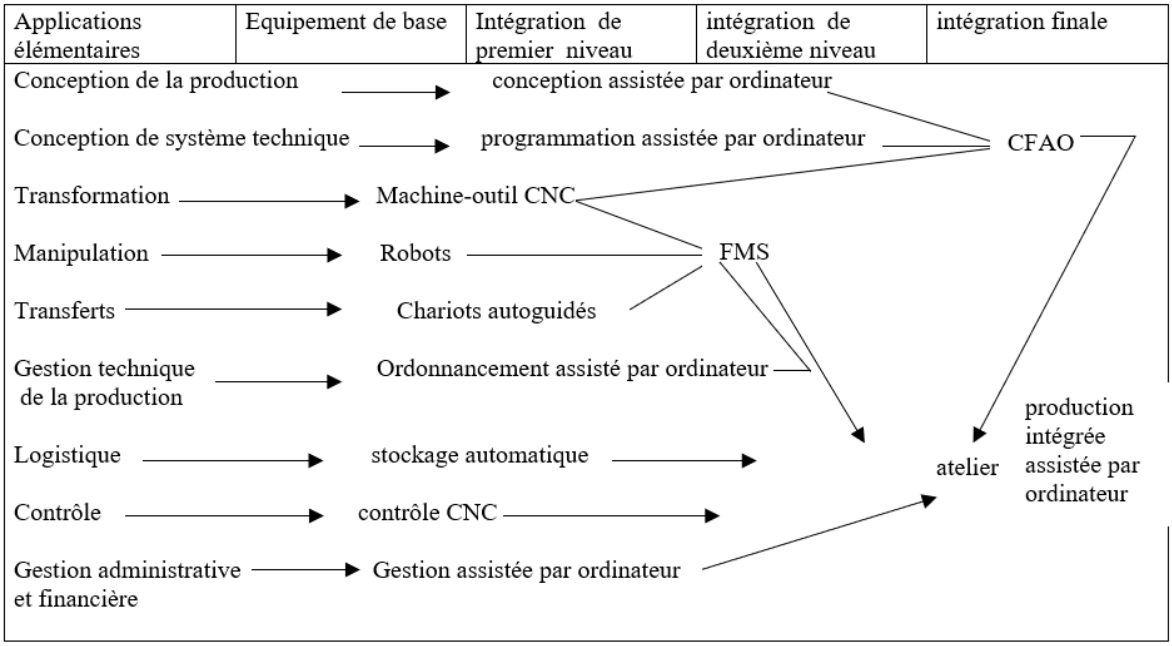
2 - a mastery of the technique intervenes by providing technical assistance to the executive staff, modifying the technical programming in case of hazards within the framework of pre-established programs;

3 - A master's degree in management and administration participates in the programming of production in conjunction with other functions.

Between the 80s and 90s three types of applications have reached a sufficient technical maturation to be operational. They are aimed at:

- Management of production units (CAPM);
- Automation control (CNC machines, robots and flexible workshops, MCNO);
- Computer-aided design (CAD).

Figure 7: Sequence of small and medium series

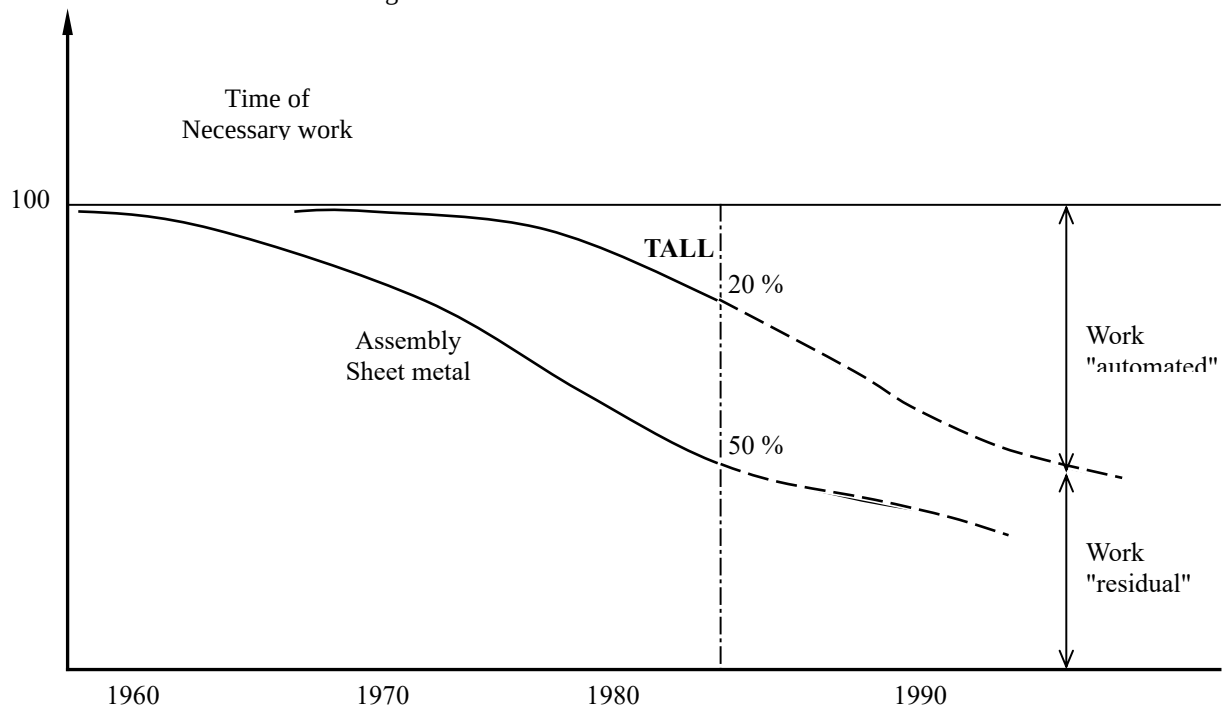


Source: D'Iribarne (1984), p.15

The introduction **of new technologies** provokes complementary logic among the traditional actors of the company (office and methods). They can bring together the search for new forms of more dynamic production at the same time as their mobilizations reach the optimal evolution of complex systems.

This evolution differentiates the competitive mechanisms causing manufacturing segmentation - in terms of time and equipment reSources. This is the consequence of three types of automation that have led to a succession of technical changes in information: automation of functions, new calculation methods and memorization.

Figure 8: The evolution of automation at Renault



Source: Renault 1990

Thus, the introduction of new technologies imposes a triple risk: technical and economic hazards and disqualification. These events at Renault have changed the organizational mechanisms that have taken resistance to the challenges of systems (CAPM, CAD etc.) [30] Automated.

We observe through graph 1, the evolution of automation at Renault, more clearly up in the 70s and 80s.

In addition, another question arises: vocational training and the *factors that determine it as well as the variations leading to its transformation*. The function of professional rules is to institutionalize social relations determined by the evolution of technology and economics. Compliant EYRAUD (1986) "another technical aspect of this professionalization begins with the development

[30] Computer-aided production management.

of machining centers[31]. At that time, the notion of profession tends to disappear to give way to a universal profession in the workshop.[32]

We can understand that this new qualification or "occupational classification" is part of a change that was already implemented in the standard model, involving the systematic disappearance of the content of work at an intellectual level while proposing a new system where the field of action is given through more or less broad programming tasks.

1.2.6 New information technologies and their impact on Renault's qualification structure

The evolution of the qualification structure has been one of the main fields of research in the field of technical progress, organization, and training at Renault. In this respect, this development is reflected in the thesis on the *polarization of qualifications*. Skilled tasks are concentrated on an increasing number of agents (technicians, those responsible for the organization of work and production, foremen, and members of the commercial and administrative departments).

Through technical progress, the balance of the company and the linking of new information technologies on skilled labor highlights a differentiation of the apprehension of technical progress in different sectors at Renault. In Table 7, we see a comparison between the evolution of initial training according to automated systems.

Table 6: The evolution of professionals x automated systems

Type	CFAO	GPAO	GMAO	KNIFE	GSAO	MOCNRL
AP (CAP)	- +	-	-	- +	-+	-
Techn. (BTS)	+	+	+	+	+	-+
CM (BAC +)	+	+	+	+	+	+
Maintenance Management (BAC +2)	+	+	+	+	+	++
Engineers	+	+	+	+	++	++

Source: RNUR (1988) – low -+ medium + strong ++ fairly strong

The design of new technologies within Renault is the result of an updating, at the organizational level, of the company towards a growing evolution of the flexible production system.

[31] At that time, the moment lived was that of the decadence of the Renault technical training school. Its closure in 1986 provoked a reflection on the renewal of national education towards a more quantitative exit from technical diplomas (Notes Renault, 1991).

[32] According to Eyraud (1986) The introduction of CNC machine tools has disrupted the occupational qualification and classification system. Because the content of the work will prove difficult, requiring in any case, the construction of a new balance. We will see if the technological factor during this work as the initiative phenomenon related to change, changes the professional rules.

This explains the impact of technological evolution on the organizational context. This is becoming a primary imperative in the human reSources management function.

The system is based on a management spirit of versatility and adaptability; according to the archives, the system has given two good clues:

- Claims have increased;
- Increased production, with control of minimum stocks.

Indeed, this improvement was done gradually and, partly independently of its implementation, by the awareness of the various departments within the company.

Renault then set high-performance targets in terms of innovation and quality. The consideration of a human reSources development policy in the process of new technologies converges towards an analysis of the reconstruction of the main lines of investment decisions on the training of human reSources in the face of technical and organizational changes.

The objective of technological development, therefore, involves a twofold process: continuous training and automation. The integration of these two aspects is done by successive adjustments. These adjustments result in an open and evolving definition of production flexibility (general assembly of the company).

Renault sees the automation process as an opportunity to continue the versatility of its workforce. From a dynamic perspective, the concept of development is linked to the process of autonomy of operators within the framework of teamwork.[33]

1.2.7 A method of versatility sought after at Renault[34]

The need to accelerate production rates and increase product ranges to adapt to market requirements is becoming the common rule in the context of strong competition. The flexibility of the production tool has long been an imperative dictated by the new technologies implemented.

Studies[35] have been carried out at Renault to establish the time range (man/hour) of a tool while respecting the tolerance difficulties of machining each phase. From there, the operating routines for each stage of production were redefined.

Versatility, therefore, calls for the elasticity of training and skills. As a prerequisite for the pair: agents/projects. They work in a multifunctional regime (see Figure 7). This is relevant to the idea of continuing training developed within the company (including a vision of broadening training).

[33] This assertion is based on interviews with the GERPISA group and members of the Renault technocentre.
[34] Versatility corresponds to a professional expansion to a second profession beyond its core profession. The widening of the fields of intervention raises the problem of the professional capacity to effectively master the whole field.
[35] in appendix

Now, a new event is emerging as an innovator at the organizational level: autonomous production cells.

Figure 9: Group practices within the workshop

Transformation in groups	**Transformations of work practices in workshops**	**Organizational transformations produced**
Transformation at the level of the actions produced in the work of the groups: Transformation of the framework of collective perception of work; Development of models and work analysis; Production of new forms of negotiations between actors.	Transformations at the level of work actions: Development of the autonomy and initiative of operators; Development of new forms of cooperation between operators and management; Supervisors become facilitators, trainers, and advisors to operators and managers of collective knowledge in the workshop.	Transformations at the level of actions in the company: - a change in the actual organization of work: the development of collective work.
Transformations at the level of identities invested in groups: Production of cognitive skills of the method and process type (problem-solving, multi-member elaboration) that are related to the development of thinking for action; These skills are accompanied by the production of skills and know-how in the negotiation and management of power relations; Production of new rules of social exchange (operators and supervisors); Production of a group identity, production of a group culture, first level.	**Transformation at the level of identities at work:** Transformation of identities at work: new knowledge related to work practices, the transformation of the roles of actors and social relations in work (operators assert themselves as a force for proposing change and as decision-makers and organizers about their work, supervisors become advisors and facilitators of groups of operators); Production of a second-level culture; Development of a meta-competence on the work during its realization, towards the management of its strategies of actions and skills.	**Organizational culture transformations:** A transformation of the roles of actors (operators and supervisors) and the modalities of expression of social relations: a reduction of previous social conflicts and a repositioning of the power issue (from the production of the gesture of work to its formalization and the ability to change it); The development of organizational learning: the production of new organizational models of action and the transformation of organizational culture, third level.

Source: Renault dossier - Revue actualité de la formation, pp.26

From this new training approach, a new operational target is implemented: these are operators (N1), indirect labor (GAP cells, adjusters), and management (foremen and workshop managers). These three categories were affected, including maintenance, tool shop, fluids, logistics and handling, and quality control. In 1991, this new approach revolutionized Renault's organization, allowing new productivity gains with a considerably low number of stocks.

The rapid renewal of products is the result of flexibility seen as a succession of organizational changes driven by the sequence of phases of workforce development.

In this connection, it can be said that the tendency towards extreme specialization of tasks goes hand in hand with the generalization of Taylorism in industrial activities, which has contributed

greatly to growth during the last fifty years. Versatility is thus understood as the quality of particular know-how *specific to a manual activity that escapes mechanization for the moment.*[36], at the same time as it appears to be an essential condition for the competitiveness of the companies that use it.

This analysis implies that versatility means a transitional phase intended to develop technical-industrial structures and organizational models. The idea of versatility implies a choice between the quality of the products and the quality of the workforce. This allows integration between traditional forms (where product quality is synonymous with business) and new forms of organization (where product quality results from flexibility to adjust to new market requirements).

Considerable efforts to rationalize production are aimed at removing from work those actions that are not directly productive while reducing the working time as much as possible. Among this is a recomposition of jobs that are chained directly to the production process.

1.2.8 Hierarchical stratification

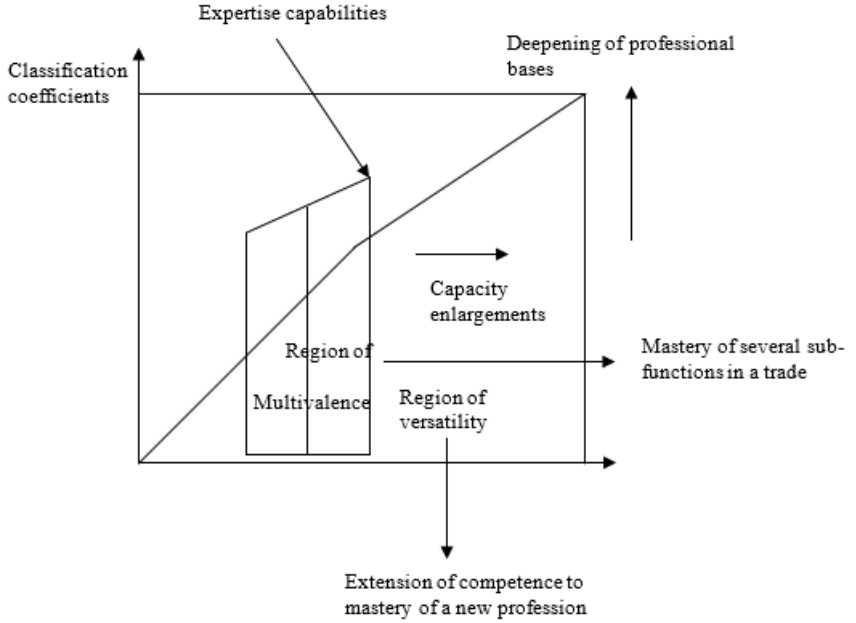
At the global level, markets have been structured around a central reality, which is the existence of internal labor markets. We can evoke here the idea of a hierarchical stratification which recalls the importance of the organization vis-à-vis the behavior of the actors [37], [38].

The development of a hegemonic democracy of methods and study offices on the organization of work in the workshop shows the interest of the company for high-skilled labor, targeting the improvement of skills. As part of in-cell management, projects are taken into account from the manufacture of the vehicle until they are put on sale. According to MONNET (1997) in the cell organization project a complex analysis of the manufacturing process is made, considering the cooperation of the various actors in a technical compromise between the knowledge involved, the very identified vertical knowledge, and missing knowledge.

Competences (sec2.2, chapter 2) appear as a reference for a vocational qualification. The latter is defined as an acquisition of knowledge through the exercise of significant daily professional practice (training). This training returns a specific link between the specialized actors and their evolution - this link is, therefore, flexibility.[39].

[36] J.C. Monnet (1994) in RNRU (1994)
[37] This makes effective certain forms of mobility based on which the conditions for an intrinsic labor market dynamic can be defined.
[38] The model advocated during the 70s by Renault led to the establishment of a thorough division of labor. In the 80s and 90s work is divided, on the one hand into execution tasks (themselves, broken down into normalized, standardized elementary tasks, and in principle stabilized), on the other hand, into design tasks concentrating "knowledge" in key areas of the company, better controlled by the *Research Department* (former design office).
[39] See conceptual definition in section 2.1 – chapter 2

Figure 10: Broadening of competence bases and expertise capacities



Source: made after Alain d'Iribarne (1989) p.152

The new technical criteria highlighted by Renault highlight the *new professional*[40], leaving room for universality in the workshop (homogeneous training). In this way, the company tries to eliminate the notions of limits of the capacities of the actors linked to the idea of polyfunctionality.

Another crucial element is the division of labor within the limits of internal promotion rules. At the same time as it presents itself as important in the conduct of trades, there are strong constraints of specialization (training) – this is because of a specific lengthening of **the technology sector.**[41]**.** This construction ultimately depends on the capacities of the actors (in particular, the initial training of new actors) to broaden and have their fields of competence recognized.

1.2.9 The versatility of equipment as a condition for new forms of productivity

Productivity includes the gains that can be achieved by reducing work stoppages. The versatility of the personnel, according to ZARIFIAN (1992) **(with equivalent technical conditions)**[42] makes it possible to eliminate many production stoppages caused by work stoppages. By making team members substitute for each other, versatility eliminates systematic stops such as random stops.

In addition to this versatility of qualification, there is the technical and economic content that makes it possible to differentiate the workshop configuration: "The diversification of production through the acquisition of new tools and new knowledge" (ZARIFIAN, 1986).

40 terminology present in Zarifian (1986).
41 The company sought new labor supply markets in Latin America and also in the ballast countries of Europe.
42 at our expense

The development of physical space is one of the important dimensions of the process of modernization of industrial sites.[43]. This evolution (the putting of machines online, the regrouping of workshops, concentration of relocation of "functional" means) proposes a trivial interpretation: the rational occupation of space, implying a direct reduction in cost with the saving of time by proximity, in particular the similarities between the physical circulation times of the actors and the times of circulation of information.

A more recent and original form of an isotopic increase in production is that which corresponds to the development of the versatility of machines. In this case, it is linked to the increase in productive capacity. As an example - machining centers - the most modern, with a great capacity for changing tools, will carry out successfully and in the same place several operations. From there, a saving of space related to the installation of machines (fewer machines, less occupied area, and therefore less built area), allowing savings in part transfers (less handling equipment, not intermediate storage) and transformation time.

1.2.10 The externalities created by versatility.

According to HILLAU (1992), there are three strategic dimensions of qualification:

In the first place is the operative strategy - where the individual does not regulate his behavior only in the face of an external prescription. It deploys a process of appropriation ... which leads him to overcome a difficulty, to learn, to become a master of the production process.

The second strategy is behavioral. It leads to a very intimate connection of the work environment with a broader social and professional project of the individual.

Thirdly, the deployment of professional strategies (investment in training, on-the-job learning, etc.) is largely conditioned by the company's social management policy (classification grid, training, and promotion practices), and categorical strategies weigh on these policies and make them evolve.

It seems to us that we must consider the ambivalence of behavioral rules (between actors) and the development of long-term employment contracts that end up justifying the existence of transaction costs (sec.1.3). Thus, investment mobility presupposes real flexibility.

This question finds various points of practical application. We can recall here the development of vocational diplomas as an improvement in the qualification of wages, containing a broader benchmark of labor market flexibility.[44] (sec.4.2, chap.4). According to FREEMAN (1989), within

[43] At Renault in 1989, the management of the workshop was divided into 8 important points: production obtained; percentage of scraps, percentage of retouching; machine stops; staff present; absent staff; staff borrowed from neighboring workshops to replace absentees.

[44] We work on this question in Chapter 4.

the group, the interest in the existence of a stable core of skilled labor has been recognized as a particular interest in the stability of employment policy.

1.2.11 The microeconomic approach

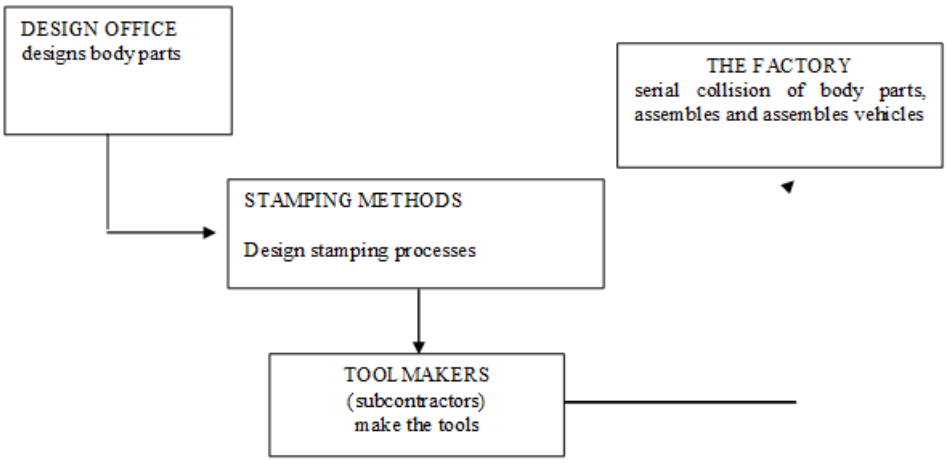
The classical microeconomic theory relates the demand for labor to the cost of using labor. The result is also a change in the costs of labor flexibility achieved by qualification.

A purely microeconomic analysis favors taking into account fixed costs, adjustments in the level of employment and indirect costs concerning labor market arrangements (FREYSSENET, 1990). Bearing in mind that there are other elements that are at the internal level of the labor market, we consider that qualification is an important phenomenon linked to the notion of security within limits imposed by the labor market. Nevertheless, qualification becomes a process that opens a path toward labor market mobility.[45] (BLANCK, 1994). An acceptable example is that of Renault, which has an internal market for continuing training, which serves as a basis for adjusting to fluctuations in the external labor market.

Considering Figure 9, we have that the basis of the technical specifications is specified upstream and downstream. Downstream, the plant recovers tools and ensures the development itself. Upstream, there is no manufacturer-tooling platform, the latter being considered a particularly efficient machining subcontractor in this narrow specialty. The methods and design offices (as a definition of the hybridization model adopted by the company) hold in-house strong technical knowledge upstream on feasibility and downstream on "development". This integration, however, is not complete because the design and production cycles of the tools are compared in what they call a sequential model and "subcontracting" (MIDLER & GAREL, 1995, p. 92).

[45] BLANCK (1994, p.47) "Whatever their virtues, high labor market mobility and flexibility are not logically necessary for a good employment performance. The proportion of the population with jobs or the proportion that is jobless depends on the difference between the rate of job finding and the rate of job loss."

Figure 11: Sequential organization



NOTE: Stamping project organization model designed by Renault (in Sept. 1991- Oct. 1993) during the development of the TWINGO project. (C.MIDLER, 1993)

SUMMARY OF SECTION 1.2

We have studied here versatility as a dynamic model involved in learning outcomes. The combination **of flexibility and qualification** does not find a linear path in the uncertainty surrounding the company, whose learning process we can conclude is irregular.

This problem deals with the knowledge of a stable core (skilled workforce). In our opinion, this presupposes a reflection on internal and external mobility, whose qualifications are the most at stake.

In the end, we approached the idea of a rational organization in the spirit of a flexible organization. More specifically, this concerns the arrangement of information in the interest of the working group.

1.3 Renault's hierarchical profile

1.3.1 Introduction

The different theories of organization have developed the concepts of firm, society, market based on standard models. Currently the literature guides us towards the new models of organization inherent in a practice of flexibility. The questioning of the traditional industrial organization is then accompanied by the emergence of new modes of operation based on the coordination of a growing number of actors: structure-project, transversal groups, interface actors, etc.

In this section, we will group the new explanatory orientations of the technical-organizational changes.

In this way we will present the hierarchy in the analysis of the firm, about the new organizational models. It will serve as a support for understanding the emergence of new professional groups at Renault.

1.3.2 The influence of hierarchy on technical-organizational change: History

The influence of hierarchy on organizational change has caused, since the passage of Taylorism, upheavals in the conduct of the postal division. With the scientific division of labor, at the heart of *scientific management*, the hierarchy is linked to the design of operating modes[46].

The standard model therefore leans on the withdrawal of control of workers' production and the establishment of a new behavioral structuring of actors.

By following the evolution of the OST, innovations have also led to a new approach to the design and fragmentation of tasks. From there, the firm's environment changes the quality of work, regarding training. The content of this leads to the encouragement of positions and salaries as well as changes in group relations. In this historical period, we observe the creation of niches and new occupational groups.

1.3.3 CHANDLER's approach

CHANDLER (1962, 1991) highlights the importance of production conditions in determining the organizational forms of the firm. These forms are constituted by managerial hierarchies, are developed within new technologies (generating new markets) that will intervene in strategic decisions. The author identifies two major hierarchical forms that follow one another historically: the unitary form, U, and the multidivisional form, M.

The first (U) covers a centralized functional system. The organization is then built around a vertical separation between the operational units ("field office") and the management, surrounded by functional departments, supervises the operational units and coordinates their activities. The organization is thus based on the development of the division of labor in the management function, through the creation of specialized departments. This organization promotes the exploitation of economies of scale, the division of labor and the rationalization of production.

The second (M) represents the culmination of a long process of organizational innovation responding to the transformations of competition and strategies towards vertical integration and

[46] In Taylor's system, the fragmentation of labor is understood as the goal of workers' super-productivity. Each loom was put under observation in several ways of such a way to create a variety in the tooling used for each operation, that is to say the beginning of the parcellation of tasks.

diversification. This is based on a twofold movement of differentiation and integration, decentralization of decisions and concentration of power. The company is decentralized into autonomous divisions, specialized by product lines or regions. Each division has its own directorate and functional structure; It behaves like a "quasi-firm," organized as an autonomous profit center. From there, a market element is reintroduced into the giant firm: bureaucracy. Above the divisions, a directorate general ensures the coordination and planning of the whole.[47].

Form M promotes (1) greater strategic flexibility by facilitating entry into new markets (through the creation of new divisions); (2) the implementation of economies of scale and variety by ensuring better coordination of production units; 3) coordination of stages of the production process through vertical integration.

The M-shape has two dynamic axes, according to Chandler, that is integrated by the responses to the firm's dual coordination problem - strategic choices and structural choices. They boil down to vertical integration and diversification. Integration, particularly between production and distribution, allows coordination leading to a broader valuation of the firm's capacities, in particular organizational capacities. Diversification corresponds to the set of professional specificities that the firm has.

1.3.4 WILLIAMSON's approach

One of the most widely used methods is that which allows an analysis of the strategic segment concerning the hierarchy, the contract, and the market.

The theoretical efforts focus on contractual incentive systems between a principal-agent (owner or shareholder) and a secondary agent, making it possible to analyze the functioning of large groups.

The answer to these incentive processes converges on the study of the market-contract-hierarchy triptych concerning the economics of transaction costs. "The market, being a price system, is characterized as the only signal given to firms to adjust their level of production" (WILLIAMSON, 1991, p.5).

1.3.4.1 The theory of the contract

Contract theory explores hybrid forms that intervene between markets and hierarchy. The latter governs transactions between economic actors. Two different types of contract are at the heart of this approach: the classical contract (neoclassical contract) presented by hybrid forms (including the contract employed as IE by Williamson) and the evolutionary contract presented by the hierarchy.

[47] View organizational Chart 3

The latter consists in seeking an ex-ante consensus and satisfying the ex-post balance of the firm. From this, the term vertical integration appears.

Vertical integration aims to save transaction costs – legitimizing market power and asset specificity. According to WILLIAMSON (1991, p. 95) "horizontal integration is justified when the objectives of transactions are not standard goods and services. In this sense, the assets invested are really specific, as well as the supply risks (customer/supplier type). The risks reach such a level that entrepreneurs are led to internalize these transactions in a single company (upstream or downstream or horizontally)".

The internal transaction costs of the company are synonymous with relationships that are both hierarchical and, therefore, a component of management costs.

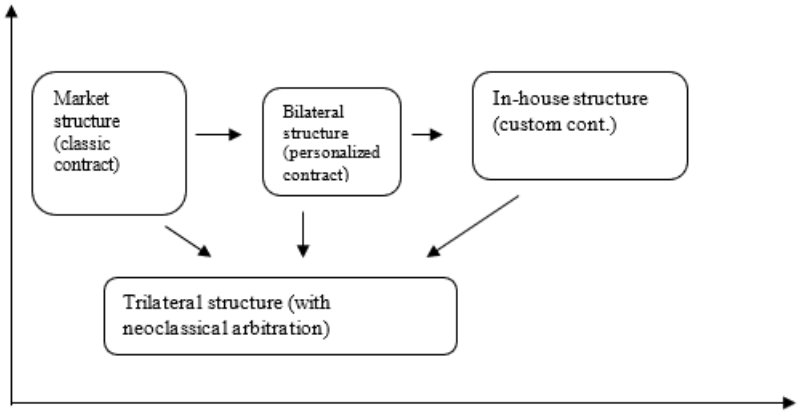
1.3.4.2 Behavioral assumptions and model environment

Behavioral assumptions with the environmental factor are divided into four derivations of rationality: total, unpredictable, opportunism, and trust.

CORIAT and WEINSTEIN (1995) consider as main axes the behavior of market players and their cognitive capacity in search of profit maximization.

The principle of limited rationality: rationality and the search for efficiency become the foundation for understanding behavior and organizations SIMON (1953). The limitation of individual capacities and knowledge is precisely justified by the existence of organizations, market or non-market and, in particular, the firm. A consequence of limited rationality is the incompleteness of contracts. In the relationships they establish with each other, agents cannot foresee in advance all the contingencies that will affect the results of their transaction. The contract cannot, therefore, define in advance all the obligations of the partners for the different possible "states of the world". As a result, the conditions for the ex-post conduct of a contractual relationship take on great importance. The degree of adaptability of an organization, and the way it manages a decision-making process and interaction between agents, becomes essential. More broadly, the adoption of the principle of limited rationality, or procedural rationality, means that forms of organization (see Figure 10) influence decision-making processes. This leads in particular to give an economic sense to the internal organization of the company. The incompleteness of contracts also leads to the possibility of "opportunistic" behavior.

Figure 12: Market structures



Source: WILLIAMSON, Institutions of the Economy, p. 94

Opportunism occupies a central place in the current reformulation of the analysis of individual behavior, which aims to consider agents "as they are" in a context of imperfect information. Opportunistic behavior consists of seeking self-interest through various forms of fraud. Opportunism is based on an incomplete, distorted or falsified disclosure of information by an agent, including about his abilities, preferences or intentions, and thus on the existence of information asymmetries between agents.

Opportunism, adverse selection, moral hazard

It can be distinguished into two forms:

Ex ante opportunism occurs when there is cheating before a contract is entered into (for example, if a seller provides truncated or false information about the quality of his product). This opportunism is made possible by the asymmetry of information between the parties, which leads to the so-called adverse selection problem.

Ex-post opportunism (or contractual opportunism) arises when there is cheating in the performance phase of the contract, which is made possible in particular by the incompleteness of a contract and the difficulty in determining whether the parties have complied with the terms of the contract. This leads to the so-called moral hazard problem: there is moral hazard when an agent may not respect his commitments and it is impossible or costly for his partner in the transaction to know whether it has been so or not.

Based on CORIAT AND WEINSTEIN (1995)

The term decision is associated with the need to warn about technological choices. According to WILLIAMSON (1991, p. 29) "important contributions in organizational theories include developing rationality." There is a repositioning of the central problem of organization, about the meeting of rational objectives with the cognitive limits of human actors. It is precisely in an area where human behavior is intentionally rational that there is space for true organizational theory.

The internal transaction costs of the company are synonymous with hierarchical relationships and they count as management costs. The latter are, therefore, equivalent in terms of organization to the transition costs of the market and contractual relations.

Figure 13: The firm's governance visions

		Asset characteristics		
		Non-specific	Mixed	Idiosyncratic
Frequency	Occasional	Governance	Trilateral governance	
	Recurrent	of the market	Governance Governance Unified bilateral	

Note: In the neoclassical perspective, contract theory is based on the goal of maximization. This implies adverse elements - levels of risk. It is difficult to express the importance of the specificity of assets for the economy of labor costs. Ex-ante costs are those incurred during the drafting and negotiation of agreements. They vary according to the nature of the good or what is to be produced. Ex-post costs include the costs of organizing and operating the governance structure which is responsible for the control function and conflicts.
Source: Williamson, O [(1994, in Mathieu (1997)], p. 106

1.3.5 AOKI's approach

This approach emphasizes the efficiency of two hierarchical information structures: horizontal and vertical - where the firm is the basic unit of operational coordination of technological decisions.

The structure of the information is based on firm J (flexible firm). This leads to hierarchical content, which goes hand in hand with the idea of horizontal coordination between business units. The plans drawn up by this model call into question the existence of a directorate within an indicative framework (see horizontal coordination).

The flexible firm is then seen as a model of profit maximization. Its technological potential is given ex-post to production decisions. In other words, it is seen as an information network.

This model (firm J) uses hierarchical rank as a process of incentive and, at the same time, a mechanism for acquiring skills. The workshop is therefore the unit of assignment of training and transmission of technical knowledge. Knowledge comes through organized training of a continuous technical nature and during the production itself.

Therefore, the work process is subdivided into several tasks complicate the transmission of knowledge. The major importance is given to the assignment of individuals to several tasks and the rotation of positions. Thanks to this rotation of positions, the dissemination of skills from former officers to younger officers is carried out on an ongoing and informal basis.

1.3.5.1 The firm J and its interior

Firm J, is characterized by the exploitation of information that emerges ex post, and which will be used *in situ*. According to AOKI (1986) at the structural level, the model is organized into two basic aspects:

- Job stability - which is based on the fact that employees are promoted based on seniority and merit - explains the natural incentive process;
- The principle of duality – It expresses internal cohesion within organizations through grade stimulation.

Autonomous problem-solving in the workshops is associated with the reciprocal participation of agents and semi-autonomous coordination consisting of mutual relations. Coordination and production tasks are integrated with a certain fluidity of hierarchical relationships.[48].

AOKI (1996) combines with this question the various modalities of work and coordination, of which three important reasons are appreciated:

- **Low cost of buffer stock**: a hierarchy can achieve savings on buffer stocks, as well as those related to transport from one workshop to another, by centralizing the coordination of material requirements forecasts;
- **Specialization economy**: the competence of employees is used with maximum efficiency when functions are specialized and managerial and production tasks are kept separate;
- **Savings of a centralized reaction to shocks**: it is a hierarchy that reacts best to global shocks because it can achieve optimal programming.

At the level of incentives, the hybrid organizational scheme covers:

- The distinction between strategic order and operational decisions;
- Adoption of sequential operations;
- Information to the central programming office to revise the production program;
- Optimal hierarchy design;

[48] Selon AOKI (1986) "The emphasis at the A firm is on the efficiency attained through job specialization and rational hierarchical control, whereas, at the J firm, it is on the workers' grassroots capability to cope with emergent events fostered by doing. The Japanese approach has proved to be effective from a quality – and cost-control point of view in industries such as steel and automotive manufacturing, where cost reduction has been attained largely through improvements on fairly established technology. But, will it be equally effective in the high-tech industry where the speed of technological obsolescence training seems to be gaining importance as a component of wokers"

1.3.5.2 Horizontal coordination

This model is formally presented as contrary to the standard models, of the traditional functioning of the organization inherited from Fayol. On the other hand, the supporting principle of the model is the Ohnian postulate of automation. It summarizes the functioning of the production model through autonomy (that of actors who make decentralized decisions relating to the "work curriculum"). The addition of complementary organizational devices concerns the execution of human work, which is explained in the automobile by the self-activation procedures. The organizational foundations can be identified through: an abandonment of organizational specialization, a reduced hierarchical line, minimum intermediate levels, a decoupling of manufacturing-maintenance-quality control, projects around teams.

It should be noted, however, that the decisions concerned by horizontal procedures are relatively minor about the strategic considerations of the company, which remain the prerogative of management and, in general, hierarchy (as a means of power).

The system goes through internal development to use in *locus* any new information, thus coordinating the actions of the agents. AOKI presents the automotive industry as a typical case of horizontal coordination. It is a question of seeing within the firm as a coordination resulting from successive operations, with a very strong quality control.

> "Each block of operations establishes specifications for each operation. Thus, each person responsible for the operation is relieved of any liability, once he has reached the standard that will be indicated to him. In addition, the method engineer does not interfere directly in the management of the workshop in particular. However, in a manufacturing process, a defect may be detectable only at a processing stage after that in which it occurred. The disconnect between engineers and shop floor managers then renders the fragmented control process ineffective. It is important to evaluate this mechanism because inter-workshop management problems become easier to manage" (AOKI, 1991, p. 971).

This model has as a particularity a form of very elaborate social commitment with the declaration of *tacit cooperation* between management and agents, signifying the horizontalization of human relationships. This is one of the pillars of the Hybrid Model adopted by Renault. As far as information is concerned, it circulates widely within the group and some decisions are taken without hierarchical intervention.

1.3.5.3 Information processing

The organization of work at firm J, as a method of use in the workshop, takes into account a specific type of hierarchical process - that of horizontal communication. The latter is placed at the forefront of administrative services, as a support for strategic and operational decision-making.

Horizontal coordination is efficient insofar as the information capacity of the group in the workshop is used to identify and solve their problems, which are increasing faster than the rate of obsolescence of technical knowledge incorporated into the production process. Relative efficiency depends largely on the ability of workers to assimilate basic information on the shop floor to cope with uncertain events[49]. This ability is determined by initial training and experience (mimicry). The hierarchical system depends largely on the professional abilities of managers and the quality of technology, as far as communication at the company is concerned. The main proposition is the attachment between technology and hierarchical control.

Let us see, in the hierarchical rank, the four important considerations:

- The problem of conscientiousness;
- Poor selection – this is linked to the expectations of firms to select highly productive and highly motivated employees, among many candidates, in a context of quality information. This raises the question of labor market information;
- How can we promote the formation of group spirit among employees if there are elements such as vertical hierarchy that in one way or another cause conflicts within the company?
- How can one make a team production and at the same time develop a beneficial spirit of cooperation?

1.3.6 Hybridization process at Renault

The hybridization process (see Figure 12) is associated with complementary organizational arrangements and management tools based on improving quality, reducing change costs and reducing the risk of rigidities subjected to mass production, called *overall efficiency* (GERPISA, 1998). The exhaustion of the Sources of productivity associated with mass production highlights the need for alternative industrial organizations. These aspects, despite new methods of organization, of the search for new skills, incorporate in themselves new management principles capable of expressing differences of various kinds.

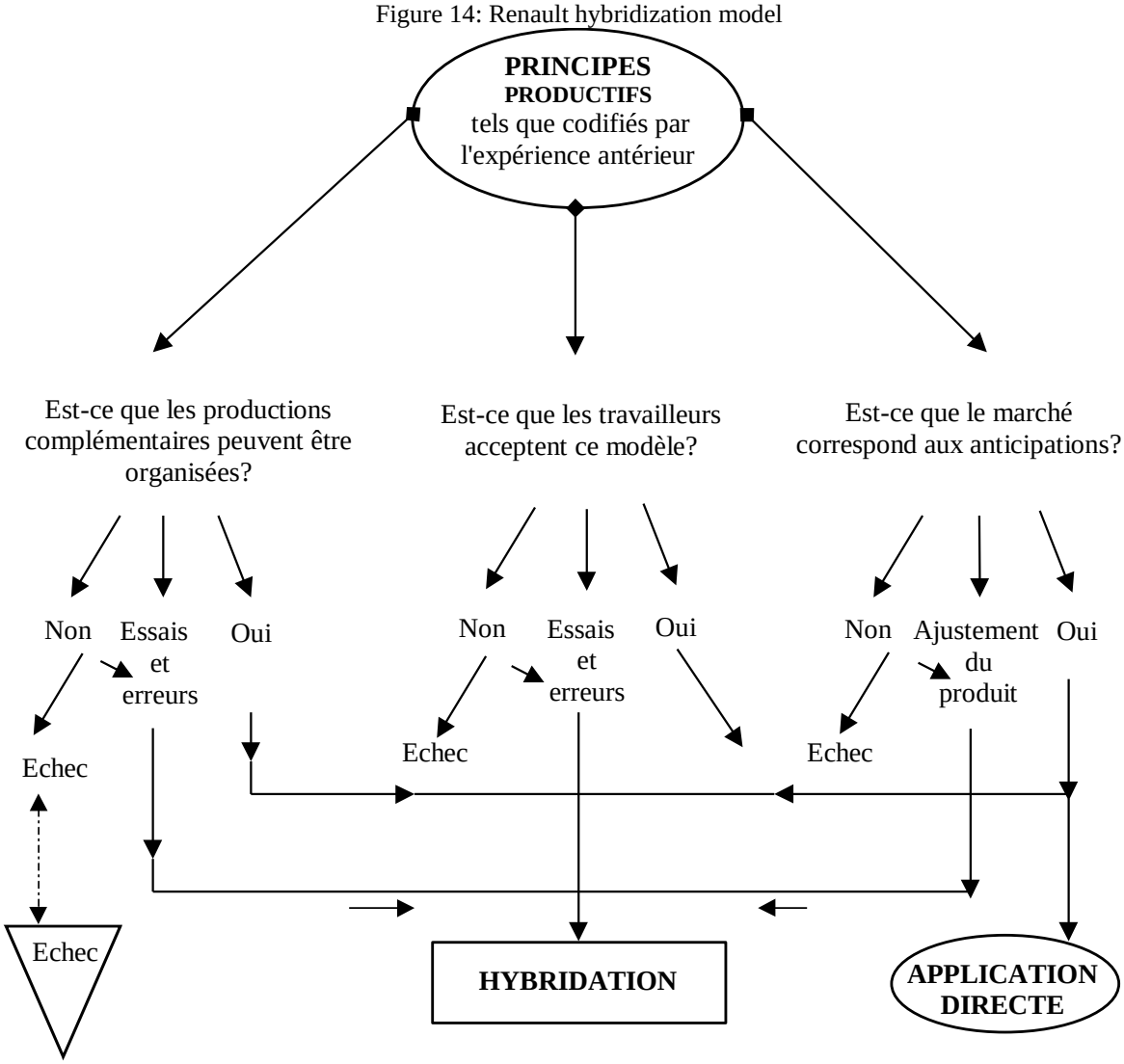
The hybridization process implemented at Renault highlights a new configuration of profit strategies extended to its new spaces (new countries where the company is setting up). This highlights a new sectoral dynamic that more precisely achieves its forms of performance. These new spaces highlight local training institutions, and the legacy of industrial relations. To this is added the capital-labor compromise of the firm which strongly recalls the Toytist forms of management. The other factor that figures as crucial in the design of this model is the *versatility* allowed by internal mobility

[49] According to CWY, supervisors believe that the training of manufacturing agents is an integral part of their responsibility. This training is done on the job, with their help, at the workplace.

between the various Renault establishments, so that a virtual guarantee of stable employment seems to prevail. In retrospect, in this new productive configuration, there are reminders of classic modes of governance, which constitute its power, especially since they express the complexity of the hybridization process experienced. The model itself uses attributions from the local context, as stated in the theory of

contingency. The implementation of hybridization as an intervention mechanism promotes new competitiveness, especially since it ensures the quality of production (FREYSSENET 1999).

Figure 14: Renault hybridization model



Source : FREYSSENET & BOYER in One best-Way (1998)

Despite certain considerations, this model is part of the nerve center of the company – pushing to analyze, ultimately, an ideal-type environment. In this context, the organization of production has demonstrated its success through its organizational choices: "just-in-time organization, remuneration

according to skills, integrated project management, quality circles, continuing training and, currently, elementary production units" (BOYER et al., 1998, p. 26).

Finally, at the company, hybridization has as its main feature innovation as a device for technical change of routines. It provides an incentive process for training-employment, concerning the synergy between a versatile workforce and an extremely flexible organization (JCM, 1994). An adhocratic network is implemented, characterizing informal communication between agents/projects. An intense traffic of information between technicians from different trades facilitates the development of compromises and allows to solve mutual adjustments estimated at 95% in terms of design. A qualified bureaucracy composed of hierarchical managers, operating rather in a managerial logic is led to resolve urgently, the questions having not been the subject of a compromise at the base. (RNRU, 1994, JCM).

1.3.6.1 The project is finally placed:

- with the introduction of new skills;
- with the differentiation of the calculation of salaries/skills;
- taking into account the financial results of the group as a whole;
- the choice of the team leader for the group members.

1.3.6.2 The particularities are described as follows:

- the search for flexibility in the use of work with the use of EUTs;
- classification of positions by versatility and multifunctionality;
- The team leader has only one function the animation of the group
- the use of quantitative flexibility (with modulation of schedules according to the production load).

1.3.6.3 The definition of a new basis for contract policy

Concerning the internal contracting policy specific to the project office, a contractual approach has been defined and implemented as a tool for regulating actor-business/actor-project relations and their respective committees. This aims to better control the overall objectives of a project to ensure the level of profitability expected by the company. Profitability is based on all the expertise of the company that will contribute to its maximization.

The implementation of this policy is analyzed by the Project Management, vis-à-vis collective commitments based on the cost-investment matrix, with the actors/businesses. Project actors must

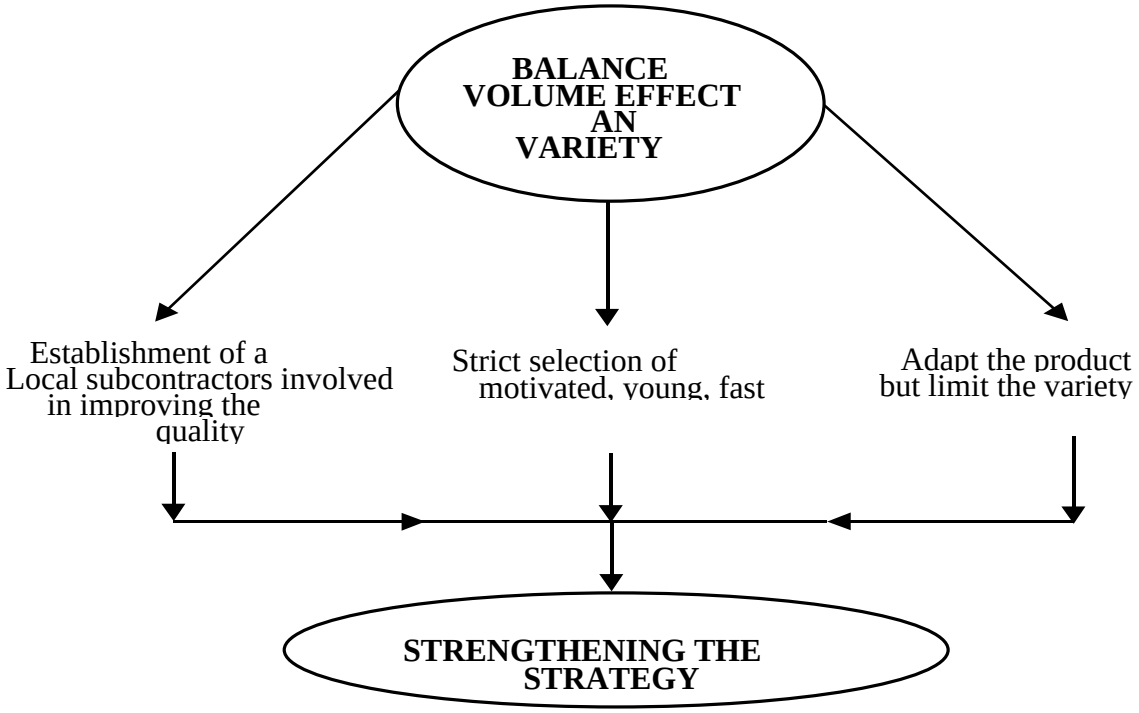
work simultaneously on multiple projects (polyfunctionality), during which they must capitalize on their experiences resulting from previous projects (perfect information network) and formalize and develop medium- and long-term innovation policies (FREYSSENET in RNRU, 1997).

1.3.6.4 Some lines of definition[50] are as follows

The contract is part of a classic logic of the legal type. It aims to unilaterally impose the objectives of the actor/project on the actor/business and to strengthen reporting *procedures*. The signatory is then encouraged not to take risks and to rely on existing know-how in technical solutions already experienced;

The contract is based on negotiation mechanisms, clarifying counterparties, and promoting compromises. It can then encourage risk-taking, innovation, the search for savings, and also the implementation of compensation mechanisms between subsets.

Figure 15: The hybridization model – the main implications



Source: FREYSSENET & BOYER in One best-Way (1998

The need for formal profiles developed between actors at the intermediate level is stated as a rule and thus makes it possible to guide the search for solutions at the base, especially those that

[50] In 1992, under the impetus of L. SCHWEITZER, current Chairman of Renault, an internal contracting process was implemented as a tool for regulating players and businesses.

designate an intermediate hierarchical level (coordination strategy, inter-business negotiation, and collective management of the contract at the level of subsets).

1.3.6.5 Negotiation and steering are based on actors and knowledge held, leading to two situations:

- the actors have a degree of autonomy and delegation vis-à-vis their direct hierarchy and that of their project management;
- technical knowledge and interface management, sufficiently formalized in each business.

In the hybridization proposals appear a new sign of development: *upstream-downstream development*. A plurality of models can then be envisaged within this new structure linked to a rational incentive margin. Functional equivalents, progressively trained over time (initial or continuing training), have a wider universe of applications and open to more advanced learning processes, this is the principle of "bench-marking". A second element concerns the improvement of performance through learning the methods of the parent company. This is explained as an attempt at partial convergence with external markets (labour) at Renault (internal market x external markets).

SUMMARY OF SECTION 1.3

The search for new forms of governance of the firm and, the generalization of management criteria focused on profit optimization associate industrial sectors with information technologies.

The automobile has long been based on the theories that make up the great tradition of the scientific organization of work. However, various factors have been fixed beyond companies' technological boundaries.

Taking into account current strategic decisions on the institutional environment of the firm, emphasize the confidence and behavior of the players in the market. The trend at Renault is to distribute the tasks of small multi-purpose groups, respecting the general strategy of the parent company as well as the opportunities it can find or seize in its environment.

Since the hybrid hierarchical project implemented a few years ago, Renault has been concerned about reducing costs and risks.

The importance given to the Japanese model in the company's projects indicates that the company recognizes the existence of significant problems at the level of engaged training. The recognition of these problems sets out its training project through four elements: (1) the establishment

of new skills; (2) differentiation in the calculation of salaries/skills; (3) taking into account the financial results of the group as a whole; 4) the choice of the team leader for the group members.

THE PARTICULARITIES DESCRIBED ARE

- the search for flexibility in the use of work, with the use of the EUT system in workshops;
- classification of positions by versatility and multifunctionality;
- the team leader has only the function of animating the group;
- the use of quantitative flexibility (with a modulation of schedules according to the production load).

SUMMARY OF CHAPTER I

We have briefly presented in this chapter, some nuances of a panorama rich in discussion from the foundations of the OST. We have highlighted certain key elements of the firm's development and environment, both internally and externally. Renault was a pioneer in implementing a flexible production model. Through his experience, we were able to identify certain passages of standard models and understand the triptych: organization-flexibility-hierarchical as complementary.

The work process is understood as a mechanism for valuing capital, so the determinants of automation are linked to the constraints imposed on this valuation. At the end of the 60s, the first crisis of Fordism shows the ineffectiveness of this model. The traditional organization finds a limit from there. Strikes broke out in 1968 and throughout the 70s, endangering the company's principles of trust and control.

Parallel to its movements, forms of resistance are detrimental to factory production (absenteeism, turnover, and the refusal of new organizational forms, etc.). These resistances disrupt production for a while. The organization is now incapable of maintaining social order, submission to the discipline of the factory, and elements necessary for the pursuit of the valorization of capital. At this time, a second crisis of Fordism broke out: market conditions did not favor the disposal of stocks or satisfy global demand. In other words, it is the crisis of mass production.

On the verge of chaos, the standard organization is now weakened in the face of intensifying competition. It reaches its capacity to make capital profitable. With a new medium - flexibility - the productive apparatus becomes more volatile. The workshop is resuming in a more decentralized spirit towards a new operationalization of complex systems, requiring a new worker profile. *Technologies are, therefore, at the time of this debate, generating different forms of recomposition of employment*

and fundamentally, inaugurating a new mode of productive consumption of labor (CORIAT, 1979, p.63): the versatile workforce.

The arrival of versatility in parallel with the flexibility of the firm defines a new productive cadence as well as the roles of the actors. In this new environment, new forms of governance of the firm are sought. Rigidity previously used as a method of controlling labor power is reflected as a cause of productivity losses. Versatility then appears as a redefinition of the term governance. Thus, the nature of union contracts and forms of bargaining are changed.

CHAPTER II

2 The Technical Knowledge Base : The Emergency of UETs

In this chapter, we will show the integration between the production process and the flexibilization of work.

The fundamental elements presented here are related to organizational changes and the company's skills network, resulting from management tools, generating both new modes of organization. As far as Renault is concerned, it uses through its economic evaluation regime certain criteria inherent in the concept of flexible enterprise, which leads to reliable answers in a logic of diversification and complexity between actors and emerging skills.

We will use the term technological innovations to imply the bias (GREENNAN, 1995a) of technological change leading to organizational change. By definition, the incorporation of information technologies into the production process leads to certain disturbances in the technical-organizational coordination, as well as in the firm-market matrix, which is integrated at the same time by the macro and micro-economic sides.

The analysis of the new behavior of the company goes through two aspects: the first, flexibility - corresponds to technological change, and the second is associated with organizational change. This last aspect takes into account the articulation of temporalities that contributes to production - this description ensures the understanding of *flexible enterprise.*

To understand technical change as an organizational one, we will develop the concept of technical know-how implemented at Renault. This conception includes flexibility as an inherent factor in the mastery of the work and techniques implemented by the company. The assumptions set out in this study combine growing technical knowledge with technological innovations. All these contributions raise a close gap between technical changes and new knowledge.

2.1 Technical and organisational changes: their impact on training

2.1.1 Introduction

"Technological innovation, organisational change and skills development are highly independent" (GRENNAN, 1996a). To take stock of different types of changes and analyze the relationships established competitively in the market, *we work with two hypotheses. The first includes technological changes as generators of organizational strategies and, the second, conceives organizational changes involved in the search for quality and in the training of actors.* Orientations

towards a flexible business model are associated with a significant and diversified investment in advanced production technologies. Technological changes and organizational changes are, in our opinion, complementary, but each time there is a domination of the former over the latter.

The evolution of the environment, in the case of the automobile, renounces the postulate of perfect rationality, to rely on that of limited rationality (SIMON, 1953). The logical basis for decisions is therefore limited by the environment and the economic situation. The complexity of the environment and the presence of uncertainty, resulting from the nature of competition, limit the scope of these opportunities. These limitations relate to the extension of the point solutions envisaged by a chosen method of evaluation.

New information technologies are then involved as a reducer of the firm's communication costs (sometimes internal and sometimes external) (micro-economic change). In addition, they change *motor skills into cognitive*[51] or *interpersonal*[52] skills. These transformations can therefore be associated with new forms of organization (new forms of governance of the firm).

We will use the term technological innovations to explain the bias that any technological change is the bearer of organizational change, to which we are committed. By definition, the incorporation of computers (called information technologies) has led to disruptions in the technical-organizational coordination of the firm. In our opinion, this changes the firm-market integration matrix upsetting the macro and micro-economic sides.

The correlations between the introduction of this new way of carrying out production have two aspects: the first, that of **flexibility** corresponding to technological change, and the other that of **training.** This last aspect is envisaged as the management of articulation in various temporalities to which production contributes (external training, in locus training, etc.). The description of the flexible company thus allows us to grasp the faster and more reliable forms of coordination in the sequence of productive acts. Consequently, the professions that are exercised in a different temporality ensure a particular coherence to production: the binomial flow – stocks.

To understand the role of technical change, the concept of technical know-how must first be developed. This syllogism engages the concept of flexibility from the mastery of the productive process and the new techniques implemented. Our hypothesis proposes that the level of technical knowledge does not decrease with a new technical change. On the other hand, overall contributions tend to grow. On the other hand, the level of their interventions changes as well as their type of efficiency according to the type of macroeconomic interaction.

[51]Ability to conduct analytical reasoning or synthesize information as an expressive ability.
[52] Ability to interact with other individuals, to supervise.

In this section, the fundamental element we are trying to bring together is the organizational change that comes from technical change, generating new management tools and new modes of organization. This goes hand in hand with the idea of Renault's economic evaluation regime; It meets certain criteria such as **:** productive flexibility, gains in scale, the new profile of the market, the new characteristics of demand, suggesting an internal organizational relationship between the company and the new technologies used.

To simplify our argument on the one hand, the technologies at work in production are diversifying and becoming more complex and, at the same time, they give another horizon to the role of interface between actors and new emerging categories. This change comes from hierarchical bodies that are changing (from vertical coordination to horizontal coordination) and which are reorganizing towards the prescription and control of one over the other[53].

2.1.2 Technical progress and organizational changes

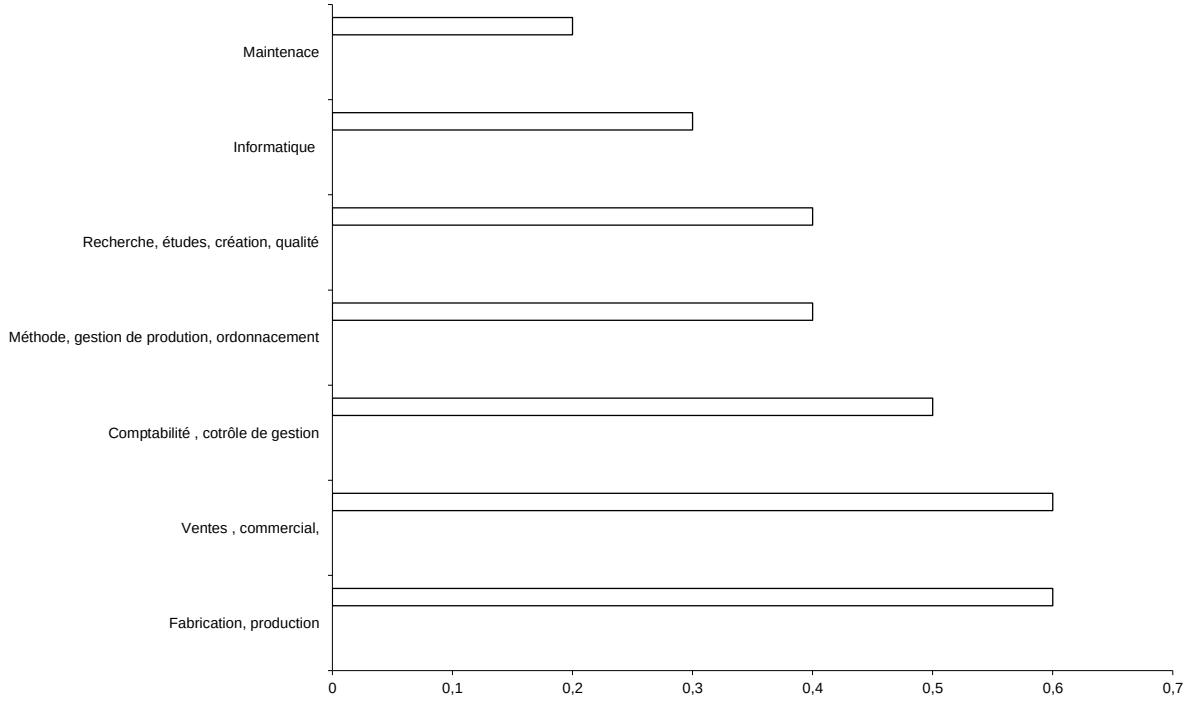
"Technological and organisational changes can have a positive effect on the employment of the enterprise if they generate a competitive advantage leading to the expansion of markets ... influencing the type of coordination structure of the firm" (Greenan, 1995a, p. 36).

The argument that technological change is responsible for the firm's competences in the field of worker training reveals the marriage between horizontal coordination, which changes the role of the hierarchy, and the abolition of managerial posts[54]. This favours the incorporation of information technologies despite emerging results (Renault hybridization model, sec. 1.3, chap. 1) as a goal of a search for a certain organizational flexibility, favoring a qualified workforce.

This principle is attached to the premise *"technological change that brings about organizational change"*. In this way, the structure of the market highlights the constraints created in terms of competition, as well as the skill choices of the workforce.

[53] The decision-making of this functional reorganization of economic actors according to the new technology requires a hierarchical reorganization that established priorities between the different temporality and articulates different professionalized, as has been established at Renault.
[54] See the example of TEUs where a contingent of 20 people have only one supervisor.

Figure 16: Key statistics – technical-organizational changes



Source: Renault Archives (1990)

These changes require technological innovation and the more extensive use of information. At Renault, this reacted as an environmental performance factor, which makes the qualification structure more dynamic. In Figure 3, we note that, depending on the degree of technological use, in some cases there may vary from 10% to 60% of technological insertion.

As main trends in organizational change, the literature presents the five most related to the nature of the knowledge and know-how mobilized:

- The first trend is *the search for internal productive flexibility*. The ability to track in real time fluctuations in volume and kind that affect the activity. This research involves a kind of organizational polyfunctionality, that is, the ability to occupy different positions[55]. As a result, autonomous units are implemented to give an optimal response;
- Second trend - *operational versatility*. This logic implies a potential of individuals to cooperate from one function to another, or even mobilization of knowledge on several functional registers (polyfunctionality).

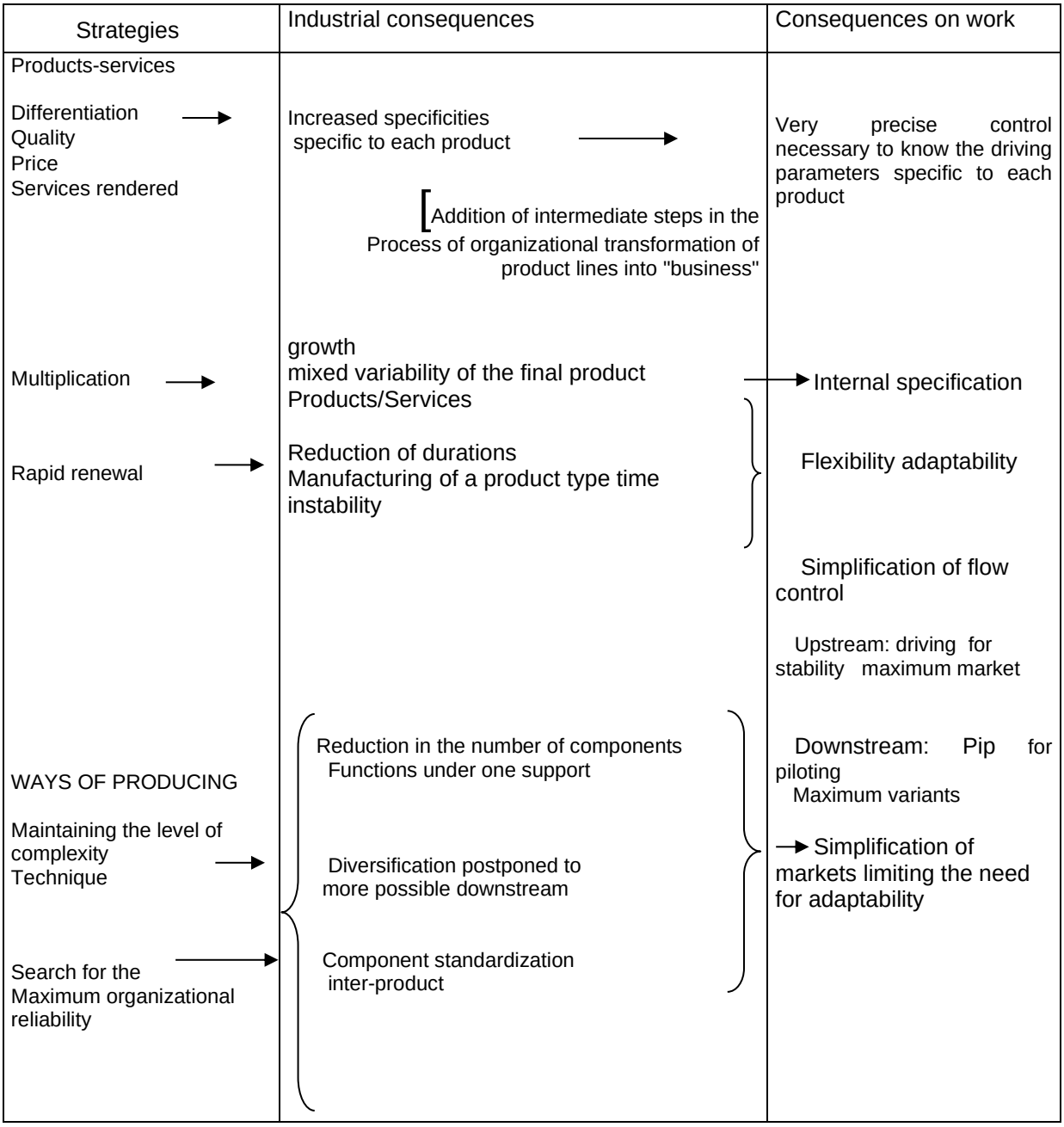
[55] A good illustration is a malfunction upstream, to respond to downstream commands.

- Third trend – the mobilization of managerial knowledge. The company requires the autonomy of individuals and groups as well as new skills in time management and flow in the workshop.
- Fourth trend - *the mobilization of new knowledge and know-how* following future market indications.
- Fifth trend - *the complexity of coordination in the organization*. It is expressed by the ability to exchange technique in the group, creating common language codes. The latter are vehicles in the company, in the transmission of management information, between neighboring services, making them general or specific.

2.1.3 The Change of tools to promote perfect flexibility

The flexibility of production leads to a permanent research on the design of new ways of working and producing that respond to different operating logics: the collective management of work operations, the control of work processes and the development of organizations.

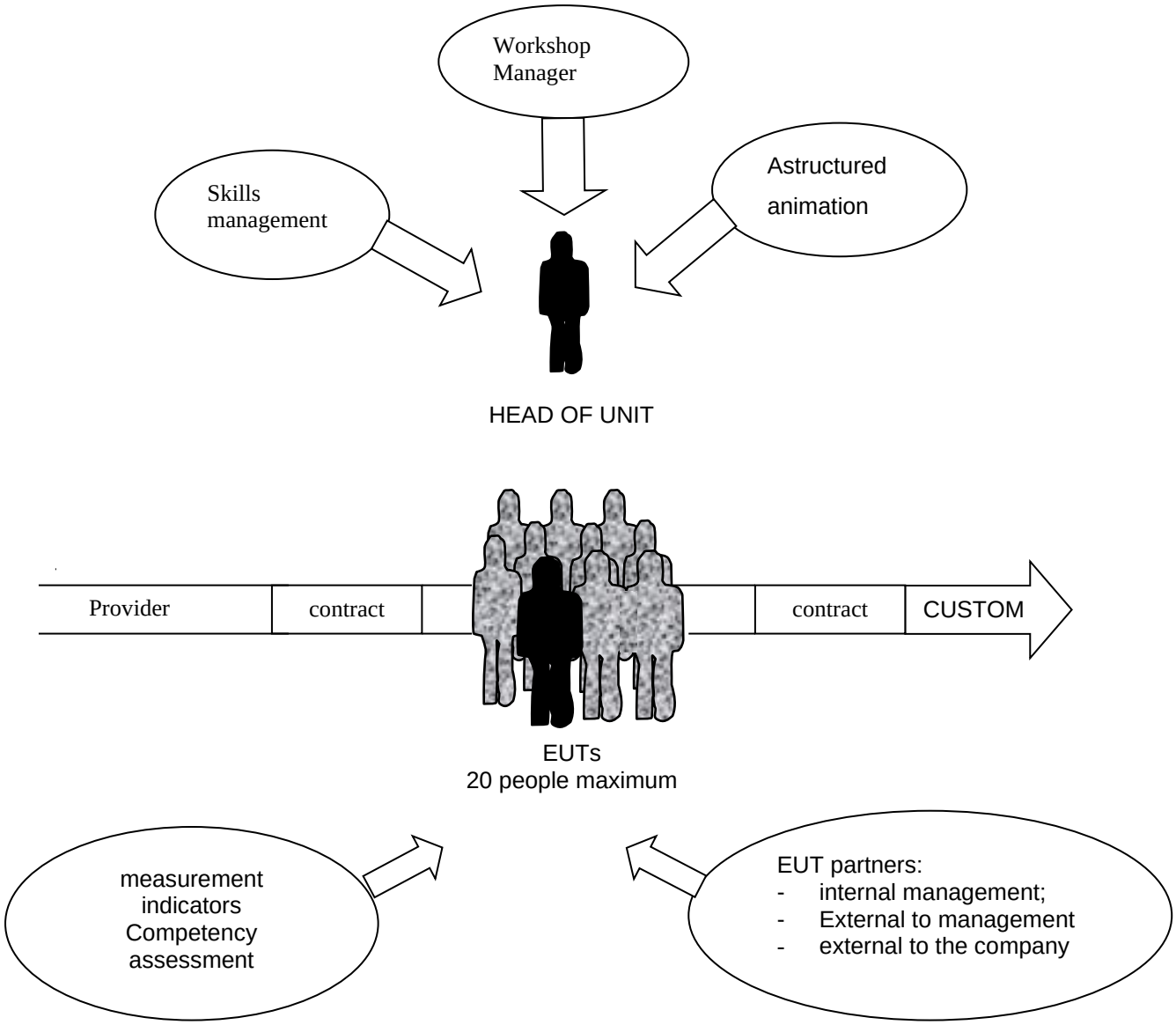
Figure 17: Work management x flexibility



Source: author based on NAALC/1995

The orientation towards the flexible business model adopted by Renault leads to the development of a considerable proportion of managers, whose skills are associated at the same time with high-level managers. This idea is associated with the following premise: *organisational changes influence the structure of employment and not only its level***.** It is important to distinguish the impact between reorganizations at the individual level and that on the categories of workforce associated with the positions. Part of these organizational changes is associated with the enrichment of operators' skills within the new work organization: the EUTs.

Figure 18: EUTs



Source : author

The idea developed was linked to the penetration of new technologies in firms with ambiguous effects (Table 8). The upheavals generated always result in periods of imbalances in the organisation and in the labour market, targeting training. With regard to the triptych: Technological changes – organizational changes – training, there is a certain juxtaposition between the last two, which do not have the same logic. Their simultaneous management has important discontinuities, namely: the phenomenon of internal markets. Other important elements are under discussion: the training of managers represented here by high-level managers (bac, Bac + 2, Bac + 3, Bac + 4, engineers, etc.) and the decline in the work of low-level workers in the workshop (according to the survey conducted by Sessi 1998, data from Table 9). In this logic, the development of the organization is key to the

evolution of the firm. However, the mastery of technology expresses the degree of training and development of the organization, which are therefore essential during the production of new skills.

Table 7: A breakdown of firms according to technological and organizational changes

	TECH1 Presence of MOCN 2 to 4 ODS robots		TECH2 Presence of CNC 0 or 1 ODS robots		TECH3 No robot or CNC, 2 to 4 ODS		TECH 4 No robot or CNM, 0 or 1 ODS	
	AND	ER	AND	ER	AND	HE	AND	HE
ORGA1 Worming the flexible enterprise model	279 50 46	160 56 51	65 12 25	34 12 29	144 26 30	62 22 31	66 12 13	28 10 14
ORGA2 Techinization movement	93 36 15	41 37 13	32 12 13	13 12 11	85 34 18	37 33 19	48 18 10	20 18 11
ORGA3 Deepening of hierarchical logic	132 33 22	71 40 22	67 17 26	32 18 27	101 26 21	38 21 19	96 24 20	38 21 20
ORGA4 Organization and competence unchanged	99 16 17	45 18 14	92 15 36	38 15 33	150 24 31	60 24 31	275 45 57	105 43 55

Note: the first row gives the number of companies in each category, the second row the percentages in line and the third row, the percentages in column. CNC stands for CNC machine, and SAO stands for computer-aided production system. The calculations are carried out on the sample, total enterprises (1824) column ET, on the reduced sample (822 enterprises after pairings) column ER.
Source: Sessi Organizational Change Survey (1998).

Table 8: Qualification Structure by Type of Change

	Share of									
	... Frames		... Intermediary professions		... Employees		... Skilled workers		... Unskilled workers	
	A	B	A	B	A	B	A	B	A	B
ORGA1	0,11 (0,60)	-0,90 (0,55)	2,24 (0,84)	0,43 (0,75)	0,61 (0,49)	0,15 (0,47)	-2,73 (1,69)	-2,15 (1,65)	-0,22 (1,87)	2,47 (2,01)
ORGA2	-0,33 (0,75)	-0,26 (0,58)	-0,06 (0,90)	0,11 (0,79)	0,61 (0,53)	0,56 (0,50)	-3,50 (1,81)	-3,99 (1,73)	2,65 (2,01)	3,09 (1,90)
ORGA3	0,30 (0,64)	0,23 (0,58)	-0,06 (0,90)	0,11 (0,79)	0,61 (0,53)	0,56 (0,50)	-3,50 (1,81)	-3,99 (1,73)	2,65 (2,01)	3,09 (1,90)
ORGA4	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
TECH1	0,67 (0,63)	-0,13 (0,61)	1,34 (0,88)	-1,22 (0,84)	-0,34 (0,52)	-0,55 (0,53)	-1,09 (1,78)	0,31 (1,83)	-0,57 (1,97)	1,59 (2,01)
TECH2	0,67 (0,63)	-0,13 (0,61)	1,34 (0,88)	-1,22 (0,84)	-0,34 (0,52)	-0,55 (0,53)	-1,09 (1,78)	0,31 (1,83)	-0,57 (1,97)	1,59 (2,01)
TECH3	1,84 (0,66)	0,89 (0,70)	2,34 (1,06)	1,28 (0,84)	1,09 (0,55)	0,62 (0,53)	1,44 (1,87)	2,21 (1,83)	-6,71 (2,08)	-5,01 (2,01)
TECH4	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
R^2	0,02	0,24	0,04	0,28	0,02	0,18	0,01	0,13	0,04	0,17

Source: Sessi – automotive sector (1997)

(i) The table presents 2 types of organizational changes: A e B vis-à-vis the type of training, and all this according to machine type technique and functional change type (ORGA 4). In some cases for A as a reference not all segments are sensitive enough, this means that by taking A, the organization has achieved a technical change, but not of significant character.

(ii) By taking B, all segments are sensitive, which means that the change implemented vis-à-vis technology, has significantly caused an organizational change.

2.1.4 Micro and macroeconomic interactions in technological development

The set of contributions shows a strong trend towards broadening and integration of the activity, articulated around three main axes, namely:

The first axis uses two elements: the first element leads to integrating manufacturing into tasks previously carried out externally (causing externalities of specialized services and, the second to the operations of recording and control of elementary acts.

The second axis concerns the production of composite products, i.e. manufacturing traditionally mobilizes professionals with diverse disciplinary roots. This new practice tends to call into question the classic sharing: from a hard core. A reorganization of learning is envisaged on the basis of complementary knowledge.

The third is developed from radical changes resulting from competition. The fundamental change in the available techniques is with regard to the stakeholder in dissemination for computerized production (Table 5 & HOLLARD (1990)). This search for new criteria makes it possible, in an economy open to international trade, to become decentralized, and also to promote a management mode that encourages improvements in working conditions.

The process of technological integration at Renault has progressed by finishing to redefine the steps that can be identified, since the definition of the means of action: which took the name of project group. Renault has thus set up cooperation structures in the form of project teams, responsible for all operations. The initial idea of coordination is to understand the transversal skills of the different trades of the company (RNRU, 1997).

Objectively, the above mode of organization is done in two stages: by the division and by the specialization of tasks. On the other hand, it allows the development of production flexibility and flexibility. This is the interface between innovation and the emergence of EUTs. Renault has established a progressive approach to interfaces between traditionally compartmentalized functions and interconnection/interdepartmental cooperation structures.

Finally, the technical change was led to an integration of sequential transformation operations and a centralization of equipment orders. This idea thus includes the understanding of an ever wider technical space of transformation as its field of action expands. The relationships between the different phases of transformation become more intertwined. We can see the main skills for innovation in Table 10.

Table 9: Skills to innovate

Types of skills to innovate	using own procedures	by appealing to external factors
Product Innovation	15	5.3
Process innovation	15	5.1
Design innovation	51.8	28.6
Business Innovation	51	14.4
Technological innovation	51.1	14.2
Qualification iso 9000	48	29.5
Technological innovation and design	49.9	27.4

Source: Renault Archives/1996

2.1.5 The characteristics of the application

The company participates in the construction of the production stages. In terms of available human reSources, the development of employment policy in the short and medium term promotes an articulation between the search for new technologies and the characteristics of demand.

2.1.6 Flexibility as an implication and consequence on technical and organisational change

Integrating flexiOrganizational change, highlights the "technological trajectory" of the company. This allows us to define two axes: the first, based on a logic immanent to technological development – generated by information technologies (favor flexible systems) and the second, based on an analysis of the relations between politics, market and technology.

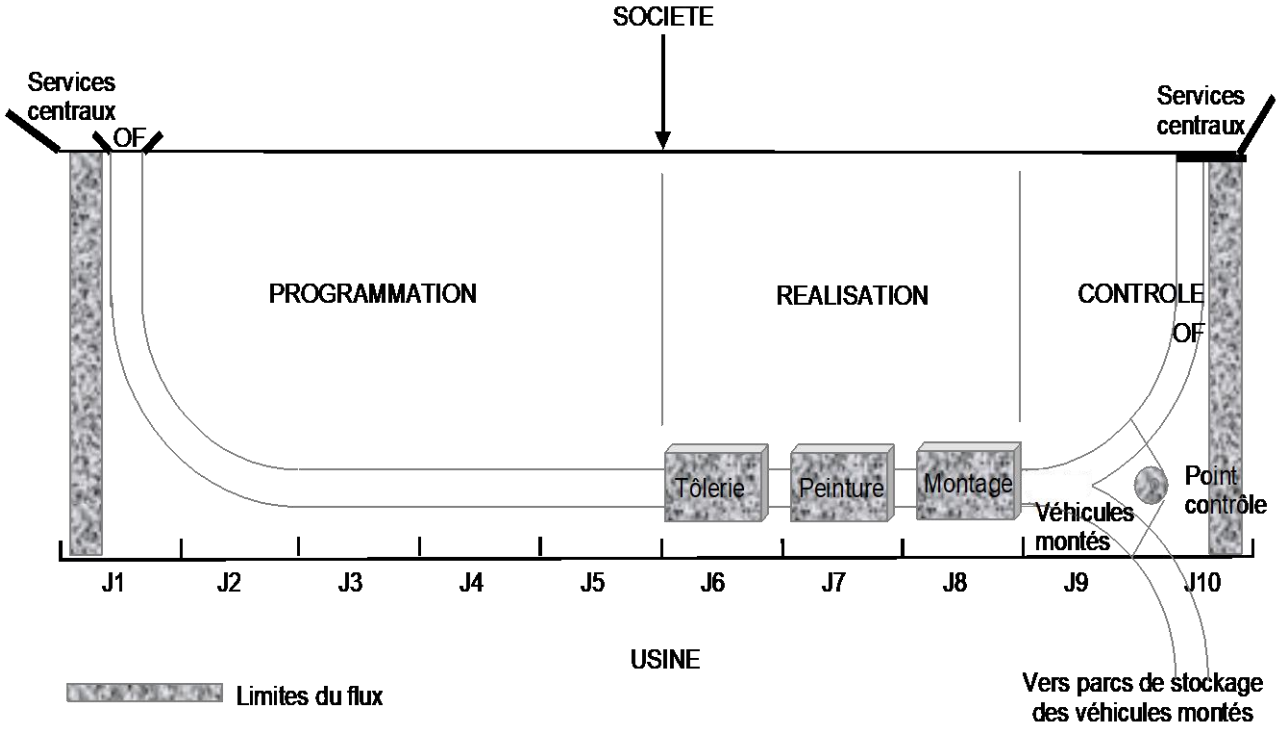
According to HOLARD (1986), flexibility has become a multi-purpose concept. Based on the challenges of social actors, the importance of the business environment and economic and social policy evoke a new series of parameters.

A reasonable analysis of flexibility takes into account two elements (Holard, 1990):

The first: the flexibility of a technical system has been linked to the company's environment, and consequently to its strategy. In flexible workshops, the notions of flexibility are attached to the assessment of possible economic consequences. However, the evolution of company production installs a new element 'confidence' in flexible workshops, to make them more reliable and integrated, has settled a decentralized logic (diversification of mechanical installations, size of parts, factories, etc.).

The second: the programming of the flexible factory (diagram 16) is essentially oriented towards the distribution of the volumes of the different types of models, called **production mix**. The optimal calculation of production is adjusted through the load/capacity binomial and the physical flow is part of a restructuring of the productive links. The results are fully predetermined and controlled in intermediate scales.

Figure 19: Sequence of flow cycles at Renault: The flexible factory model



Source : Renault Archives, 1994

In the flexible business model, decentralization enables faster decision-making, while integration accelerates its implementation. Autonomous work teams, working groups and both rotation on different positions and the implementation of a total quality approach are in the foreground; important elements for assessing the transition from technological change to organisational change (see Table 11).

2.1.7 The Role of Organizational Change in the Automotive Industry

Technologies are the symbol of abstract schemas but they are the ones that give the support for their deepening and widening within the framework of the installations.

Changes in the organization of production and the evolution of skills are highly independent. To link these elements, we have taken the structural path that attributes technological change to the key to organizational change.

The link we reaffirm is that technological changes are more related to the micro-economic level, while organizational changes are directed towards labour flexibility. Nevertheless, the flexibility of the workforce enhances the content of the training in terms of skills and tasks. Finally, the entire organization is highlighted: size, sector, strategies, investment and new technologies.

Returning to the idea of organisational change, in the context of training, the contributions of SESSI (Tables 7, 8 and 10) showed that work activity is fundamentally a training activity. According to Grennan (1996) organizational change occurred through a new distribution in the sense of units, information structure and communication.

Table 10: Key Levels of Organizational Change

	Participation of employees participating in teams or groups	
	1996	1997
Production employees:		
Stand-alone working group	61,8	17,6
Problem Solving Group	62,7	22,5
Project Groups	81,4	15,3
Total group types	68,6	18,5
Other employees:		
Self-working groups	73,0	16,7
Problem-solving groups	68,8	24,2
Project Groups	71,5	24,4
All types of groups	71,1	21,8

Source: Survey – SESSI (1997)

Any change in the division of labour, in the distribution of decision-making power and in the flow of information constitutes an organisational change (cf. Table 11). Organizational changes raise the bias, in the current literature, of decentralization and increased integration of the organization favoring a high degree of flexibility (GRENNAN, 1996).

SUMMARY OF SECTION 2.1

It is the technological change that affects the employment behavior of the company more. Through its impact on market expansion, the skills structure becomes sensitive to new emerging skills. Social practice is changing in favour of a new labour market profile, i.e. more diversified training.

The information, organization and performance of firms form the *current analytical corpus*, in the new theories of the firm. It is therefore the impact of technology on organizational change that defines this new technological paradigm.

2.2 Technological skills and regimes – the case of EUTs

2.2.1 Introduction

We will understand economic activity as a set of elements articulated around technicality, the relationship-communication between agents and the performances developed. If we take the standard vision, we focus on the functioning of the organization and the hierarchy. If we take the dynamic vision, we focus on flexibility and the rules of management and the learning process (MIDLER, 1991). This panorama simply describes the daily life of the company that we will be addressing.

The theme of skills corresponds to a renewed vision of the firm as a custodian and producer of specific knowledge and know-how. "Skills are a network in training and transformation of know-how in-put and out-put of collective work in organization" (MENGER, 1999, p.312). The firm is therefore a beneficiary of the accumulation of knowledge and practical and individual knowledge. Its responsibility is to know how to develop the dimensions and working relationships that promote internal exchanges, interactions and also the circulation and communication of information.

The classic concept of skills is to be a set of knowledge, qualities and capacity in action, ending in attributions, approaches and knowledge of the enterprise (ANALC, 1998). In the polysemy surrounding this term, we will use it as a set of know-how, mobilized or mobilizable.

The notion we present in this section is that of the deepening of the term professional competence and their connection in two specific biases:

- The first is the collective dimension. The main idea is to understand the set of basic know-how provided by competitive differentiation designated by the strategies that characterize the company. It is therefore seen as a cell that makes strategic decisions (macro-skills) on individual skills taken in common with the actors at stake.
- The second bias is that of the notion of competence as a set of knowledge and capacities for actions and behaviors structured according to a goal and, in a given situation. Thus, skills constitute mobilized knowledge, integrated knowledge, transferable knowledge and proven and recognized know-how (MENGER, 1999).

These ideas contribute to understanding the renewal of Renault's professions (various workshops, qualification recruitment, etc.) in the spirit of a recomposition of general know-how. Indeed, the renewal of technologies and forms of organization does not take place at the same speed

and at the same time in the different workshops, creating contradictory situations during the development of the workforce.

Here we situate organizational practices, which put in place means allowing individuals and collectives (working groups, operational circles) to understand the work on a daily basis. This new faculty regenerates individual and collective skills involved in the organization for a formative purpose.

2.2.2 Shared hypothesis

The hypothesis imposed that each skill generates local learning processes (this is the case of autonomous production units, quality circles, etc.). In our opinion, skills represent knowledge emerging from the circulation of technologies. We believe in these collective procedures, which even individual ones are put into circulation as methodological tools of the global productive process functioning as reference capacities. This gives a new profile to the content of the professions. This emphasis on the definition of competencies (with regard to information technologies) allows the creation and adaptation of an innovative out-put, thus leading to a new organizational relationship. Finally, it is a kind of entanglement of the concept of profession vis-à-vis areas of competence mobilized around the same mission.

2.2.3 Routines, trajectories, and hierarchy in the flexible enterprise

According to Nelson and WINTER (1982) the places of residence and main construction of knowledge are the individual members of the organization, their knowledge therefore becomes elements of organizational coordination. Routinization is then the transition from an individual cognitive logic to an organizational cognitive logic. By routinization, the authors imply an organizational cognitive dynamic where the components are organizational and/or technological changes.

2.2.4 The enterprise - agent of a techno-economic network

Understanding skills requires the creation of technology, through the accumulation of past experiences and the challenge ofdevelopment of real learning capacities. This relationship can be explained according to the reSources allocated and commercial objectives chosen and also the transition from science to technology[56], as explained by CALLON (1986).

[56] According to CALLON (1986) the characteristics that are implemented here are those of the translation of intangible elements within the exchange of information between network enterprise and environment.

Any technological innovation strategy recomposes the intangible heritage of the company, redefining the distribution of skills of the techno-economic network, of which it is part. Skills management must allow, identify, formulate, ensure access, dissemination and sharing of this new heritage. To make this notion viable, it is necessary to formalize and capitalize on the company's key skills. The elements of forward management of skills have been proposed in terms of the recomposition of technological and organizational skills on a strategic information system of the company in a classic way as a system that has the properties to follow:

- He is influenced by his environment;
- It makes specific changes to inputs (such as strategic analysis);
- It exerts an influence on its environment, but only according to certain specific processes called outputs (selective dissemination of scientific and technical information and constitution of strategic recommendations).

According to ZARIFIAN (1988) on the whole, these elements reveal an ad hoc approach of the organization as coordinator of a working method and evaluation. In addition, the implementation envisaged is characterized by the basic sequence defining the different stages, the type of relationship established between the specific step and the techniques implemented by collecting information, analysis and processing of the information collected; and the type of validation and formalization of the results.

The approach of skills in the sense of organization is reasoned on the definition of certain parameters, namely: the quota envisaged, the levels of information, the framing, the processing of information involve the transfer of technology and especially the method currently used in the development of learning the mode of application.

In a simplified way, we can attach skills to the technology watch system. This system evokes the capacity of the strategic elements of the company's information system and the variety of the company's environment presented as the set of strategic information of all actions, making it possible to increase the degree of determination of the company's strategic information system. In the final analysis, any industrial enterprise tends to reduce the diversity of its environment and this reduction takes place through a specific management of scientific, technical and commercial information that it identifies, conveys and emits.

2.2.5 Cognitive principles and the learning-skills network

The dynamic process of constructing scientific knowledge of individuals and firms is defined by two basic principles: 1) the skills composing the cognitive principle of firms and 2) dynamic skills in various modes of organization.

The first principle is attached to the idea that the firm is not the only producer of knowledge and information. Knowledge is developed as the result of interaction between economic agents. Productive activity necessarily generates knowledge. Because the production apparatus is the place of capture of knowledge, it performs a function of Source of information and knowledge of the needs of the firm/market binomial.

The second principle is consistent with the localization of the rationality of the firm as endogenous data (organizational uniformity). This highlights various elements that guide the *construction of a cognitive process of differentiation and reformulation of the rational empowerment of the organization*.

2.2.6 Skills and flexibility

The logic of "skills" is based on the confidence and weight that each individual can bring to the collective progress of the organization (as well as to his own professional development). According to ZARIFIAN (1995), skills management is, in the flexible production model, the modality that animates the work collective. According to Boyer (1993), the dominant factor is training, which engages in a process of permanent innovation.

At the finer level of the enterprise, the approach, in terms of basic unit of responsibility, provides an interesting avenue for reconstruction (re-energeering) with the following requirements:

- Organize the activity around results and not tasks;
- Have the process carried out by those who use the results;
- Have the information processed by those who do the work;
- Place the decision-making centre where the work is done and integrate control into the process;
- Information is collective.

Figure 20: The conditions for implementing the competency model

Limitations of the current competency model	Solutions for the implementation of the competency model
1-The notion of competence is based on two opposing conceptions: know-how linked to acquired experience, repetitive and knowledge linked to school training and scientific knowledge.	1- Redefine the intelligence and collective competence of complex productive situations: •Overcoming the distinction between knowledge and know-how and the concept of intellectual and practical intelligence (understanding of the situation and actions to take charge of them). •Avoid the contradiction between formalized training and practical experience.
2-The notion of competence is still based too much on the requirements: • The organization of work is always thought of as an assembly of jobs: importance of the required; • The recognized competence of employees is assimilated to the requirements for employment ("job evaluation"); • Competencies are defined externally to employees.	2. Recognize the knowledge gained •take the logic out of the network, to be based on the logic of the acquis (the human initiative actually employed) • Be based on the reality of work in a threefold way: - By the components of productive situations; - By the importance of communication between the actors involved; - By the relevance of the actions undertaken from the point of view of the recipients of the work (customers, users); - Synergy of skills and initiative, building on what has been achieved.
3-The development and enhancement of skills remain limited • Unrecognized competence in calculations; • The employee continues to be considered a cost; • Employees are destabilized.	3.Highlight organisation as a 'liaison body' between competence (individual and collective intelligence) and economic performance (level of result). • The deployment of the competency model involves: - The valorization of skills; - Performance management; - The choice of the organization best able to involve them; • The methods of assessing individual competences and collective performance must remain distinct (competence is assessed on the basis of achievements, individually, and performance is assessed on the basis of results, collectively); • Develop and enhance skills in order to strengthen the efficiency of the company.
4- The logic of competence versus downsizing practices •Contradiction between "logic of competence" and "exclusion procedure"; •No logic of competence is mobilized to define the company's strategy.	4. Integrate workforce management into competency management •Make employment development an essential element of the strategic explanation (the strategic explanation = possibility for all to participate directly in the overall orientation of the company); •Put strategic explanation at the heart of competence.

Source: author based on ZARIFIAN (1995)

2.2.7 Skills at Renault

At Renault, the process of technological integration has redefined the means of action to capture skills. The name project group has set up cooperation structures in the form of project teams

responsible for all operations. The initial idea sets new coordination criteria whose trades sectors evoke the emergence of new actors. The latter are forged in broader representations of their activity in a general context of the company. The skills taken into account are transversal in nature concerning different trades of the company.

There are three areas of expertise that are attached to the profile of the project teams. (GIARD, 1993):

- The first is the competence to manage the project itself. Competence beyond mastery of project techniques presupposes an ability to implement established operational modes;
- The second is the mastery of techniques used in the realization of the project. A project actor masters the trades he coordinates;
- The third is the understanding and adherence to the project he leads - the actor-project is the living memory of the project, he is the guarantor of its continuity and convergence.

The mode of organization by project objectively goes beyond two stages: the division and specialization of tasks. On the contrary, it allows the development of hierarchical flexibility and production flexibility. In these situations, as in others where innovation is a necessity; Renault has established an approach where interfaces are created between functions traditionally compartmentalized by the structures of cooperation of interconnections, interservices and inter-trades that are carried out according to the projects.

Competitive behaviour has led Renault to change operating methods towards a personal approach, which is a little out of standard strategies (competence-diploma, competence-position). It is therefore the evolution of these managerial practices, management and trust, which are in the spirit of EUTs.

The elementary production units constitute a collective of task enrichment and versatility. They are understood as islands of production or "versatile and autonomous teams". EUT is defined as a homogeneous set of production of goods and services, with a small size (10-20) people. Training is therefore the key element of this new form of management. Following Figure 18, we can understand the competency profile of EUTs, observing the three key points: information processing; organization and adaptation. The definition of tasks is individualized in the sense that everyone is responsible for himself, but the collective defines the skills and the interest of training (cf. Table 12). The tasks are then accomplished by rotating the solidarity teams, and thus reducing the hierarchical staff.

Figure 21: EUT Profile Competence

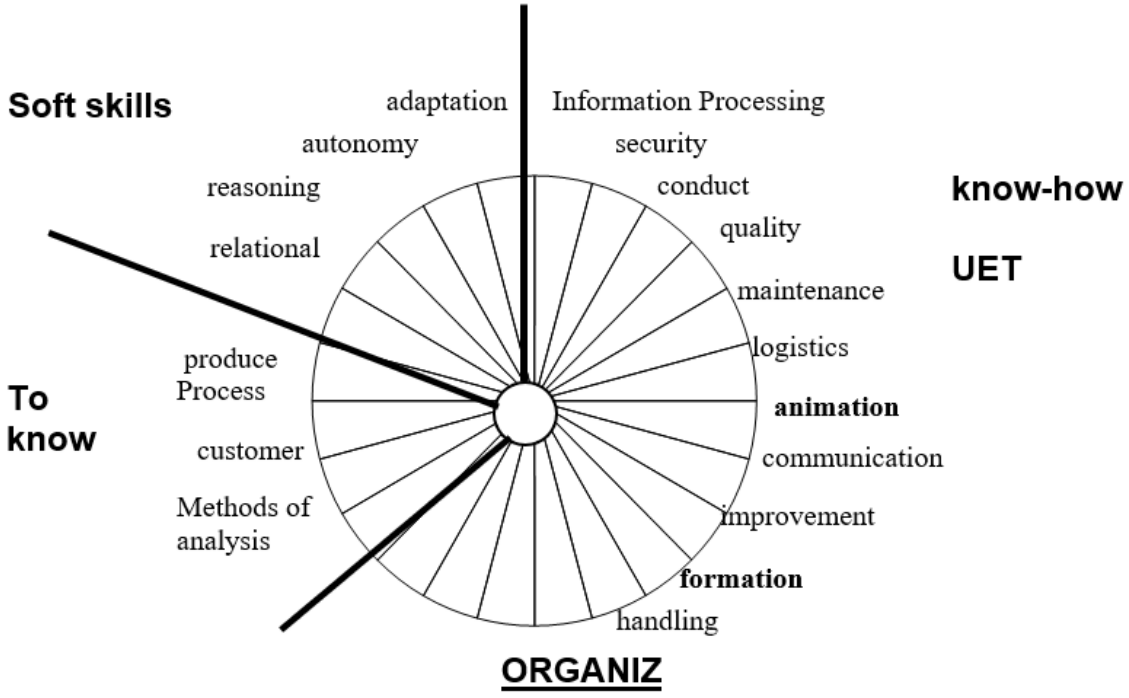


Table 11: Organizational Changes

Organization of work according to the number of organizational innovations practised by occupational category	AP	P1	P2	P3	Reg	Empl.	techn.	On the	Frames
Rotation of positions	15,5	21,8	28,9	33,6	23,8	13,5	7,8	33,3	5,7
Individual performance by application method	27,2	24,6	21,2	20,4	47,1	49,6	41,3	51,5	47,8
Individual evaluation system in the group	25,6	28,1	38,8	31,7	30,4	29,5	30,4	47,8	42,8
Specific tasks	73,6	71,2	63,3	65,6	74,7	68,9	70,6	68,9	71,8

Source: Renault Archives (1995)
(i) The procedure of various systems of assessment of competences has been taken into account in order to capitalize on the experiences lived in the enterprise between 1986-1991.

Professional foundations can intervene for executive jobs expressed through a growing mastery of technologies by giving a new path to skills routines in the company. Professional prospects correspond to the qualifying management of individuals.

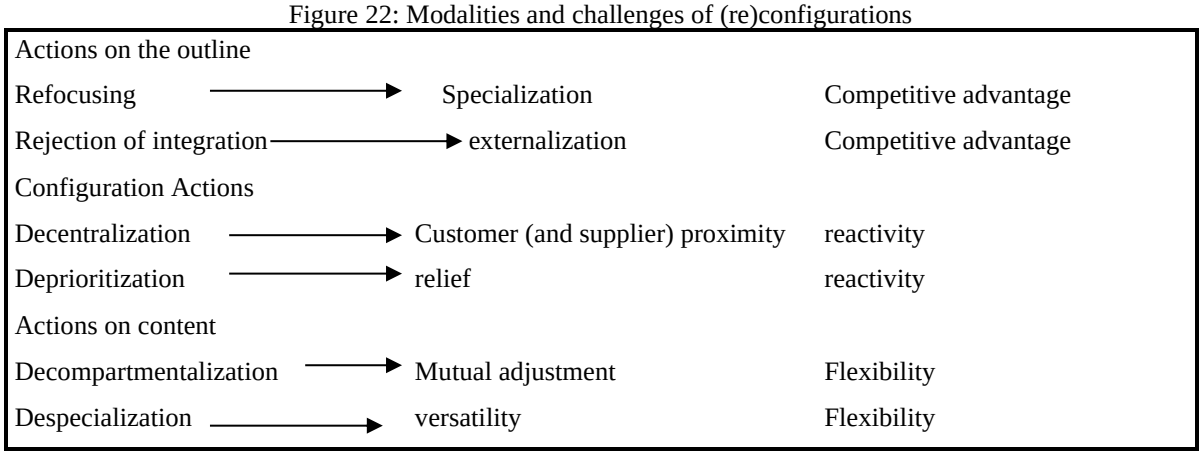
2.2.8 The emergence of training at Renault

The production of experience can be seen as the emergence of a flow of information that occurs during the execution of the multitude of activities that the firm coordinates.

The execution of an activity calls on know-how as a generic reSource of experience. Training is then an indispensable recourse in the world of EUTs. Knowledge is understood as versatile and

multifunctional, focusing on three important poles: the contour of the activity; Organization configuration and, task content.

Figure 22: Modalities and challenges of (re)configurations



Source: HENRIET (1999)

The new organizational configurations (Figure 19) lead to specialization actions as a competitive advantage. Within the EUT, know-how increases from an individual to the community. The foundation of competencies is integrated into general functional specifications based, above all, on information that may consist of accumulated experience and that is intended to be trained.

Like the representation of skills, Renault defines the notion of competence on the basis of mobilized knowledge, where work is seen as an act of training: a learning and learning organization.

The EUT includes a small autonomous and responsible collective, whose workstation integration and control go through the quality and maintenance of supply monitoring (represents actions on the configuration).

In this model, there is a reduction of the hierarchical line (i.e. actions on the content). Work situations are evolving and explicitly used as the place and purpose of training. In other words, the learning organization is not based on the mobilization of new reSources, but more on the coherence of these means in order to explicitly promote learning in the workplace. In this spirit, the learning organisation involves the actors in their work, where opportunities for individual and collective skills development promote greater economic efficiency.

The implementation of this method has generated a favourable environment with regard to flexibility of procedures and contents. Sectors have been able to have greater autonomy in real work situations, which means more flexibility. This autonomy makes it possible to set up innovative rules of production at the workplace itself. These rules anticipate, in a complementary way, collaborations from situation *to situation and* from individual to individual, *allowing the enrichment of collective practices and new experiences.*

The performance indicators of these new skills have been linked to the cost-quality ratio (i.e. hourly productivity and mastery performance in the workshop cf. Table 13).

Table 12: Staff Autonomy in Workshop R-9

Duties	Hierarchy	operator	Specialist	Hierarchy	Operator	Specialist
	In 1991			In 1994		
Adjustment of installations	24,1	62,5	49,4	28,7	52,9	46,8
1st level maintenance	16,7	65,1	40,1	21,5	50,9	44,8
Distribution of tasks for operators	83,6	14,5	8,6	84,1	10,0	5,1
Quality control of supplies	35,1	43,4	39,7	42,8	34,6	35,2
Participation in performance improvement	78,5	54,0	35,0	79,2	36,6	30,7
Participation in project teams	75,4	28,4	35,2	75,0	22,1	32,4
Shutdown in the event of an incident	82,1	40,8	22,1	84,1	34,2	19,2
First diagnosis in the event of an incident	63,1	43,6	43,3	68,6	33,2	38,1
Restarting production in the event of an incident	82,1	19,1	25,2	82,4	13,7	20,9

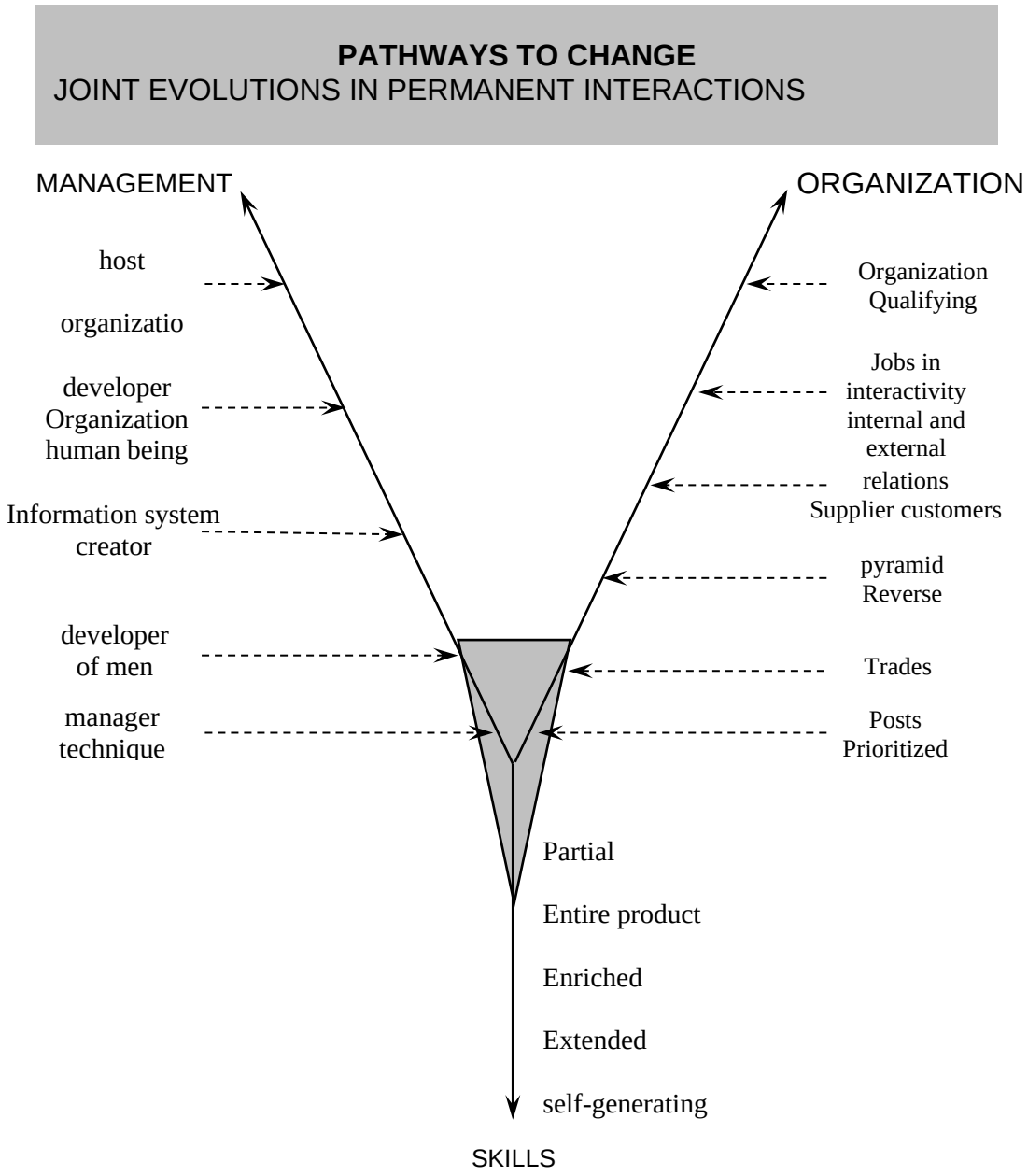
Source: RNRU (1994)

Between 1991 and 1994, the workshops virtually eliminated almost all difficult cases, including those involving maintenance, electronic breakdowns and diagnostic skills. This means that at the same time that these new skills and strong knowledge have broken with the old balance of the workshop and have given a new characterization to varying degrees in the operational plan. These new skills concern the key points of workshop performance and restructure of hierarchical skills, once the new routine of the operational cell was defined.

2.2.9 The functioning of the group organization

The transmission and construction of knowledge articulated to the functioning of EUTs, linked to versatility, determining the proper technical functioning that lead to a permanent circulation of knowledge and know-how. Each actor works as a pair with the tutor and allows a reassuring presence during the shutdown of each machine and the use of the others. This implements a process of progressive circulation, through the pooling of the logic of job rotation (as we verified in diagram 20).

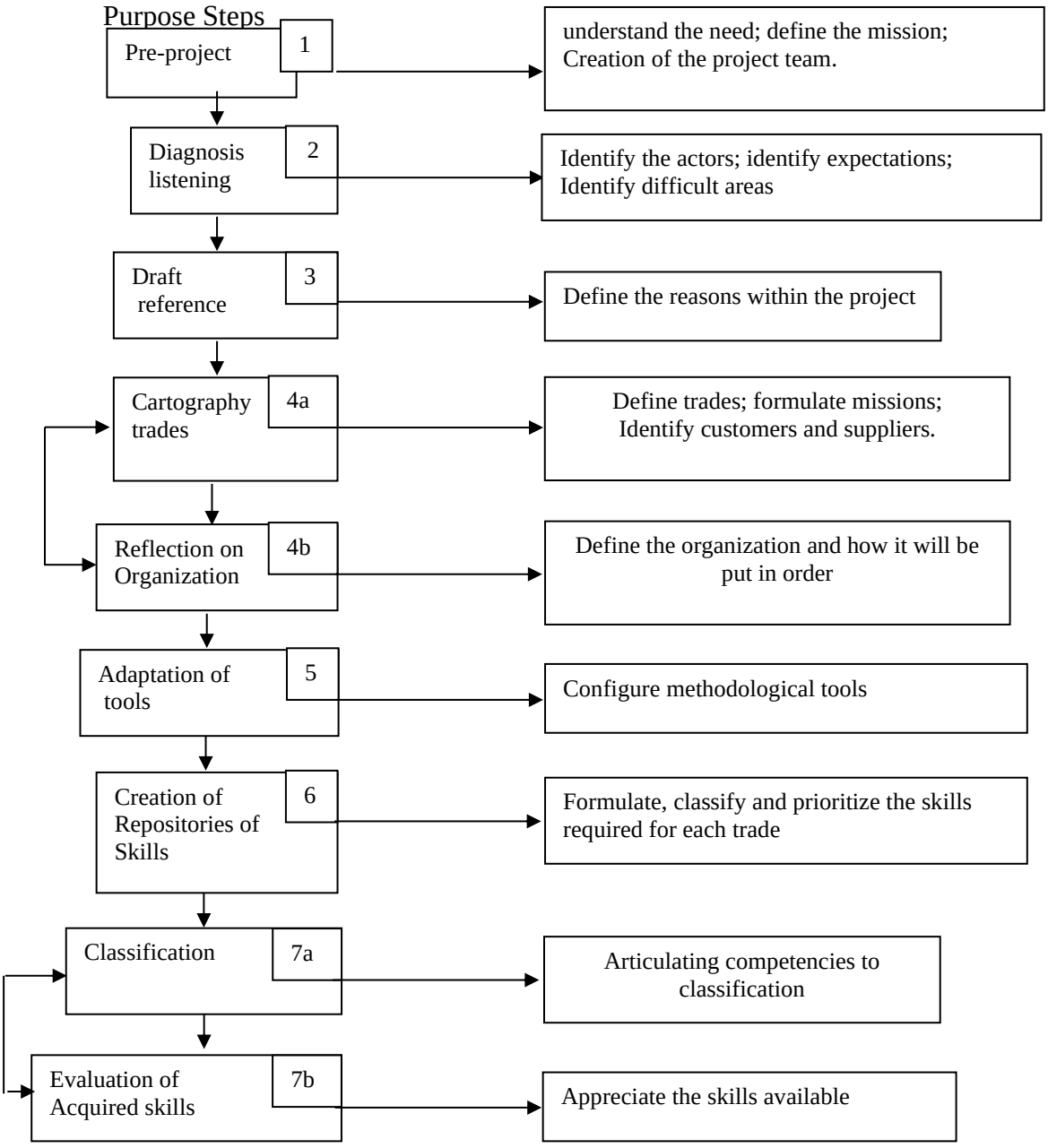
Figure 23: Pathways to technological change



Source: Renault dossier 1997 – Revue Actualité de la formation

The control of the process in different sectors (see diagram 21) requires optimizing the technical skills of maintenance and manufacturing operations especially, to be able to further improve the flexibility and responsiveness of the company. For this, steps were developed of a methodological approach to understand how to establish competency frameworks in EUTs. Each axis corresponds to the conduct and information to be processed by the enterprise (RNRU, 1997).

Figure 24: The methodological approach



Source: Dossier Renault, 1995 - Revue Actualité de la formation

SUMMARY OF SECTION 2.2

The analysis of skills at the company concerns first of all, its internal environment and the competitive advantages it provides.

Skills are transformed and built in part by individuals during their participation in the work process. On the other hand, know-how is defined as the set of operational capacities that workers acquire (individually or collectively) through their participation in the work process. They thus appear as conditions of production and as a vector for improving productivity.

We have found a link between learning and the dynamics of skills production through Renault's experience. It has elucidated various obscure elements such as the integration of work vis-à-vis the creation of skills. Generic knowledge, in a work situation, integrates organizational dynamics through a collective dimension, at the same time as it generates particular rules in organizational terms. At Renault, the goal has been to build new knowledge by taking advantage of existing potential and looking for others, recreating old ways and creating others.

SUMMARY OF CHAPTER 2

In this chapter we have highlighted the technical and organizational changes and the company's network of competences in a quest for structural coherence. This allowed us to deliver a series of proposals relating to the emergence of the firm's performance, beyond the limits of the internal learning network.

The plurality of conditions and objectives channelled by Renault puts it forward in the automotive industry. The company wants to decentralize, from its model of autonomous units, while maintaining the benefits of optimizing its staff. For this, a pool of new technologies is à la carte, facilitating the performance of EUTs. One danger, however, is likely to make the dynamics of learning non-optimal: *imperfect information within the EUTs and the enlargement of its internal market*. This scenario leads Renault to play the role of trainer, capturing new knowledge, especially since it regulates professional mobilization according to the needs of the units.

Let's look at some points in the issue of the competences of EUTs:

- Information technologies that promote the performance of the actors in question;
- Combinations of training to the needs of institutionalized groups and difficult training groups;
- Internal knowledge and redistribution of imperfect techniques;
- project-based skills development;
- Minimization of time/technology/man-to-man transfers;
- Strong specificity of external learning translation equipment and support.

In this chapter we have retained as important in Renault's current behaviour the transformation of skills through the commitment of a new knowledge base, ensure the development of technological innovations.

CHAPTER III

3 Organization of the firm's production system: definition of the information network - circulation

"It is quite logical, when approaching a new land, to start to try to establish a topography. Such an approach is particularly necessary in the case of the economics of organizations, first for conceptual reasons: the notion of organization and, secondly, for empirical reasons: the analysis of economic phenomena has, in fact, singularly privileged the study of markets and their mechanisms, to the detriment of the organizational component" (Menard, 1990, p.11).

One of the nuances that we want to present here refers to the organization as a place of decision that is obliged, by internal changes and also of the market, to modify the relations between the participants, made of authority, hierarchy, and control.

The new perspective opened by the theories of organization has a specificity based on learning capacities: a place where knowledge has been produced, capitalized, and transformed: autonomous islands. To explain the organization in this logic, we present the evolution of the nature of the firm from its productive characteristics. New information technologies (I.T.) are the hallmark of this understanding.

I.T. is at the heart of this debate to better understand the functioning of production through the majority of activities directly related to organizational change. Its introduction makes it possible to orient the organization toward the production of knowledge relevant to the firm's challenges. This implies the emergence of new notions of training values. In particular, we recall here the production of knowledge on flows (productivity guided by automated systems) comprising a micro-system of technical knowledge.

The analysis of the company allows us to understand a space of exchange and management of complex information. Technological innovation introduces a diversity of new knowledge, as well as skills that guide a new industrial organization.

The modifications of the operators' tasks resulted from this new industrial organization finalizing a technological breakthrough. This disruption results in identifying the time left in the face of production hazards (reducing operating costs). Two fields of research are priorities. On the one hand, the understanding of the emergence of the firm (sec. 3.2). In these terms, the evolutionary approach to technical change develops from the construction of a specific theory of the firm. On the other hand, evolutionary tools are also mobilized by the behavioral analysis of the same.

We will try to explain Renault's flexible integrated factory model (chapter 2, sec2.2) as a new "organizational apparatus" to solve problems related to the quality of the final process and the quality of hierarchical relationships. The introduction of this tool concerns training by questioning hierarchical levels to increase the degree of instrumental rationality (objectives/results/means) and socio-technical evaluation of work acts.

From there, new autonomous methods of management appeared: operational units and elementary technological units. The business units are grouped by homogeneous products (and no longer by homogeneous manufacturing process) and consist of two technologically dominant poles: the production engineering division and the production division. The production engineering division consists of four functions: 1) the improvement of the manufacturing process by line technologists; 2) the improvement of working methods through the definition of the product and procedures; 3) the reunification within the production division of two hitherto distinct functions, operations management and 4) materials management.

3.1 The Technology Regime and New Flexible Production Models

3.1.1 Introduction

"The description of the interaction between supply and demand in the traditional industrial process is capable of reorganizing the productive apparatus so as to better harmonize the situation of differentiation which leads to a problem of efficiency comparing the old (rigid) technology with the present (flexible) regime" (FREEMAN et al., 1982, p.261). Thus, the organization promotes adjustments, at the first level concerns investment, production and employment. This consists in designing rules for the circulation, processing and presentation of information in such a way as to enable economic agents to maximize their individual objective function and to ensure a certain consistency with competition (Brousseau, 1993, p.48).

In this section, we wish to present the thesis of the economy of flexibility or economy of ranges resulting from the process of technological innovation. The flexible organization leads the modification of management criteria in the company and at the same time takes up the fundamental principles of economy of scale privileging the criterion of adequacy as the response of the market to the criterion of economic efficiency. From this, we draw three crucial elements:

Flexibility in the use of equipment of the organization, people and the search for minimum cost during variations in quantity and volume;

Reduction of indirect costs, in particular those of redefining internal classification:

The search for the total productivity of companies in the effort to make work more productive.

3.1.2 Organization – a definition

Theorists in general call formal organizations systems of coordinated actions between individuals and groups whose preferences, information, interests and knowledge differ. The various theories describe the triple conflict between interfirm cooperation. and the coordination of efforts, as a basis for the state of the art of the organization (MENARD, 1990).

Organization therefore refers to the planning of one's own individual activity or of general activity, for example by organizing the circulation of information within the enterprise and also work, as a function of priority knowledge (STANKIEWICZ et al., 1998, p. 140).

The firm-institution concept, formulated by Chandler (1989, p. 92), is at the heart of the organization. We have summarized its actions in two axes that will follow our study: 1) the consideration of the social dimensions (as an expression of the legal and juridical system in which it is inserted and which poses limits to its activity) and 2) the search for a historical perspective of the organizational forms of which it is the seat of the process of evolution.

They place the firm and its modes of organization in a social, legal and political context that includes in a central way the systems of property rights, and, more broadly, all the rules, conventions and systems of sanctions historically constituted that underpin the modes of relations between agents.

The organization is thus constituted in two alternative forms of coordination: one by administrative coordination and the other by "hierarchy". From there we found a major implication that restores the firm and its modes of organization in a more global social, legal and political context, which centrally includes property rights systems and also technology.

3.1.3 The opposition of the modern firm to the neoclassical firm

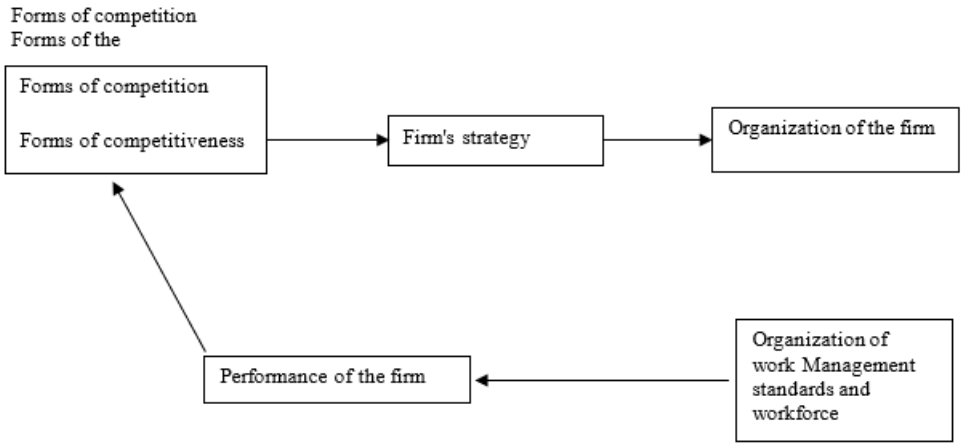
In the past, the idea of organization linked to neoclassical theory argued that the volume of production made it possible to reduce part of fixed costs and unit variable costs, stimulating technological investments and nationalization ratios (towards task analysis, improvement of methods). The large modern firm, managed on the basis of these economic criteria, generates a streamlined organization, where procedures, functions, services, and control mechanisms are located. In this spirit, the set of events is linked to the accession of flexibility economy.

3.1.4 Classic definition of firm

Industrial economics has analysed industry in the form of the triptych: structure/strategy/performance. This reading grid has the advantage of placing the heterogeneity of the firm as an object of study (see Figure 22). In addition, it makes it possible to approach the

company from the perspective of organizational diversity and to propel it to a strategic role with regard to reliable structures (those leading in the market). This triptych made us perceive the action of the firm in a particular analysis, each element of which would follow over time. It promotes trivial effects in its specific market, drawing structures and generating results. This way of conceiving the firm, as a set of rational and analytical decisions, can be nuanced. In our opinion, the firm is certainly in a position to analyze its reality (economic and social) but this continually calls it into question. According to DOSI (1998) "the firm never ceases to modify and transform", which is why the system of norms and rules, which gives it support, is placed back at the center of its concerns. It seems that in this analysis the important idea is the interweaving between relationships, behaviors subject to phenomena instituted outside the firm and complex relationships that escape the decision-making power of the organizational unit.

Figure 25: Standard review of firm dynamics



Source: based on GREE (1995)

The firm being a place of production and accumulation of reSources is essentially subject to constraints of capacities and skills. The latter are specific to the organizational changes adopted, stemming from its technological development trajectory (DOSI et al., 1991). "Fundamentally the firm is defined for its ability to coordinate economic activity and its organization as a response to the environment, making optimal use of all reSources for the purpose of maximizing profits" (Penrose, 1963, p.78).[57]

These reSources are the skills considered as specific assets of the firm and no longer simply as a cost. One of the factors in the production of skills is Continuing Vocational Training – CVT, as

[57] PENROSE (1963) "Fondamentally , The firm is defined by the aptitude of its managers to coordinate activity ans to organize its growth in reponse to the environnement and these talents are never universally optimized".

an endogenous process for the creation and acquisition of knowledge. Skills are linked to path dependency[58] based on the idea of rationality (whose past makes the future learn).

Thus, the firm is defined as innovative, as in the Schumpeterian idea, subject to ex-ante irreversibilities and limited by ex-post irreversibilities (STANKIEWICZ, 1988, p.162).

3.1.5 The role of new technologies in sectoral dynamics – an evolutionary vision

Traditional economic analysis separates the field of economics from that of technology. It reduces the problem of technical progress to the comparison between fully constituted technological states (constituting the state of the art technology), and the growth regimes associated with them, ignoring, however, the process by which a new productive capacity is constituted.

Evolutionary theory since Nelson & WINTER (1982), from a broader bias, conceives the notion of flexibility economy as the expression of a regular regime of growth, in sequence of imbalances generating structural transformations (essentially market structures).

The technological trajectory is therefore considered as a succession of minor innovations, driven by economic strategies capable of answering questions arising from demand or supply constraints (technical constraints set a priori by the limits of technological potential[59] [GAFFARD (1989) in COHENDET & LLERENNA (P.259)].

The emergence of new technologies or so-called flexible technologies are, in terms of technological innovations, based on the scale of micro and macroeconomic results that go hand in hand with the tools mobilized by autonomy and changes in operating methods and more precisely at the heart of a management model used.

Over time, organizational and technological innovations often lead to the rigorous standardization and codification of previously informal procedures in order to ensure greater transparency and communication between functional units. LINHART (1994) points to a correlation between technological change and organizational change characterized by conjunction of technological innovations, i.e. those that end up broadening the sectoral dynamics of firms and the versatility of working methods.

[58] This goes hand in hand with the idthat men at work participate in the production of irreversibility – they possess certain know-how skills strongly idiosyncrasies) DOSI (1990 p.151).
[59] Evolutionary theory suggests that the profile of evolution may be foDetermined by constraints, i.e. by the intrinsic nature of the technology that is being developed. GAFFARD (1989) in COHENDET & LLARENNA (p.259).

3.1.6 The influence of research

Research plays an essential indirect role as an instrument of barrier to entry. Through technological innovations the firm is supposed to choose the parameters of productive performance, such as: average cost function, minimum efficient size, minimum unit cost in strategic terms of decision elements such as investment decisions.

In this regard, the microeconomic theory of financial intermediaries develops the thesis of incomplete information and information asymmetries between lenders and borrowers. In this context, a new element emerges: the flexibility of investment behaviour against the adjustment of goods markets. Within investments, a crucial element appears in the organization of firms: skills. These are characterized by the volume of investment in equipment, with a view to flexible factor productivity systems (computers, peripherals, signal processing, restructuring of personnel management) generating a dynamic of modernization of capital formation in equipment (capital/man/machine). As a result, innovation interacts directly and indirectly as a powerful out-put on the entire productive investment.

To try to explain the circle of interaction of innovation, in productive activity, we must first analyze the virtuous circle. It seems that the virtuous circle of investment and growth are inscribed, a priori, in an intense logic of innovation[60]. However, the embodied innovation of real investment stocks propels growth as a natural trend in productivity, all the more so since it provokes an effective implementation of the dynamic sequences between development policy and investment financing.

In Table 14, we have the example of Renault showing an evolution in its cash flow leading to significant expenditure on R & D. This explains why the company extends its virtuous circle throughout its three years presented, even if there are significant fluctuations.

In short, a nuance of the subject "innovation versus organization" is its multifactorial character, because capital and labor are seen in the same decentralization grid, noting the principle of separation of activities. In this terms, effective demand and flexibility of investment behaviour, propelling to sustainable accelerations of labour productivity in the light of multifactor productivity. In this context, these accelerations cannot be envisaged without the existence of a considerable dynamic of final demand.

[60] As an explanation for this, the only way to justify it would be to assume a Continued decline – relative to total value added – either in the interest burden, or in the pressure on the wage bill, or in capital consumption (i.e. a fall in the relative price of capital goods and in particular information processing systems, or an increased leverage effect).

Table 13: Cash Flows

(CHF million)	Self-financing capacity	Reduced working capital requirements	Increase in sales financing receivables	Research and development expenditure	Flows/ Investments	Contribution/ Shareholders	Dividends paid	Net change in borrowings	Flow/ funding
1996	6.918	2.819	1.312	1.187	13.321	168	814	2.696	2050
1997	13.804	3.940	6.103	926	9.292	483	121	243	605
1998	20.321	9.503	8.524	950	11.577	182	1.044	11.759	12.621

Source: Renault Financial Balance Sheet (in millions of dollars)
(i) The contribution to turnover in 1997 was 34,520 million based on structure and methods;
(ii) Significant self-financing capacity has increased, leading to considerable investment in research and development;
(iii) Investments, for example, in the renewal of product ranges.

3.1.7 Opportunity costs and sectoral flexibility

The organizational regime has as its characteristic a particular dynamic that defines the role of economies of scale. This dynamic defines a high growth in production explaining the fluctuations of the virtuous circle of markets.

According to GAFFARD (1989, p. 135) "economies of scale are, in fact, the real Source of growth insofar as they are the key to a vicious and virtuous circle between productivity gains and market extension".

Increasing the scale of a production leads to productivity gains and lower unit costs per product concerned, but also for other products (income effect), which, in turn, makes possible a further increase in scale leading to further productivity gains relative to productivity and demand. However, economies of scale can become an elastic factor, i.e. as a component of market growth, which can cause fluctuations.

In this respect, a regime resulting from fluctuating endogenous growth is strictly linked to a regime operated by an economy of varieties, in other words an association with the new so-called flexible technologies[61]. This reacted as an objective, fast and simultaneous response, allowing to produce a variety of flexibility in terms of products (or multiple characteristics, reorienting the technological watch). The most remarkable features of this growth regime are the variety economy considering the intrinsic nature of technology. This suggests an effective stability in the growth of economies of scale resulting from economies of variety and decreasing sunk-costs. Price elasticity, on the other hand, leads to a strong pressure towards the variety of supply and consequently towards the choice of demand. Therefore, the reorganization of production demonstrates a decrease in unit

[61] Growth regimes obey the same fundamental principle ... Growth lies in the sequence of productivity gains and falling prices –extmarket awareness. With regard to flexible systems, productivity gains are achieved without taking into account the ability to react to different degrees of differentiation of a product or variety of products (Boyer & Coriat 1986);

costs (consequence of the flexible regime associated with gains in scale) and production without disrupting the routine of production.

The key element of this debate is therefore technology. It conceals in the various scales of organizational change and not only in technological change. A kind of distribution of the network of computers and machines gives the work codes, in the new order of management. Flexibility becomes, implicitly, a limited response to the needs of installed information systems[62]

Innovation is the prerequisite for a flexible and rational system, from which it becomes the result. The flexible economy is therefore expressed by another concept, that of flexibility of initiative; ending to be the challenge of a progressive widening of the range of solutions and productive problems, with a view to creating a productive capacity (generation of new learning concept).

Flexibility, in its entirety, means the challenges of the environment, as they can be apprehended in terms of availability, reSources and articulations between productive phases or between agents. It thus reveals a capacity to integrate and integrate (one of the definitions of EUTs) that is constantly changing, constituting the Source of technology creation becoming an essential component of the production process. Such integration into the firm's environment makes this process a sequence of phases articulated in time. Moreover, this kind of flexibility makes the reSources involved, in each process, specific to that process. In addition, skills become collective while remaining individual in terms of knowledge production[63]. This includes the idea of a collective integration of knowledge that promotes the development of the learning process.

This process then depends less on the intrinsic nature of technical systems than on the ability to create and implement an evolutionary variety of human reSource skills and competences whose articulation is the specificity and that of the production process with which it is[64] associated. The implementation of skills in production allows a specific learning, stabilized by the process of change implemented related to particular forms of organization and management. The mechanisms of this approach are entangled in the flow of information more horizontally than vertically. The aim is to enable the use of skills on the spot and learning by doing that embody a particular procedural rationality.

Taking into account this new concept, the link we can establish is that of the increased segmentation of markets envisaged by firms. Production is therefore less standardized, more

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62 See discussion on UETs, sec.4.1, chap. 4.

63 One of the principles of UETs is the resemblance of collective competences. Nevertheless, at the level of production, they remain individual.

64 According to GAFFARD (1989) this leads to the conclusion fondamental according to that which proceeds from the specificity of productive resources. It remains to assess the conditions of viability of the process of seeking this flexibility.

customized, able to satisfy diversified demand and above all react quickly to changes in market conditions. Thus, demand becomes an essential input to the production process. As a result, the required flexibility only concerns market strategies at the very moment of specification of the production process. The solution of a productive problem and its clear definition of the gradual production process requires rapid changes of direction in the research and organization of in-puts, as new developments take place.

3.1.8 Innovation Process and Formalization of Externalities

In an innovation process, exogenous technological factors are referred to as "technology push forces", i.e. factors that "push" innovation activity exerting "pressure" on economic activity in general. The technological opportunity is defined by the difficulties managed in a specific moment of the firm or by the costs related to the innovation activity in a particular technological sector. These costs vary from sector to sector with respect to the inherent characteristics of the technology and the stocks of knowledge available. In the case of automotive, depending on the level of technological complexity, technological opportunities vary by sector. Thus, technological externalities reflect the potential benefits from one sector to another.

Technological opportunity and externalities affect the cost of innovation activity, given that the appropriation of knowledge is imperfect. Thus, costs are likely to be affected by this sectoral activity (LORENZI, 1996). In the case of automobiles, the phenomena of externalities are also complementary and an increase in these externalities should lead the firm to intensify its R&D activity.

Market factors are defined as representing the factors that "pull" on innovation activity (demand push forces), i.e. the factors that exert an influence, an attraction on this activity (external markets). These factors include the behaviour of economic agents (producers and consumers) in the goods market, as well as the structure that characterizes it. A plausible element is the structure of the market, in which firms evolve, which is legitimized by the behaviour of economic agents.

3.1.9 Market specificities – international plan and innovation process

The innovations take into account the specificities of each market in each country, based on their economic situation. New technologies are intertwined with innovation resulting from a new learning process, generating skills.

The analysis of the work process, in terms of R&D, highlights certain particularities:

Processes and sub-processes that display high degrees of indeterminacy and inactivity, in turn, require organizational units with a high level of flexibility and creativity ("high-commitment organizational units") as well as the development of professional roles with a high level of expertise and inventiveness (new professions);

The existence of a series of first-degree variants (disturbances) and structural alterations that modify the pattern of planned activities and generate different control and regulation circuits, thus requiring and producing various types of organization;

In order to absorb disturbances and structural alterations, the control adopted makes use of the organisational characteristics and operating procedures used, assimilating the common variants: 1) exercise of responsibility; 2) use of local memory, timeliness of adaptation of reSources and programs. It also uses different organizational characteristics and operating modalities (interactive input training (define), two-way communications, joint advice and decisions on high-ranking processes, self-control authority at the lowest level, and a way of working with a high degree of cooperation, organizational units and roles operating in a more self-regulating structure);

The content of the work and the professional mode can and must therefore integrate not only the technical realization of a more or less uncertain or innovative process, and the corresponding technical expertise, but also the contribution to the coordination and preservation of the subsystem of a broader expertise (technical knowledge and organizational competence).

New systems of production on employment aimed at replacing human labor by technical processes. Other issues addressed related to the definition of work, working conditions, skills and work organisation. The way in which this theme is described and evaluated, calls into question some plausible responses involved as significant variables in the relationship between organisation/work and new technologies:

a - The diffusion of new information technologies is unevenly distributed within the productive sectors, in the functions of the enterprise and in the various phases of development. The harmonization of new technologies, organization and the social system is not reduced to a simple laboratory experiment, but results from the implementation of complex processes of reality assessment, learning and adjustment;

b - New technologies are the common thread of intelligent functions combined with innovation.

Finally, the direction of innovation is new and temporarily at least, more dynamic. It can be oriented towards two axes: the first, the day-to-day operation of the production system – the workshops and all the related service – as a small innovation, or as an improvement. This small improvement can produce very powerful effects and transform the way employees look at their daily

work. The second axis is linked to the idea of verticalized competence where cooperation is not limited to the workshop and to the services traditionally invested with the power to design and make innovation. Horizontality should then encompass verticality, seen as an emergence of the global space of production. In this case we are talking about the great innovation or differential innovation, that is to say that achieved by the renewal of products and the process of investments in which new technologies are involved.

3.1.10 Economic agents and the organisation of flexible markets

In this point we insist on the idea that economic agents assimilate and dispose of defined goods-functions, at the same time as they apply themselves to a particular objective-function in accordance with market competition. The auctioneer duo has resulted in a new approach that looks like the competition. Flexibility is therefore seen as the ability that economic agents have towards competition. Three elements emerge from this discussion:

The usual "technological" constraints represented by the production function;

"Institutional or legal constraints" whose main purpose is to avoid unlimited speculation and more to ensure that economic agents have a fair and logical dynamic;

Constraints at the level of transitions (rationing insufficient outlets), particularly important when we are interested in situations of risk or balance.

3.1.11 Integration – the key to industrial change

Integration here is presented as "technical integration" where the technical elements are separated into the same assembly or device. This evokes a multiplicitude of operations of transformation of the production-circulation network. In other words, it can be prolonged in a "compaction of production phases" especially those of processing, by eliminating certain discontinuities. This is the idea of splitting refining in the automotive industry with the aim of increasing a rationality and a particular technical performance of important phases.

This integration takes the form either of direct interweaving of the technical elements in the same device which takes the object of work and ensures the unfolding of a plurality of operations, or for an indirect interweaving, carried by the circulation of the object of work between several devices which succeed each other through forms of integration allowing to delimit the "reaction zones" targeting a more global rationality (ZARIFIAN, & HOTEL, 1990.)

At Renault, the development of electronics opens up new investment prospects for the company. The regulatory accompaniment of this technological evolution is reflected in the

progressive definition of new safety requirements, in particular concerning braking systems and vehicle behaviour.

The years 1996, 1997, 1998 were characterized by the pursuit of profitable growth strategies, divided into three axes: innovation, competitiveness, and internalization. This strategy has enabled Renault to be a major player in automotive development in France. It is an approach of four million vehicles by 2010, half of them outside Western Europe.

Efficiency and industrial responsiveness are gaining space at Renault. The process of rationalization and simplification of its industrial apparatus, made as a general principle the assignment of the plant in a single segment of vehicles. After the establishment of a single high-end platform in Soudeville in the year 2000, two products will be produced simultaneously: Twingo and Clio II on two different assembly lines.

This industrial scheme is thus consistent with Renault's range plan and platform architecture. Renault's three vehicle assembly plants in France: will accommodate the three platforms of the range: high-end, mid-range, and lower segment. With the agreements on flexibility and the organization of working time in the group's factories, the production imperative is shifting to three shifts for bodywork-assembly sites, and weekend shifts for mechanical sites.

With regard to research and development, Renault seeks maximum efficiency and a global dimension of integration. In the field of equipment manufacturing, the company partners with NTN, a Japanese company, to ensure the sustainability and development of joint transmission actions, located at the Le Mans plant.

3.3 Training for innovations

3.3.1 Introduction

In the early 70s, automation meant new machines and processes. At the end of the 70s, the innovations were essentially a response to union pressure. During the 80s, allowed a flexibilization of production, interpreted here as the ability to respond quickly to variations in demand, thus facing competition (GERPISA, 1994).

The development of microelectronics, immediately transferred, in computer technology, allowed the emergence of manufacturing. It is the automation of all the functions of the company (machines, processes, etc.). Undoubtedly, the circulation of manufactured parts and products (transitory), the design of products and manufacturing methods, the management of production units, and the exchange of information between these different functions. Innovations with regard to

technical-organizational changes thus reveal two distinct and successive logics: flexibility and versatility (FREYSSENET, 1998).

At the same time as the spread of flexible automation, automatic systems for stock management, material transport and control systems have also been developed. Very quickly, the objective shifted to the search for optimization of certain phases of the production process and the computerized integration of the entire production cycle: the C.I.M (computer integrated Manufacturing) model made it possible to connect certain computers, machine tools, robots, control terminals, televisions to management and distribution systems.

3.3.2 Technological innovation: a path to organizational change based on new training

Technological innovation, especially in high-tech sectors such as the automotive industry, has had quite significant effects in terms of the hierarchical coordination and the organization of work itself.

Two opposite or apparently contradictory effects were generated by the pair: computerization – automation. The first, a tendency towards the decentralization of technical responsibilities downwards in the hierarchy and, the second, the inoperity of the former function of supervising workers' tasks and know-how (FIAT, 1984).[65]

The simultaneous organization of product/production design, which could be described as "systemic", through the pooling of complementary technological skills, has had strong technical and economic impacts, in terms of reducing the number of components and simplifying their machining – assembly, reducing direct labor and reducing manufacturing time. By similarity, the automotive manufacturing process includes fully automated machining, assembly and change operations and handling of raw components, as well as computerized quality control operations (in process, "on line", "off live") (control and management of production ensured by a central computer system). By excluding social relations from hierarchical coordination and work organization, the firm has pursued through this technological organization of production the ideal of a cybernetic system (PERRIAUX, 1998, p. 167).

On the qualitative side, technological innovations have represented a broadening of skills and a spirit of solidarity. The dominant characteristic, in a measure of technological innovation, remains an elastic hierarchy of work organization, where groups of actors coexist by type of professionalization, activity, salary and often management[66].

[65] FIAT Report, presented at the International Symposium on Automobile Network – GERPISA, 1984.
[66] F. MANA and T. VALVO (1985) thus define two occupational profiles: LAS production operators ("Lavoratori a Alta Specializzazionze") with residual processing-handling tasks; LAP ("Lavoratori a Alta Professionalità") operators who

Renault's "integrated factory" model, through its new "organizational apparatus", makes it possible to solve problems related to the quality of the process and the quality of hierarchical relationships. This introduces a new concept concerning training, each hierarchical level of which makes it possible to increase its own degrees of instrumental rationality (objectives/results/means) and socio-technical evaluation of work acts. From there, a new derivation emerged: operational units and basic technological units. The business units are grouped by homogeneous product (and no longer by homogeneous manufacturing process) consisting of two technologically dominant poles: the production engineering division **and** the production division. The production engineering division has four functions: 1) improvement of the manufacturing process by line technologists; 2) the improvement of working methods through the definition of the product and procedures. Reunification within the production division has two distinct functions: operations management and materials management. The latter aims to streamline the dissemination of information and make manufacturing choices more appropriate[67].

The content of this vertical and horizontal cooperation extends to continuing training (professional capacities and quality improvement methodologies) and informational actions/feedback. The EUT model describes the flexible business model below.

3.3.3 Industrial training logics

The highlighting of a plurality of training logics at Renault goes against the current discourse of the "new company". Market transformations and technological (re)developments should lead to increased attention to the skills and training of basic workers. The reality is more complex because there is a great diversity of the productive fabric and the paths of modernization (MAROY, 1996, p. 35).

According to MAROY (1996, 1998), continuing training is becoming increasingly important in a context of technological and organizational modernization. It seems to be a natural extension of it. However, the intensity and logic vary as regards the training and qualification policy of each company. In this scenario, new technologies make it possible to streamline the management and organization of production. In the case of Renault, we have observed that the search for flexibility, or even the diffusion of increased integration of the production process combined with the development of an industrial quality policy, sets up an organizational development targeting the requalification of actors. Thus, training is made up of different logics which emerge by observing the articulation of the

must possess a wide range of technical-scientific knowledge and an ability to manage their freedom of action and a high level of productivity. C.R FIAT (1984)

[67] Case of assembly of the Renault plant 1984, billancourt

different aspects of the training practices observed: function (hierarchical level), content, forms of transmission, effort and selectivity, degree of institutionalization.

Taking up MAROY (1996, p.37) "the function of training is a reactive optimization and can lead to one-off results, in a case of minor technical change such as that of a planned optimization". In the first case, minor changes are perceived neither as a rupture that "revolutionizes" the ways of producing, nor as a recurrence whose consequences must be managed or anticipated. The training implemented aims to solve two types of problems: adapting workers to changes in tasks, following changes in machines, product or market developments and, on the other hand, to face problems of assignment or recruitment of labor on functions to be powered. It is then implemented to overcome these difficulties with the concern to restore as quickly as possible the conditions for an optimization of the production process. Training is therefore conceived as a form of adaptation of men to changes in functions or tasks in a search for quality content and flexibility[6869]. In the second case, it also guarantees important procedures and rearrangements, including the spatial separation of the work process, as the cause of malfunctions during the work process.

In a perspective of planned optimization, this implies a change in mobilizations in the content of the request (strategic aspect of the planning put in place). Training, in this spirit, links technique and knowledge as organizational bases. In the case of Renault, training ensures the hierarchical process (of a flexible nature) that is modulated according to the techniques adopted[70]. The strategic nature of workforce adaptation is therefore perceived as a change in professionalism induced by new equipment. It considerably accentuates the stakes of the interventions of the actors, while transforming the nature of the tasks. The addition of technological innovations, new modes of control of the production process, creation of functions, renewal of the workforce, etc. may lead to a continuous evolution of the changes to which the production process is subject. In this case, continuing training, as a particularity of training, is conditioned to technical changes which are distinguished according to the continuity of these same changes. In our opinion, training is based on the change made, i.e. technical change. In other words, training accompanies organizational or

[68] In the case of training with regard to reactive optimization, two problems are proposed to be solved: adapting workers to changes in tasks following changes in machines, product or market changes and, on the other hand, facing problems of allocation or recruitment of labour on functions to be able (MAROY, pp. 40, 199).

[69] In this context, the logic of continuing training for workers in the fabric of the automotive sector remains ad hoc and selective. Responsibility for production appears individually as a kind of apostle of training, continuing training appears when the company has to accompany a change of machines or changes in product specifications.

[70] Training by planning theoretical training is organized in such a way as to appropriate the operation of the new equipment. In the case of automobiles, the main feature is to be reversed from the technical change in progress. This underlines the rupture, the event that change represents, not only in itself, but from the point of view of its consequences on the conditions for obtaining the results of production, which in this sector are defined in terms of time.

technical changes caused by technical developments and essentially generates a dissemination of knowledge.

3.3.4 Investments in new technologies

Investments in "new technologies" represented nearly 24 billion francs in 95, in French companies. They are mainly used for the automation of manufacturing activities and the computerization of production management, as we can see through Table 15. This penetration of advanced production technologies is mainly achieved through the implementation of technological devices and systems.

3.3.5 Technologies in the daily life of the company – the case of Renault

In the manufacturing function itself, the identified technologies may represent alternative solutions. In the case of automobiles, some suppliers report using one technology and others using two technologies, as is the case with Renault (CCFA, 1998). Production technologies penetrate and computerize the related functions of manufacturing, mainly those of production management operations (32%). Design and communication functions remain behind with penetration rates of around 20%. The most used are particularly the information technology of inventory management and supply.

According to the Sessi survey on technological innovations, the automobile is emerging as one of the highly automated and computerized sectors. It produces strong returns to scale by series length with a skilled workforce at high wages.

Table 14: Technological Innovation in Sectors

	% of industrial enterprises			% of industrial turnover		
				Technologically innovative products		
	innovative in product	Innovative in process	innovative in product or process		of which new	of which improved
Clothing, leather, miscellaneous industries	11,3	11,4	17	5,5	2,9	2,6
Publishing, printing, reproduction	14,9	22	25,9	8,8	3,6	5,1
Pharmacy, perfumery, maintenance Home equipment industry	53	39	55,6	13,6	6,7	6,8
automobile industry	36,7	27,2	40,9	33,5	13,7	19,7
Const. naval, aeronautics, railways Mechanical equipment	**44,2**	**38,3**	**46,7**	**27,6**	**13,3**	**14,3**
Equipment assets. Electronic-electronic	**43,4**	**35,3**	**48,5**	**34,2**	**12,3**	**22**

Mineral products industry textile industry Chemistry, rubber, plastic Metallurgy and metal processing Ind. of electronic-electronic compos Total manufacturing industry	39,7	30,1	44	23,1	8,6	14,5
	56	**51**	**64**	**46,2**	**23,2**	**23**
	33,4	23,6	40,6	12,2	41	81
	34,5	32,9	40,9	15,5	5,6	9,9
	52,4	38,2	57,7	26	11,6	14,4
	26,1	47,6	58,2	28,8	11,4	17,5
	50,7	47,6	58,2	28,8	11,4	17,5
	34,3	29,4	40,8	23,1	10	13,1

Source: Sessi, April/1998

According to Table 16**, the most considered motivations,** the flexibility of production makes the differentiation and renewal of products.

Table 15: most considered motivations

Importance of the objective	**Zero**	**weak**	**Medium**	**strong**
Replace obsolete products	34,1	18,1	24,2	23,6
Improve product quality	11,2	7,6	31	50,2
Expanding the product range	12	10,1	28,1	49,7
Conquer.nouv;markets or accr. market share	10,2	6,4	25,7	57,8
Reducing environmental damage	43,9	23,7	20,5	11,8
Meets legisl., reglem., norms, standards	32,3	17,9	27,3	22,5
Giving more flexibility to production	28,6	20,7	30,4	20,3
Reduce labour costs per unit of output	29,7	19,9	27,6	22,7
Reduce material consumption	33,1	24,8	24,5	17,6

Source: Sessi /1997

Innovation is therefore a decisive factor in the performance and competitiveness of companies. It is the result of a complex process as demonstrated by the automobile (Table 17). The mobility of the success factors of innovation are at the work of the skills of the company, which turns out to perform a number of productive actions profitable in terms of organization.

Attached to the company, these skills become the sum of individual qualifications and abilities. Among the basic skills, have been grouped into 9 major skills, in the research made for the Sessi 98. According to this typology, the French automotive industry more easily mobilizes skills that highlight innovation in the overall strategy of the company, that is to say to assess the company's ability to transform. Therefore, they make it possible to manage technological innovation typically skills inside and outside itself.

Table 16: Production equipment Main statistics (1995-1997)

Information Technology	**Operational competence coefficients (%)**
Production Functions	
CAD – 2D	24,7
3D CAD	38,1
AO Engineering	12,8
Production Management function	
IT inventory and/or purchasing management	68,9
Planning of AO production needs and reSources	43,7
Scheduling of manufacturing operations and monitoring of AO production	52,6
MAO & GMAO	21,8
Manufacturing function	
Technical Data Management System	51,8
Local network at the manufacturing floor level	31,1
enterprise-level LANs	41,8
Long distance communication network	41
Manufacturing function	
CNC machines	58,9
Automatic machines without CNC	59,7
System. Automat. control/mesre/test during fab.	39,7
Automatic manufacturing lines. (Integral of the aut elements)	31,5
robots	35,4
Process Control System	21,8
Handling function	
Automat. system change/dischargem. Mach	22,6
continuous handling systems	19,8
Automatic storage/destocking system	17,8

Source: Renault statistical archives (1995-1997)

The innovation process must, however, interact in constant renewal. However, not all product innovations are equally novel. At Renault, the period 1987-97 revealed a tendency towards recession, reducing product innovation much more sharply and intensifying in terms of process innovation. There have been favorable periods (34.3% investment in terms of product innovations in 90-92 and 26.6% in the same period in process innovation), where competitive pressure has made the company more visionary of an intermittent process of seeking new skills and new ways to innovate.

SUMMARY OF CHAPTER 3

Recent approaches describe the firm as an entity not only capable of collecting information but also of processing it. This pool of information is constituted from heterogeneous knowledge and know-how, already shaped by the actors, produced in locus or externally. A new concept is emerging in this new environment: skills. They arrive following a technical system consisting of inter-market reports, as well as the adaptation of technological innovation to the corpus of the company.

Information is put to the test in interactions between actors producing different skills. On this occasion, one question gives rise to concerns: the human apparatus disposed and their qualification. The firm, as an imperfect entity, is not necessarily in the desired format. These human reSources are therefore at the center of these questions. As a prerequisite, the definition of a professional and personal training framework is needed, in order to produce and reproduce knowledge that builds responses to the desired optimal course.

Through internal and external interactions, the company finds exchanges of information, new knowledge, which are organized by setting up a communication network related to continuing training. Gradually, knowledge is formalized generating devices that highlight the organizational design project of the Renault company, defining it as a locus of knowledge production.

In this chapter, we have made a theoretical resemblance to the survival of the firm in modern capitalism. Several are the reasons that lead him to trace his learning path, his knowledge, his available skills, finally redefining his human apparatus. We had as a hypothesis the information incorporating different types of devices (objectives, action plans, decisions, contracts, etc.), nevertheless, in our quest we discovered the firm as a locus of distribution and absorption of tacit and codified knowledge; increased skills and to be sought.

Finally, we want to conclude that the firm crystallizes and incorporates knowledge, producing innovation decisions, technology and processes in order to seek others. This crystallization of the knowledge produced, thus lies in the relationship that it itself establishes through the new firm-market links.

CHAPTER IV

4 The instruments of the new training

The organization has evolved a lot in thirty years (1960-1990), signaling an almost uniform language of training within the firm. The workshop then becomes a complex place of production, which goes beyond simple manufacturing logic. It breaks with the classic monopoly of knowledge, becoming a crucial place for the acquisition of new knowledge. In this context, new technologies are partially involved and are associated with the idea of a "smart workshop." Consequently, the latter is intertwined with transversal changes as well as with "new functional management logics" (BOYER, 1998).

The 80s and 90s put a new emphasis on workers' training. The automotive sector is one of those that have recreated innovations in terms of management. The methods of evaluating training as a qualification are capable of being reformulated since the arrival of cohabitation models (hybrid management); Implementation programs for career function estimation and cost-benefit analysis then serve as a bias to reduce the externalities of the company.

Throughout this study, we will analyze the company from two axes: the first, the implication of technical-organizational changes on the organization in cells, and the second, the evolution of the skills network.

The highlighting of these two axes has raised questions about the new emerging training, namely: the mode of formation of socio-professional groups and the qualification in autonomous cells.

In short, in this chapter, we will discuss the practices of organization in EUT. In this spirit, we see the organization as "learning" - envisioning better economic performance vis-à-vis a new concept of work.

FRAMING THE PROBLEM

Among the many training activities carried out at the heart of the Renault company, several are the difficulties concerning the arrival of new technologies. They have modified the recruitment criteria through the acquisition of knowledge, the memorization of group functions, and the understanding of new scientific parameters with the process of continuous updating of knowledge, set up in 1989.

"Vocational training" is developing within Renault, supporting the idea of industrial training. Various elements constitute this idea: one of them is the growing need for qualified actors increased by precision and technical rigor.

For a long time, the company benefited from the training programs maintained by the Renault Training School from 1930 to 1986. In this way, the company wanted to adjust its activities and bring the link between learning and production development closer together (QUENSSON, 1996, GERPISA, No. 17, 1996). After its final closure in 1989, the reality of training became more complex. A consortium has therefore taken place: GIE between the National Education and Renault.

Human reSources have accompanied the development of the company's profitable growth. The introduction of working time arrangements has encouraged flexibility in all establishments and subsidiaries, sometimes in France (Choisy-le-Roy, Cléon, Douai, Flins, Sandouville, MCA, SOVAB) and sometimes abroad (FASA – Spain, Brazil, Mexico). These mechanisms have also made it possible to improve responsiveness (cyclical, staggered schedules, part-time, time capital, etc.) to better meet commercial demand, increase plant uptime and reduce development times and manufacturing costs.

A NEW ERA IN THE COMPANY

The training plan in 1996 aimed to strengthen the adequacy of human reSources to the needs of the company, linked in particular to the objectives of cost reduction and growth, to meet the aspirations of the staff. However, particular emphasis is placed on the preparation of retraining and mobility, as well as the implementation of the Training Time Capital (CTF). The latter makes it possible to reconcile training projects specific to agents and the development of the skills necessary for the company (François Foix, 1998).

To do this, 2 million hours were devoted to training, or 43 hours on average per person, representing an investment of nearly 500 million francs, or 5% of the payroll.

THE PRIORITY OF THE 1998 PLAN WAS

- To strengthen the skills of the trades (36% of the hours);

- Anticipate changes by preparing for retraining and mobility (30% of hours);
- Increase management skills (13% of hours).

In addition, investments in training to learn new technologies were continued to support industrial start-ups and commercial launches. On the other hand, 7% of productive hours were earmarked for this purpose, 6% of which were for languages, as part of the intensification of the qualification of office automation.

The social plan provides for 1158 internal reclassifications and 1153 job cuts. Age measures (agreement and progressive early retirement) and an agreement to assist part-time transition are also planned.

To conclude, the use of training courses is a partial indicator of continuing training practices. It draws attention to the more formal dimension of the activity of the workshop or management through collective or individual approaches.

In this perspective, four new formative situations have been selected:

- Work-based training;
- Training in the context of workshop conferences or seminars;
- Training through job rotation;
- Investment in self-training.

OBJECTIVES OF THE CHAPTER

We will focus our study on four questions that we hope to answer in this chapter:

- How has the training strategy been placed since the arrival of EUTs?
- What changes have resulted from the articulation between versatility and polyfunctionality in EUTs?
- What are the current pedagogical training mechanisms?

These questions go hand in hand with the layout of the sections, which we organize as follows: in section 4.1, we will present an overview of the methods of exploitation of the knowledge produced in the company. The competencies related to the implementation of the recruited training and the arrangements according to the election of new criteria will be dealt with in section 4.2. An assessment of the current training framework and the evolution of investments at the same level Capital-Homme will be presented in 4.3.

4.1 New knowledge and the evolution of new forms of organisation in the Renault company

4.1.1 Introduction

The competitive universe of which the automobile is part imputes certain rules that will become the standards of those who want to be among the most efficient. Renault's ambition is to be the automotive leader in Europe. Organizational changes concern the constant adaptation of the company, leading it to a search for new motivations for work and, to review the behavior of direct and indirectly involved agents - which constitutes an endless quest for the optimal maximization of reSources.

The main changes, which we have discussed in previous chapters, have been reflected in the appearance of matrix structures for trades/projects, organizations [71]in platforms (1992 – technical platform of Rueil-Malmaison) and, by the approach at the level of training (high-level workforce recruited and continuing training).

Three elements are then considered in the interest of this undertaking: (1) the allocation of reSources; 2) skills acquisition and 3) career management. These three elements, by way of compression, emerged following various difficult situations, to which Renault was subjected, with the aim of ensuring the matrix structures put in place and the capitalization of experiences in a concrete way. The actors function as multifunctional and versatile intervention agents reducing the difficult situations of loss of very important knowledge-past.

In this section, we will present the media used in the dissemination and motivation of skills with regard to the evolution of the management of autonomous groups leading to the appearance of EUT at Renault.

4.1.2 Renault – organizational history

Before the Second World War, the organization of work was still very close to the model of mass production (COHEN, 1995). In the workshops, workers, often former metallurgists from the Paris region, attracted by high wages in the automobile industry (FRIENDSON, 1979), work on universal machines that required professional knowledge acquired in the work activity. The Taylorist organizational principles (QUENSSON, 1996) (division and scheduling of production operations into elementary sequences, timing of tasks, remuneration of workers on the basis of measured production)

[71] the terms business/project and set/project comes from the junction of American and Japanese methods at the time of the launch of the Twingo by which the actors were associated with the design. The aim was to bring together specialists in design, process, logistics and manufacturing in one place. It was the real production upstream of production.

find technical and organizational problems (deficient production machines and tools, insufficient preparation work) attributed to the unsuitability of workers.

As such, a new partner is emerging: the Renault apprenticeship school, in a context of upheaval of know-how and restructuring of the market. A sense of identification and belonging is developed, highlighting the worker as a sine qua non actor for the company. According to the Renault archives, "the opening of the centre of synergism of knowledge has integrated on the one hand, the workers and, on the other hand, the strategic profiles expected by the new emerging organization" (RNRU, 1989).

Around the 70s, the automation process led to recognition of the field of worker qualification made available at Renault. The introduction of new technologies then considerably marks its technological progress. This transformation results in a confused reproduction of knowledge, leading the organization to countless failures. This apparent disorder leaves traces of discontinuities in production, causing a process of revision of the parameters of recruitment of labor. FRIDENSON (1979) emphasizes that at this moment the workshop no longer has the characteristic of forming, but of changing and absorbing knowledge produced outside the company. This was explained by the increase in the cost of training and the opportunity cost of employment in man/machine terms.

The technical business school has passed on some of the technical culture in the automotive industry. Throughout its existence, its vocation has been confirmed in the results obtained. The transfer of qualified personnel to other plants and the training delivered intersectorally considerably changed the configurations in which Renault's Technical School was developing.

In this regard, Renault is part of a particular approach (specific to the 80s and 90s), envisaged by a workforce that is more dynamic and rich in terms of individual (initial) knowledge and diplomas. A joint training strategy with the National Education is made. The requirement for CAP/BEP diplomas (the technical certificate or technical baccalaureates in mechanical constriction and electrical engineering) appears as a recruitment criterion.

These "hiring" criteria have also become a sign of the definition of the training framework. The attributes and expected results of the flexibility implemented, push for change based on individual growth, degrees, versatility and polyfunctionality.

From 1981 onwards, the pedagogical training project focused on preparatory training, hence the broadening of knowledge towards the specialities of electromechanics, electronics, electrical engineering and management. This reorganization reflects the internal debate around industrial training experienced in the United States and Japan, cradles of the respective models of production flexibility.

Training is then taken, in this context of maximizing productivity gains and reducing inventories, as complementary to systemic innovations. The concern was therefore to find a boost between adequate performance in terms of efficiency and training costs[72].

From this positioning, the bias taken from the training was part of an evaluation grid of the technical needs of the workshop. The recruitment of a new workforce is filtered through initial level training. This therefore reflects the career reclassification position implemented. As an example we have: the CAP which starts at the hierarchical classification level; and the technical BAC outline a "trainee technician" level (RNRU, 1989).

4.1.3 Keyelements of the new organizational path

Training as a prerequisite for performance can be understood as a technical culture; because it is situated in a situation guided by new technologies opposed to the formal technical/training relationship.

The corporate culture or its technical culture is included in the communication network (including information processing tools and the learning structure) and also in the adopted lines of technical-organizational changes. It includes, first of all, a set of facts that agents must know and the behavioral rules of the organization.

CREMER (1993, p.353) defines *organizational culture* "as basic assumptions that a given group invents, discovers or develops by learning to face its problems of external adaptation and internal integration, and which are proven to be sufficiently effective, to be validated and, by the same token, taught to new members of the organization as a correct way of perceiving, think and behave in the face of these problems".

At Renault, the organizational culture understands the workshop as the result of complementary mechanisms, based on shared knowledge and a common language, leading to two consequences: firstly, an awareness in terms of collective responsibility and, secondly, allowing agents to predict the actions of their colleagues. This last dimension is very important, since it compensates for the limited rationality of agents by facilitating the determination of possible responses.

The existence of such a culture is decisive in terms of the efficiency of the processing of information received from the environment, which the company interacts with in favour of its performance. CREMER (1993) proposes to broaden this field of analysis through the integration of

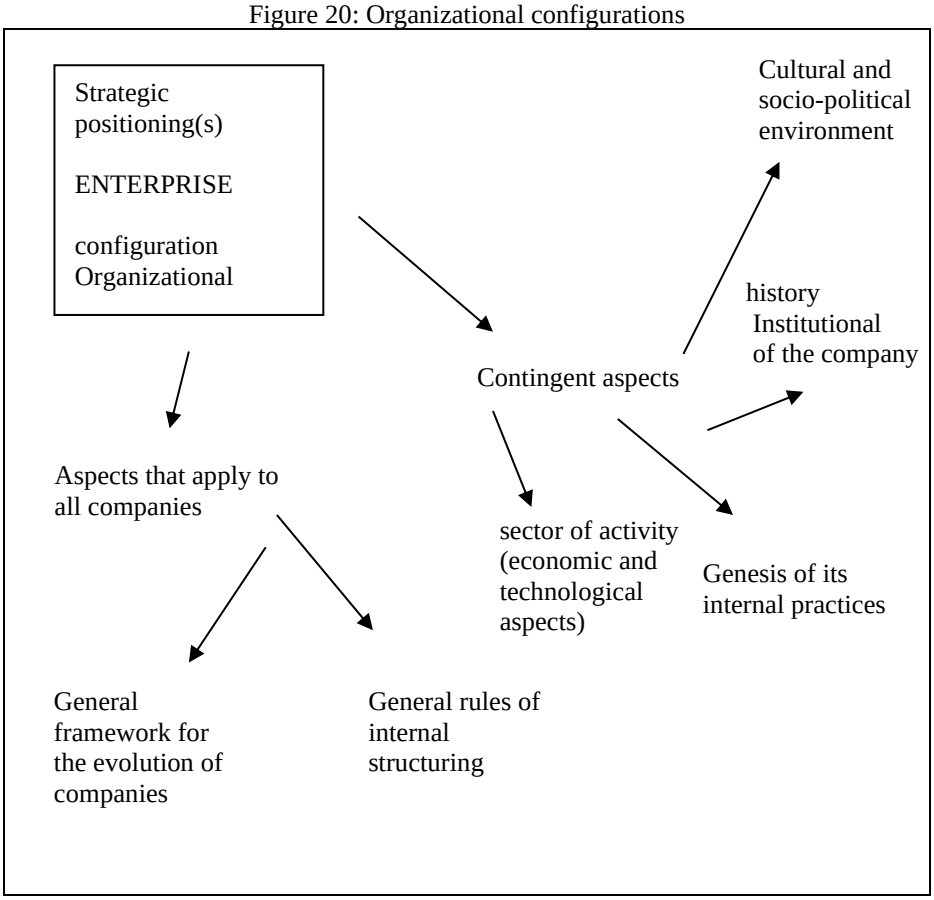
[72] cost-efficiency = Pmg t. The bias of the wage-training effect estimating the firm as a linear evaluation function Wi = axi + bDi + ei.

transversal communications. This, in his view, enhances the use and effectiveness of communications vis-à-vis sectors subordinate to those of the first rank; allowing a saving of scarce reSources insofar as the messages are standardized, as well as a saving of the costs induced by the essential successive decoding.

Renault's organizational culture requires strategic market changes and the implementation of a flexible incentive mechanism. The organization of work in cells (EUT) includes these two elements. It is defined above all for its collective dimension. The service being a place of meeting and valorization of the respective assets of the agents, allows the skills and the actors to evolve; This leads to *technical integration* – actor/machine level and actor/project to increase specific rationalities in an environment conducive to flexibility; of which the individual is seen as a flexible component.

The organizational culture of the company and the organization of work in cells, leads us to understand the new organizational configuration, integrating the networked circulation of information with a plurality of information (see figure 23).

Figure 20: Organizational configurations



Source: author made from LOUART. P. (1996)

4.1.3.1 At Renault, the provisions concerning the choice of actors are:

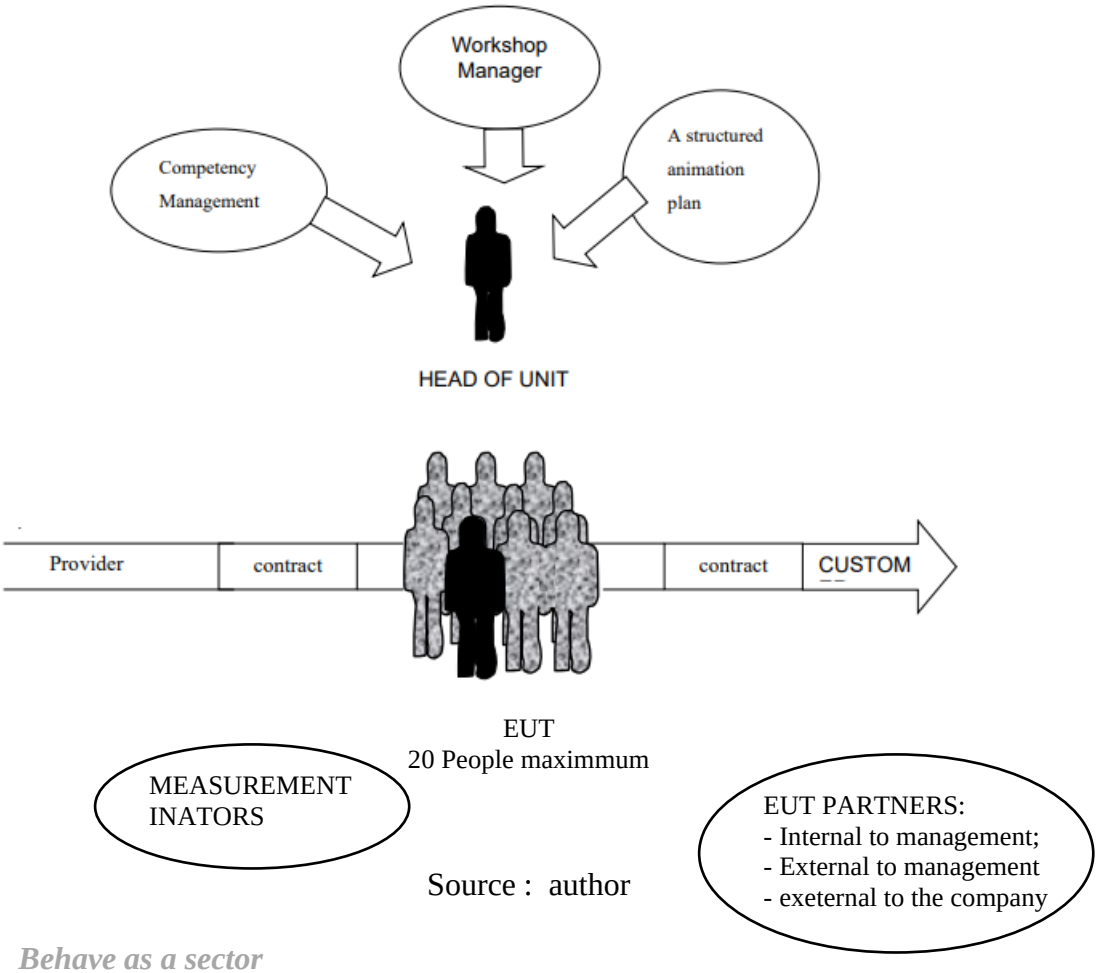
- ReSource allocation – In the context of projects, flow management and the adequacy of burdens and reSources raise questions that are sometimes difficult to resolve, both qualitatively and quantitatively. Indeed, the people working on the projects depend hierarchically on the professions. However, these are assessed in the context of several requirements: 1) the development of several projects; 2) the need to develop innovation, capitalize on experience and 3) the fluidity of staff in several projects.
- Skills acquisition – the skills required consist of placing the individuals concerned in formative work situations (in the case of project organization) on the real level. The individual is simply formed by working as a team. Then, it is necessary to organize the career paths adapted to the actors involved.
- Career management – the transition to the planned organization reveals responsibilities, capacities, especially managerial. They must be exploited from the more traditional functions. Within the missions of the career committees, Renault had to adapt its evaluation rules thus promoting performance mobility with regard to hierarchical distribution.

4.1.4 Work generating collective individual skills and the new organization

The integration of individual work into cells takes on collective dimensions by revealing functional (basic) knowledge and collective skills.

Renault's technical relationship (technical system/work) has brought sectors closer together through the capitalization of criteria and knowledge. The project has a spirit of collective training carrying within itself a heterogeneous firm model (flexible factory). This means that growth paths are heterogeneous in an environment of specific interaction "human capital" (entry of specific basic training) and "technological capital" (cumulative expenditure on research and development).

Figure 21: EUTs



Source : author

4.1.4.1 Behave as a sector

Some sectors such as assembly/assembly are attached to rigid rhythms specific to manufacturing operations. In the world of autonomous groups (EUTs), the technical basis adequately identifies a system of exchanges between suppliers and the plant and the expansion of the internal information network. The maintenance/control sector, through its proximity to manufacturing, promotes a process of hybridization of knowledge (half/half). Hybrid exchanges therefore involve the adequacy of the rhythm of production – flow of routines, as reflexive approaches of flexible (re)organization involved. A temporal release takes place towards an adjustment of the system in real time, inserting itself as an anticipation of change of range and technical device.

This process of skill generation involves three stages (MIDLER, 1995):

- The objective plan - The actors must be capable, to the point of maintaining a complex production system, allowing the resolution of problems by developing expert knowledge, which resists the evolution of the system.

- The time plan – The temporality of project management is taken into account according to the actors/projects, suggesting a future substitution in terms of assistant functions. This means that the professional skills acquired are developed in the temporality reserved for a good continuity of knowledge exchange processes, as a response to the exploitation of the technical innovation made available.
- The performance plan – Innovation must be the subject of the piloting, specifying certain methods that promote the routine skills of the workshop.

These three points correspond to a certain extent to a reallocation of seniority towards a new temporal and spatial availability in a line of cognitive development. The recent pace of operations in the EUTs allows agents to integrate into the production-circulation system of concrete knowledge.

4.1.4.2 Each UETworks objectifying three elements:

- improve productivity outcomes;
- take into account each other's ideas;
- increase individual skills for a collective purpose.

To facilitate these tasks, hierarchical coordination (a single manager) becomes more flexible operating in short lines. The customer-supplier-agent triptych is the upstream-downstream evaluation perimeter. In short, two strong elements make up the coordination of the EUTs: *the set of evolving skills (versatility, integration of peripheral activities) and a contractual participatory animation system (indicators, progress plan known to all members of the unit, annual interviews).*

4.1.5 The viability of the business and its short-term efficiency

ReSource allocation (financial viability) for training efforts may correspond to the ability to create technological reSources and to innovate products and processes.

The reSources (generic and specific) exploited by Renault have had a multiplier effect in the change in production. The specificity of human reSources lies not only in the intrinsic skills (linked to initial training), but also in those acquired during the production process conceived in a temporal dimension. This is the result of learning and enrichment of tasks, defined in the policy of business groups/projects.

GAFFARD (1990, p.334) explains that "this good organizational form is based on the efficiency of internal labour markets making it possible to mobilize the human reSources in question; participate in the same proportion in the development of its practices, the interdependence between

individual learning and the collective enrichment of knowledge". It is in this context that the company has the ability to create new markets, products and new learning.

We can establish a link between the generation of new knowledge and training warning practices, taking the example of Renault. The question that arises is whether technical requirements are involved in the renewal of training as a need to remain competitive. According to AVENTUR & HANCHANE (1998) the idea of rapid development and training effort of actors during the 80s, took place in the modernization of the productive apparatus, leading to the creation of an instrumental dimension of individual-collective training involving strong pressures in terms of capital-labor revealing, through this means, a new Source of technical-organizational knowledge, arising from technical and professional developments.

This converges with the syllogism from which the company makes its choice. Renault is in favour of triptych policies (skills-actor-market), taking collective performance as a response to the individual skills generated within autonomous production units. In addition, it reacts combined with the principles of versatility and polyfunctionality as inicitative content in games.

4.1.6 Renault's skills renewal and continuing education

Companies have different ways to renew the skills of their staff. In particular, they may favour external recruitment or, conversely, the training of their staff and/or their internal mobility combining different forms of renewal of skills (CEREQ, 1998).

With regard to training situations (cf. Figure 25), we can identify the two phases of the training process of the EUTs:

- All training efforts have been channelled mainly on the workplace, taking advantage of in locus mechanisms;
- The training concerning the capitalization of external labor is made up of experienced workers and / or young diplomas, through an internship of at least two years.

Figure 22: Formative situations

Formative situations
Internal and external training internships - external internships – designed and organised by an operator who is not part of the company; - internal internships – designed and organized by the company itself.
Continuing training in locus Any planned period of training the workshop to gain practical on-the-job skills or experience, using commonly used tools. The criteria are: On-the-job in-locus training – understanding of the usual work tools; Inspection by a supervisor; Training propagated by a tutor using computer pedagogical tools; Tested for training received.
Continuing vocational training Participation of executives in conferences, workshops, seminars, self-training through computer-directed teaching, Evaluation to be defined by the training coordination group vis-à-vis the rotation of posts and quality circles.

Source: author made from Renault – training plan doc. internal (1998)

These two phases have been the means of renewing the company's skills in relation to the most diversified strategies. This integrates the objectives of the training policy including the axes of adaptation to technical developments, as well as means of facilitating technical changes, improving product quality, developing versatility, and adapting new recruits. As a result, employment and career management usually takes a back seat.

4.1.7 The various forms of organization and the development of the training network in the enterprise

The global challenges of the new matrix organizations and the consequences on the evolution of roles and professions have highlighted new criteria of skills in the field of organization. As a result, problems in defining roles and occupations give rise to more complex matrix structures and significantly change the way people work. In this regard, it is necessary to focus on certain issues such as the business/project duality.

The EUT is presented, in a way, as a collective competence, that is to say, an organization bringing together people with different but complementary knowledge; The sum of this knowledge is necessary to achieve the company's objectives for the operation of the facilities (in terms of capital/technology and capital/man). The evolution of operators' skills is based on the division of

work (versatility, polyfunctionality), on the nature of the work to be carried out (responsiveness to events), on collaboration with the most skills, promoting the transfer of knowledge and on the animation of the mastery. At Renault, the organization has defined the UET as a homogeneous set of production of goods and services, on a small scale (10 to 20 people). This mechanism is inserted in the negotiation "Accord à Vivre".

The organization has therefore established itself as decentralized, with strong functional specialization. In the light of horizontal coordination, the unit decides on the quantities and quality of products to be received or transmitted to the coordination of the other units. In this case, coordination is the responsibility of local initiatives of an adaptive nature which are often informal in nature, but implicitly constituted by codified rules.

UETs distinguish between certain needs for direct coordination (centralization of the use of information technologies). In this context, coordination is established as a mediator of the arrangement of information technologies in deference to user agents in the form of common databases (comprising the same range of business software, electronic archiving with interactive updating, etc.). Thus, the marriage between information technology and UETs makes it possible to directly coordinate these identical references and actions in real time.

The autonomy reflected in the UET makes it possible for operators to set new production standards in the workplace and to invent new ways of working. This refers to the ability to invent, to anticipate the vagaries of production.

In a complementary way, the mode of organization of work promotes collaborations from situation to situation and from individual to individual, allowing the collective enrichment of practices and experiences carried out in certain sites of the company.

4.1.8 EUTs as an object of requalification of the collective

The objective of requalification of operators is affirmed in the Accord à Vivre and in the principles that define the UET. This means a "determined level at which the company's performance ends". The organization favors learning and autonomy, reflecting the professionalization plan.

The application of this new concept involves two potential changes. On the one hand, the new policy leads to an increase in the skills required globally in the field of business/projects, by relatively shifting the flow of information between the design office and suppliers. This promotes the initiative of agents to avoid operational breakdowns. On the other hand, the application of TPM (total productive maintenance) allows the clarification of procedures to be respected as profit/maximization of technology. The effect of the combination of these two changes results in the balance between two internal interests of the EUTs: the division of labour and cooperation between them.

The organization therefore becomes qualifying when the work is done in teams (autonomous cells) and responsibility carries a performance attribute. It qualifies when the hierarchical levels do not oppose the management of staff animation (in the case of UETs, the facilitators are the foremen). It therefore has a decompartmentalization between the functions of the company. Unforeseen and problematic situations are then privileged learning moments and exploited as such.

The trend of this movement is towards a diversity of models of knowledge exploitation. Crews are equipped with highly integrated and modular technologies, which goes hand in hand with a decrease in the frequency of repairs. For example, in the maintenance sector, techniques must be mastered online, i.e. the extension of maintenance intervals with flexible transfers throughout the current process.

With regard to the design of UETs, the fundamental element is the process of knowledge capture, which is efficient. Here are some thoughts:

- conventional mechanical repairs are losing importance in favour of the exchange of complete groups (engines, transmission, control elements, etc.);
- diagnostic system skills are becoming increasingly important and necessary;
- the rate of repairs in the area of computerized and microelectronics units must be kept decreasing;
- the repair sectors must carry out its tasks as a whole, using all the reSources that the group offers;
- the main mission of the UETs is the in-depth growth of multipurpose systems and above all with a focus on methodological competence.

4.1.9 Objective conditions for the exploitation of knowledge

First of all, the analysis of this question requires the gathering of a very heterogeneous public. The daily practice of the company includes the exploitation of knowledge in two remarkable characteristics:

- characteristics inherent in early learning – focus on barriers to promotion and skills training that risk the use of knowledge acquired during short or failing schooling;
- socio-professional characteristics – monotonous and fragmented tasks, pace reserved for production agents, frequent discomfort of living conditions, cramped free time, restricted social space, limited communication network... factors that are not conducive to lifelong learning.

The general objective of the company is to take stock of the basic general training of agents, with the aim of identifying the mobility or flexibility necessary for socio-professional circulation. It is therefore necessary to seek a general training framework which proposes an overall structural objective of promotion and professional integration.

A pedagogical principle guides the implementation of training in the UETs. According to François Foix, training cannot be thought of as general or prior but above all professional. From this a general framework of training is structured evoking two axes:

- The explicit expectation integrates various learnings with the final aim of resembling the various networked learning giving impetus, between the UETs of common interest;
- An integration of general training and professional elements allowing the practice of a pedagogy of the concrete (observation, analysis, confrontation of experiences). Pedagogy of the concrete but also global pedagogy and implementation of globalizing knowledge, which implies that we have clarified all the objectives to be implemented to significantly improve the content of training.

The pedagogy of the company is therefore centered around specific interests. This is organized around professional themes that allow interested parties to discover their skills, promoting the transfer of knowledge.

According to the Human ReSources Department, the training is understood as longer and indistinct. It must also be agreed that among a very heterogeneous public, there are disadvantages that will not all lead to the same level of qualification, later reflected in the professional mobility of each. Nevertheless, this mechanism promotes access to training and everyone will be able to improve their situation.

In terms of organization, a number of proposals could be put forward: 1) the search for individualized training itineraries focused on projects; (2) the definition of training modules that can constitute itineraries for projects; 3) the search for alternance methods that take into account the learning rhythms of the persons concerned, and also the redefinition of possible relays to training within the same site, in order to make training profitable.

4.1.10 A look at the new qualifications

Renault's consideration of a human reSources development policy is marked by the introduction of new information technologies in the form of organisational changes. The main

decision-making steps and the implementation of automation, identified the main actors and their logic of action.

Between the decision to automate and the commissioning of new facilities several years elapse, during which other automation decisions are prepared and implemented (through the General Management, Design Office, Central Methods, Central Personnel Directorate, Establishment Management, Personnel Services, Training). This process has been the subject of ongoing negotiations and consultations. This has linked the difficult task of defining the roles of actors. This difficulty arises from the fact that some adjustments have been made in parallel with the continuing training and promotion of staff in their concentration of fields.

The company's policy expresses certain objectives: a gain in productivity and the development of know-how in the fields of information technology, sometimes at the design level and sometimes at the manufacturing level.

Every productive activity includes a number of functions, the content of which is distributed differentiating man and machine in different technical stages. This transfer makes some tasks disappear and creates new ones. The analysis of their content from the point of view of the competence they require is the condition for understanding the evolution of work with automation (DARES, 1998).

In the early 80s, versatility was sought at Renault. Nevertheless, the automation that seemed to be easy was not obvious. The diagnosis required knowledge of all the techniques directly affected by electromechanical and mechanical parts. Two points, then, are highlighted in order to eliminate these problems of a workforce of versatility: actors with mobile knowledge and young people.

The objective of the qualification is to bring together people who have different but complementary knowledge. This new policy is the new way of developing training.

The evolution of skills is therefore based on the division of work (versatility, polyfunctionality), on the nature of the work to be carried out (responsiveness to events), on collaboration with the most competent, which promotes the transfer of knowledge and on the animation of the mastery. This refers to the idea of a requalification reflected in the plan for the professionalization of the UETs.

GAREL (1994)[73] characterizes three types of knowledge at Renault:

- Technical knowledge that allows actors to perceive and transform objects and the environment. They are at the heart of the traditional competence of the trades;

[73] GAREL (1994) Survey on methods of collecting the reduction of development cycles: the cases of stamping in the automotive industry: a comparative approach.

- Evaluation knowledge (according to the triptych economy/deadline/quality risk) makes it possible to evaluate and negotiate options, to make choices for the project, to measure the implications of its actions, the priorities for the project... The compromises between technical experts from different fields are opposed in these terms. This knowledge is carried by the project actors;
- Relational knowledge is necessary for an effective relationship with others.

4.1.11 Transformation of the foundations of professionalism vis-à-vis flexibility into working groups.

On the occasion of the transformation of technical production systems, we are witnessing a triple transformation of the content of the activity of individuals at work, of the modes of sharing of work and within groups.

At Renault, we observe two dimensions of professional grouping: the first refers to the ordering of individuals into major poles reflecting the idea of a social hierarchy, including in the aspects of functional partition: workers, technicians and supervisors; The second distributes the actors according to their production support reports. Compared to the first pole, the professional framing of the EUT leads the actors to redefine their statutes from professional responsibilities (described as the first pole). The second concerns the implementation of new technologies in production and a division of labour into groups according to qualification criteria.

These two different logics obey certain specific grouping criteria, it is the emergence of impulses between skilled workers and qualified technicians (which allows the hierarchical line to present a coherence and to be based on a representation of work that makes it legitimate).

SUMMARY OF SECTION 4.1

The organization of production can be considered as the functional integration of knowledge and skills coordinated by the company in order to maximize techniques and the workforce.

We found a correlation between the objective conception of production (the General Management, the methods office and the design office) and the reproduction of knowledge. The latter is not attached to the endogenous functions of the company, but to the workforce that knowledge and skills are produced outside the company (school training, cognitive capacity, knowledge acquisition). This knowledge is the participatory element for defining organizational changes and skills.

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4.2 Qualifying training in the enterprise

4.2.1 Introduction

Over time, vocational training acquired a strategic role in the modernization of the productive apparatus. As a result of this development, Renault's participation is becoming very significant in terms of staff training expenses. In the 80s, the heterogeneities experienced by training in the company, starting from the incorporation of the flexible factory model, are directly addressed to the content of internships, the slowdown in hourly costs and the increase in trainee rates.

From 1974 to 1995, the company's financial participation rate (TPF) in continuing education (FC) doubled. From this, we draw three explanatory periods of the evolution of training:

- **First period: 1974 – 1980** - this is the period of implementation of the law that obliges companies with 10 or more employees to invest in training. This period is also famous for two events: the first oil crisis and the second Fordism crisis (increase in turnover and absenteeism, cf. sec1.1, chap.1). Here the company opens its doors to the system of internal and external hourly internships. This is the time of gangs and losses with the investments of technicians and high-level training.
- **Second period: 1980 to 1991** - this is the boom of economic growth and, the increase in foreign sales. We also contemplate the modernization of the productive apparatus, characterized by heavy investments, on the organizational side. There is also the emergence of severe measures of productivity and reduction of stocks giving new status to continuing training. The latter is acquiring a strategic role in the management of these major changes, directly involving certain key factors: the reduction in the hourly cost of traineeships and the growth in the rate of financial participation (cf. Table 18).
- **Third period: 1991-1995** - this period shows the economic shrinkage from 1992 to 1995 (see Table 18). At Renault, it is the accentuation of the crisis in some branches and the increase in the hourly cost of internships. This leads to an increase in the unemployment rate.

Table 17: Training rate in cost/number of internships

	1991	1992	1993	1994	1995
TPF (%)	3.2	3.26	3.29	3.29	3.26
Trainee rate (%)*	32.3	32.9	33.2	33.6	34.1
Average duration (hours)**	49	48	45	43	42
Hourly cost (80 francs)	141.8	147.3	154.3	154.3	151.5

Source: Tax return No. 24-83

(i) *on average
(ii) **internal training plan for the company

In this last period exploited, we observe that Renault favors the hiring of graduates of BTS, CAP, BEP, BAC. In 1996 there was a stabilization of the recruitment rate, given the rise in unemployment among young graduates[74]. The repercussion of this phenomenon in 1997, led the company to create the opening of 2000 internships for young graduates.

4.2.2 Training as an investment

Our reflection on this point considers training as an investment. In our view, it is linked to economic efficiency. On the one hand, this mechanism (training) improves the knowledge and skills of the group and is established in the organization as a tool for career development; in terms of employment and wages inside and outside the enterprise (SEC; 4.3). On the other hand, the use of continuing training concerns the restructuring, modernization or improvement of production and work systems (MAROY, 1996; VERDIER, 1991).

Table 18: Professional career and developments

	Promotional training		Initial training	
	Staff	Percentage	Staff	Percentage
Graduate executives – engineering education	1837	12%	257	7%
Promoted executives	822	22%	260	13%
P1 graduates	3262	23%	303	12,7%
P1 promoted	5432	21,5%	150	11,8%
DESS technician	786	20%	291	13,4%
Master's Technician	1851	21,3%	291	11,8%
LAC Technician	1303	19,8%	356	14%
Promoted Technician	2053	22,3%	457	9,8%
supervisor	2262	21%	1688	17,3%
CAP/BEP workers	7852	48%	2632	31%

Source: RNRU - (evolution of vocational training 1984 –1994)

Looking at Tables 19 and 20, we draw that continuing training is an influential mechanism, since it defines the classification of functions and positions and also its restructuring; As we can see through the examples of executives/engineers and graduate professionals.

[74] More than 500 thousand young diplomas (CAP, BTS, BAC, BAC + 2, Master's degree, DESS, ...) not found jobs in 1995. This provokes in 96, an inverse trend employment-qualification. (employment survey 1995-1996).

These issues link training to economic efficiency in a symbiosis called *transformations of organizational forms*. Production management is considered here as closely contingent on demand; It is accentuated by more sustained technical-organizational changes or based on the search for numerical or functional flexibility of jobs. In other words, "training, as a continuous mechanism, is a decisive instrument, allowing the proper management of skills" (MAROY, 1991, 1996).

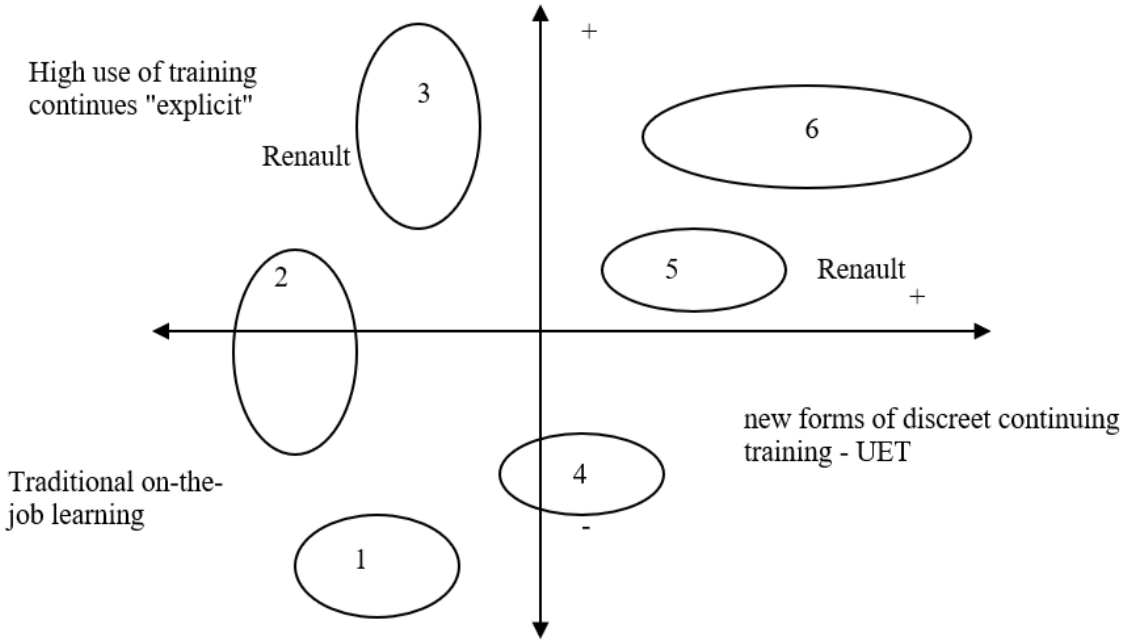
Table 20: Professional mobility

	Promotional mobility	Horizontal mobility
Change by occupational category (executive)	38%	45%
engineer	34%	37%
Access to other statuses	66%	68%
supervisors	25%	27%
Graduate technician	20%	36%
Low-Diploma Technician	15%	11,8%
Non-graduate technician	11%	11%

Source: RNRU 1994

Renault's training activities stem from several elements. The first is the allocation of reSources through training, which goes hand in hand with the construction of internal labour markets and rules governing the movement of labour (variation in operational staff, see Table 20). The second concerns the harmony of individual strategies to form the collective skill set of EUTs, the construction of internal labour markets represents the strong point in labour mobility at Renault (see Table 20). They are subsequently linked to the improvement of the *employment contract and the increase in efficiency*. This binomial works inseparably favoring the strategic behavior of the units. The strategies are defined as plans and generalizations on the objectives to be pursued and on the instruments to be mobilized (see Figure 27). The strengthening of a link between training and hierarchical modernization projects tends to ease tensions around the allocation of company reSources for continuing training.

Figure 23: Relationship between forms of use of training and organizational dynamics



Source: Author renault dossier (1995) – Continuing training news

Renault's strategy favours a shift to more differentiated production in a context of intensifying competition. This strategy is more closely aligned with horizontal than hierarchical coordination (BOYER & AOKI, 1991, 1996) and a pooling of knowledge and know-how at the level of autonomous teams (BOYER, 1992).

An example of success in the company is the commercial sector. The complete sales teams, with their hierarchical superior and at his initiative, have undergone training of a methodological nature, applied to ongoing business (identification of the customer's decision-making process, costs and benefits of the offer, evaluation of the competition, development of sales tactics). In this context, the EUTs are accompanied throughout the training process by an advisor and are encouraged to organize themselves into "inter-business teams" in order to mobilize all the necessary internal skills reSources.

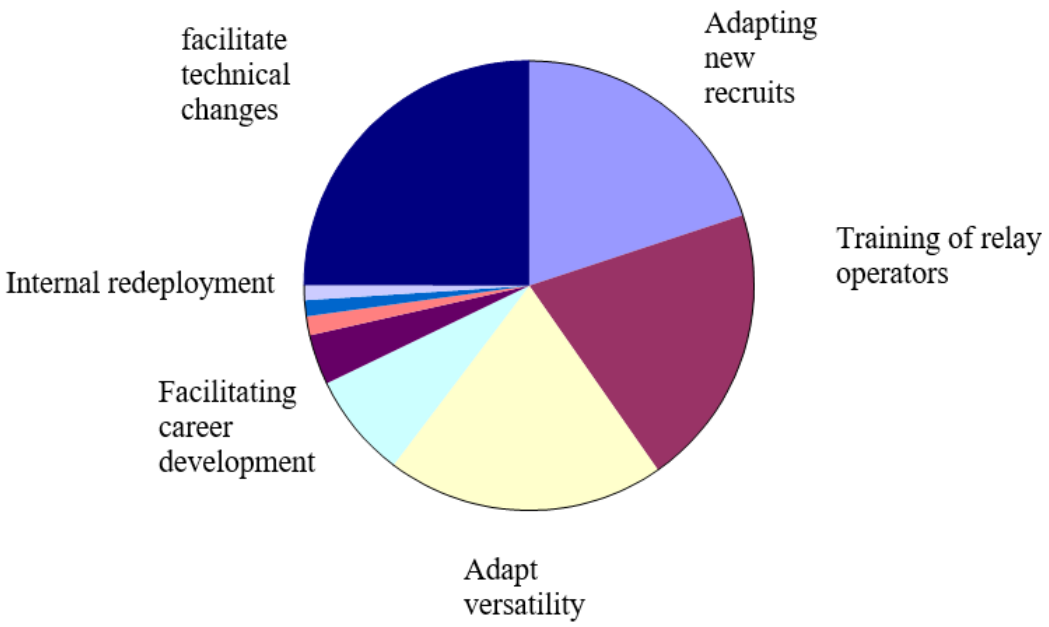
Operators (POs) are another targeted category of this training. It is a question of increasing their versatility according to the respective production line.

4.2.3 The emergence of a new training model

The emergence of a new training model is the result of a process of integration of company management and a series of elements of the pace of production coordination: *technological, organizational, financial and commercial innovation*. Over the last ten years (1989-1998) the company has faced continuous and multiple changes concerning its internal development and its

repositioning on the market (see Figure 4). The current hierarchical structural change then positions itself in favour of new, flexible forms of coordination. Horizontal coordination becomes *the complement* to the training model in question, promoting operational autonomy for officers.

Figure 24: Changes adopted in the last ten years



Source: Renault (1996)

In this new approach, highlighting technical culture is important since it calls into question the market-product-process circuit. The integrated management model, framed in the current policy of organizational changes, ensures that agents have access to learning skills, thus allowing the company to expand and develop its human factor more easily. From there, two factors emerge: **1) the internal market –** technological and financial reSources are provided in terms of continuing training; 2) the **external market** – the opening of new margins favors the hiring of young graduates. This set leads the company in a search for internal flexibility of work. The results are the homogenization of sensitive segments and a new training based on forms of versatility obtained in the process of integration of skills.

4.2.3.1 a - Cascade training – the example of Renault Douai

The launch of any new car at Renault leads to an expectation of organizational change; such a project represents about four years of training and supervision effort. In the factories, the generalization of the organization in UET has allowed a widening of the hours of training leading to

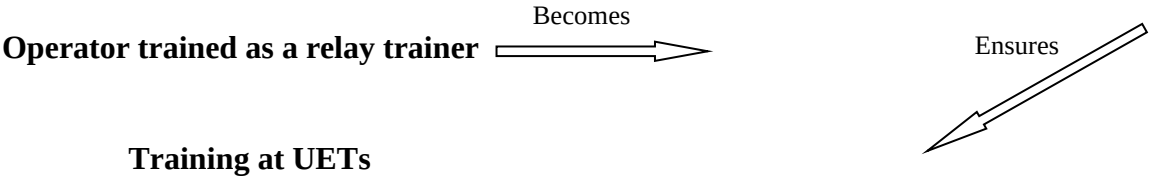
a reduction of about 50% in the hierarchical level[75]. This measure has not only led to a reduction in hierarchical lines but also has initiated a new communication process that has made possible the autonomy and greater accountability of the actors. From then on, the only objective was to gradually increase the skills within the units.

Table 20: Renault Douai's training project

1 year	**2 year**	**3 year**	**4 year**
100% Engineering Management	30% factory 70% engineering	70%factory 30% engineering	**100% factory**

Source: Mégane Project – approximately 5000 people trained by the end of 2000

At Renault Douai there are 350 UETs mastering more than 800 operations. This requires 400,000 hours (45% more than the R19) of training effort[76]. The training plan established took into account pilot (external) and relay (internal) trainers at the same time. Now the objective of the UET is to train to be able to train. The language used is the same for engineers as for operators (OP - professional workers), thus promoting training "listening to all". At the end of the training, the agents become relay trainers of their basic UET[77].



4.2.4 Training as a disruptive element

Training is constantly sought. Yet the departure of a key individual on an internship is all the more disruptive as it is important. The outsourcing of training actions represents not only a cost, but also a one-off loss that is difficult to manage. Within the units, the objective defined is "the versatility of agents for better execution of projects". The unit refers to the need to master knowledge that is sometimes specific and sometimes diverse. Organized UETs evoke a methodological dichotomy,

[75] An example: the DOUAI plant. The organization in UET, allowed this plant to go from eight hierarchical levels to four (operators, heads of UET, heads of workshops, and the plant manager).
[76] These needs were previously assessed by the socio-technical council (J-P. FALLUEL)
77 These relay trainers are required in workshops among the most qualified POs.

because they facilitate the transmission of internal information in terms of flows, at the same time we observe the reduction of the stochastic loss of knowledge[78].

In trying to break with this apparent dichotomy, a new element is being experimented: the absorption of key configurational categories of projects. They mobilize knowledge external to the company and that of other EUTs. This broadens the information network highlighting training as a dynamic of collective skills.

4.2.5 Renault's partners

Faced with the demands of international competition, Renault must extend the skills of its employees, train new hires and develop a technical path to professionalization. In five years, the company has invested nearly 2.5 million francs in human reSources training, as we can see in Table 22. At its side, the Ministry of National Education, Research and Technology is committed as a collaborator promoting the training and integration of young graduates, and professional development during their careers (Renault, 1999).

Some National Education institutions have received between 11 and 12% of investments in training, based on exchanges with Renault, either through a non-repayable project or through structural exchanges. Technical training schools, the business and management school also receive considerable investment in the development of these contents and the training of its students (tables 24 and 25).

Table 22: Investments in Training

	Investments in Training (million francs)
1994	372
1995	290
1996	219
1997	422
1998	788

Source: RNRU balance sheet (1998)

In this approach, Renault has made available robots and automatic systems for teacher training as well as that of students, with the aim of returning to Billancourt training. Despite the difficulties in carrying out certain training and development programmes (mainly for financing reasons), Renault is launching a new diploma: the CAP - industrial installations, also participating in the creation of a Bac Pro (PSPA), in close collaboration with the UIMM. "The company is therefore involved in the

[78] at the time of project execution.

definition of certain diplomas, presenting itself as a partner of the National Education, by training technicians who will revive the apprenticeship of the Renault technical school" (GERPISA, acts n ° 17).

The main structural reforms in terms of higher education engendered by Renault represent a future vision in the formation of the company. Institutes of technology have created "a rapprochement" with certain disciplines between the pupil and the labour market (cf. Table 23). From this rapprochement emerged heterogeneous contents[79].

The Savary law of 1984 emphasizes the scientific and professional vocation of universities. This prompted Renault and its partners to restructure towards more technical specialties, forming new content.

Table 22: Required Training x Categories

Formation	Categories						
	Frames	Techn Dess.	Maintenance	Techno	Supervisor	CM	Ordonnac.
School	Xxx	Xx	x	x			
License and more	Xxx		Xx	Xx			
DUT, BTS	x	Xx	Xx	Xxx	Xx		
DEUG	x	Xx	Xx	x			
Bac Gen.		Xxx	Xx	Xx			
Techno Baccalaureate		Xxx	Xxx	Xxx	Xx		Xx
Bac Pro			Xx	x	Xx		
CAP, BEP				Xx	Xxx	Xx	

Source: RNRU (1995)
(i) x – low; xx – medium, xxx – strong

Training operations are processed in "just-in-time". In other words, the training plan ends with the systems that are working well. They are the target of a positive transfer of skills in terms of new knowledge and know-how related to information technologies.

Table 23: Beneficiary Institutions

Institutions benefited	1991	1992	1993	1994	1995
CPGE	X	X			
STS	X	X	X	X	X
IUT	X	X	X	X	X
Engineering schools (universities)		X	X	X	X
Schools of business, sales, management and accounting	X	X	X	X	X
Miscellaneous higher education institutions	X	X	X	X	X

Source: RNRU /1996

[79]In general, training is provided according to the needs of the agents, previously provided for in the specifications of each chief engineer, and then transmitted to the trainers.

Table 24: Educational institutions x Percentage of training requisitions

Training organizations	Requisition of pedagogical and trainers (%)
Universities and higher education organizations	21,7
GRETA – Marne Valley	18,0
AFPA/ASFO/Consular Chamber	19,8
The IUFM	8,9
For-profit organization	15,7

Source: Renault (1998)

4.2.5.1 b - Current partners

Among the agreements between the French Ministry of Education and Renault, one of them is essential: the *framework agreement*. The Academy of Versailles and Renault have signed a *framework partnership agreement* for initial and continuing training. Through this agreement, the two partners wish to promote the professional integration of young people and professional development during their careers. The agreement defines the exchanges between the two and combines their initiatives and reSources, while seeking the complementarity of their competences. With regard to initial training, Renault and the Academy of Versailles collaborate in the areas of analysis and development of the *professions, skills and training of the company's establishments within the scope of the agreement* (Renault Headquarters, Guyancourt, Rueil, Cergy-Pontoise and the Flins plant). To help young people define their professional projects, the two partners exchange information and guidance, setting up multiannual actions: the organization of visits by psychologists and experts, the development of educational materials or tools, etc.

The commitment policy of these two partners leads to the development of the training of young people in the workplace and to encouraging their socio-professional integration. The participation of Renault professionals in the training provided in National Education establishments shows the existence of an opening of apprenticeship sections in public establishments. The creation of a new diploma, the CAP "Industrial Plant Operation" was developed between Renault Flins and the Academy of Versailles.

4.2.5.2 c - Diploma policy

Renault and the Versailles Academy will develop their collaborations with the Training Engineering Council. The Délégation Académique de la Formation Continue (DAFCO) will provide support to Renault to help adapt its staff and retrain them in existing or new professions. It thus has centres of expertise capable of responding to calls for training tenders launched by Renault. Thanks to a work-study programme, the Versailles DAFCO and the Renault Technocentre have developed

the skills of design technicians on the basis of the designer's business reference system. The goal is to obtain the CPQM (Certificate of Professional Qualification of Metallurgy) - "Computer Aided Design Design Design Technician".

The two partners are still committed to collaborating at the pedagogical level. They will define the lines of educational cooperation relating to qualification needs. The establishments concerned by the framework agreement are: Renault Headquarters, Guyancourt, Rueil, Cergy-Pontoise and the Flins plant, which will employ more than 22,000 people. They will also be associated with the industrial, commercial and logistics subsidiaries located in the territories of the Academy of Versailles. This framework agreement gives rise to others between GRETA and IUTs.

4.2.6 EUT and continuing education

The modernization experienced in recent years at Renault confirms that technological change is decisive for the internal organization of work. The appropriation of new techniques by the company is increasingly accompanied by an adapted training program. The introduction of CNC automation has given rise to numerous courses: in total, industrial technical training represents 15.6% of internships at Renault.

The ISO 14001 certification for 40 industrial sites and 8 different countries (an example are the factories: SNR in Annecy (2 sites), the SBMF foundries in Lorient and the Le Mans plant, the assembly plants in Saudouville, Valladolid and Palencia in Spain, Slovenia, Turkey, Portugal, Argentina and Brazil), is an example of the company's commitment. These priority actions, expressed in Figure 5, are part of an approach to train specific environmental personnel with the aim of reducing or eliminating the impact of techniques on the environment that are part of the choice of flexible and transversal network organization.

Figure 25: The main training approaches

Source: author made from RNRU (1996)

Despite the advantages sought, training is always considered urgent and preventive, i.e. training qualities are sought before problems appear: breakdowns, or difficulties in technical mastery. A training schedule is drawn up by the trainers and relay trainers (operator elected by cell) specifying the task to be taught; the tools used, the expected time, the subject, the training method; training materials and, evaluation. In this context, training promotes the EUT in terms of learning a task and acquiring a specific skill.

4.2.7 The influence of graduates in the recruitment criterion

More frequent admissions are still highly dependent on degrees. The positions of AP (production assistant) and P1 (professional 1) are very strongly represented BTS and CAP diplomas. In more specialized sectors such as mechanics, control and maintenance, diploma requirements range from CAP to BAC + 2, with varying insertion levels from 26.8% to 35.4%).

CURRENTLY, the level of initial training required requires some training (BTS, BAC, BAC + 2 levels). One of the features of this new approach is the development of training (cf. Table 26), linked to the ideal of having individuals who are sufficiently versatile to be competent in both technical and managerial skills.

Table 26: diplomas x integration rate

Diplomas	General baccalaureate	Techno Baccalaureate	Bac.Pro equivalent	CAP, BEP
insertion rate	26,8	25,1	19,6	35,4

Source: RNRU (1996)

The demand for workers with new skills is currently growing and are concentrated in five more sought-after skills:

- Technicians: trained in a wide range of fields: electronics, hydraulics and diagnostics;
- Systems Specialists: trained to see the integrated plant as a whole;
- machine specilaists: able to carry out all activities related to specific equipment;
- Dual-skilled workers: trained in a second training (a mechanical assembler trained in electricity);
- Multiple skilled workers: who have acquired additional skills through their initial training.

Table 27 helps us to understand the training specialties most in demand vis-à-vis the skills described below.

According to J. C. Monnet[80] (in PERRIAUX, 1998), the strong growth in initial training leavers, particularly at the technical level and beyond, facilitates the direct recruitment of young diplomas. ...."this inevitably triggers strong competition with internal employees through, through a

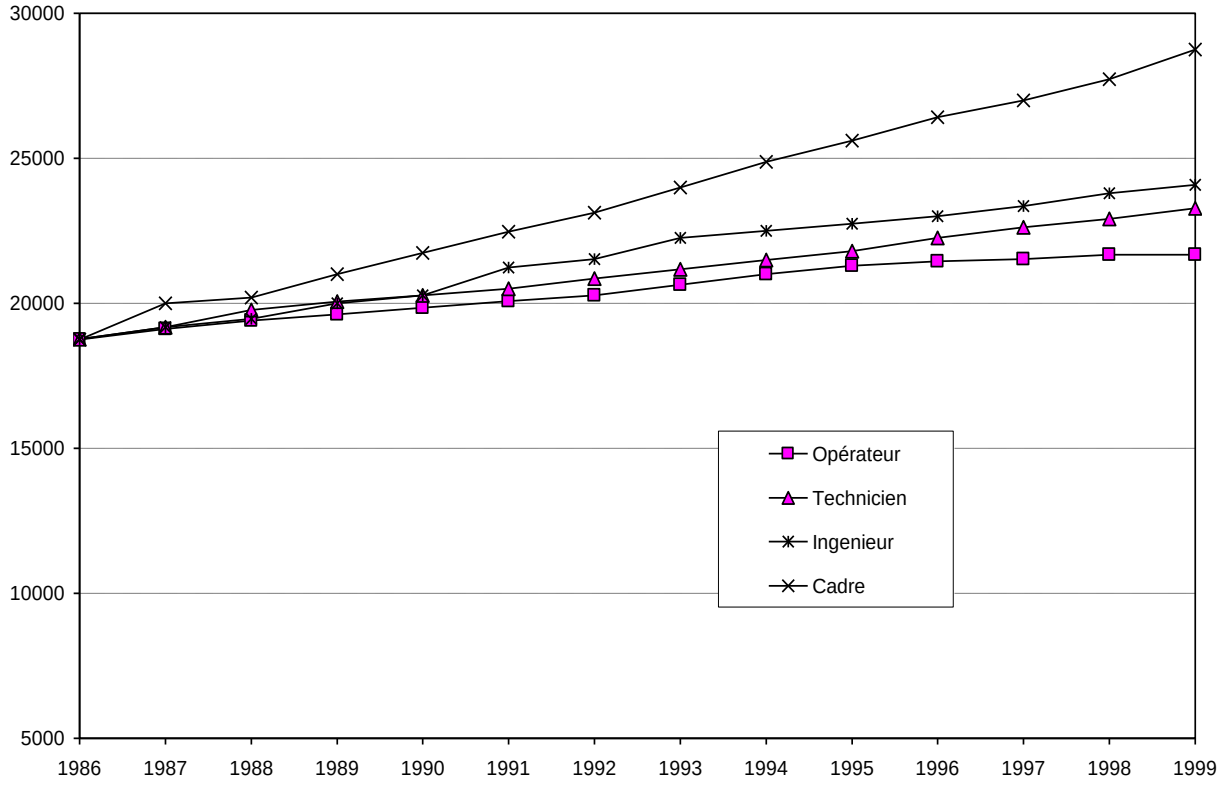
[80] Director of Human Resources Research at Renault (commercial sector).

reduction of past hierarchical lines, as a reflex of potential for promotion". According to him, this sometimes widens the gap to be crossed. Finally, the economic horizon of firms, both here in Renault and elsewhere, becomes more difficult to reconcile with an individual training effort often spread over several years. In addition, it is possible to think that automation is seized as an opportunity to pursue human reSource goals. It works bilaterally on the recognition and potential development of the workforce and the development of self-reliance in a collective framework.

Through Figure 6 we can identify the evolution of graduate flows according to three logics:

- Management and engineering functions remain highly dependent on diplomas and basic technical training (generally from grandes écoles);
- The functions of supervisors and technicians make their trajectories in a heterogeneous way. Basic training is of medium level, increasing throughout their career at the company;
- The functions of operators have a minimum basic training, expanding throughout the career.

Figure 25: Hiring key training categories



Source: Internal report – Renault (1999)

Changes between 1991 and 1996 are more moderate. The company invests in terms of continuing education using continuing education internships with external organizations such as GRETAS, IUFM, and Val du Marne University. However, the evolution of training behaviour is rarely linear. Several factors compete with this normal "counter-trend" (see Table 27).

4.2.7.1 d - Recruitment

The recruitment of young people at BAC + 2 level is very significant especially in specialties such as maintenance (Table 23). This is already being sought for young people capable of occupying various jobs and with a general education (cf. Tables 27, 28). Otherwise it is hoped that they will be able to adapt easily to organizational and technical changes. Another explanatory path identifies the group of young people with a BAC training and especially BAC + 2, as new blood by renewing the staff. This highlights the qualification of EUTs with a view to having technicians likely to be relay trainers for their units.

Table 26:PROFESSIONAL CATEGORY / TRAINING REQUIRED

Required RNRU Training categories	CAPE	HAD	BTS	BP/BT	CEP	FERRY	LAC+1	LAC+2	BAC+3	BAC+4
AP A	X			X						
APB	X		X	X						
APC	X		X	X	X					
Home	X	X	X	X	X					
ON 1	X	X	X							
OP1 IN C	X	X	X							
OP1 C	X	X	X							
OP2	X		X	X	X	X				
Q Adjusters			X	X	X	X				
CS Adjusters			X	X	X	X				
HS Adjusters			X	X	X	X				
ATP					X	X				
Agt. techn.						X				
Dessinat.						X	X	X		
Agt.Mat							X	X		
Frames							X	X	X	X

Source: RNRU/1991

Table 27: Most In-Demand Training Specialty

Training Specialty	Training started between 01/1992 and 05/1993	Hourly duration	
		Inferior at 40 p.m.	Upper at 60 p.m.
IT, office automation, data processing and text	21.1	70.9	8.8
Industrial technology	15.6	53.3	20.4
Human Relations, Supervision, Management, Communication	11.3	54.8	18.2
Management, economics, law, knowledge of the company	9.8	63.4	16.0
Commerce, sales, marketing, knowledge. PROD AND MARKETS	9.4	74.8	11.2
Pedagogical training of trainers	5.7	52.8	23.5
Health and safety, first aid, working conditions	4.6	74.1	2.0
Languages	4.3	29.1	16.2
Basic general education	3.4	42.7	27.4
Other	9.3	50.5	21.4

Source: RNRU (1993)

For the work of organizing information are recruited a BAC and BAC + 2 training. These are the codification of the 28 types of information, the more than 4000 types of parts, the expense centers, etc. ... With this qualification is worked in a perspective of specializations that have been managed outside the company.

The analysis of the integration of young graduates is based on the current of competition of the market given but this is not the only element of decision. Initial training is not the only one required, the company itself invests in continuing training so as to be able to raise the potential of its workforce. Initial training is important in the recruitment criteria at first sight, nevertheless the evidence of changes in the integration of the workforce is a question of at least medium duration.

4.2.8 Engineering training

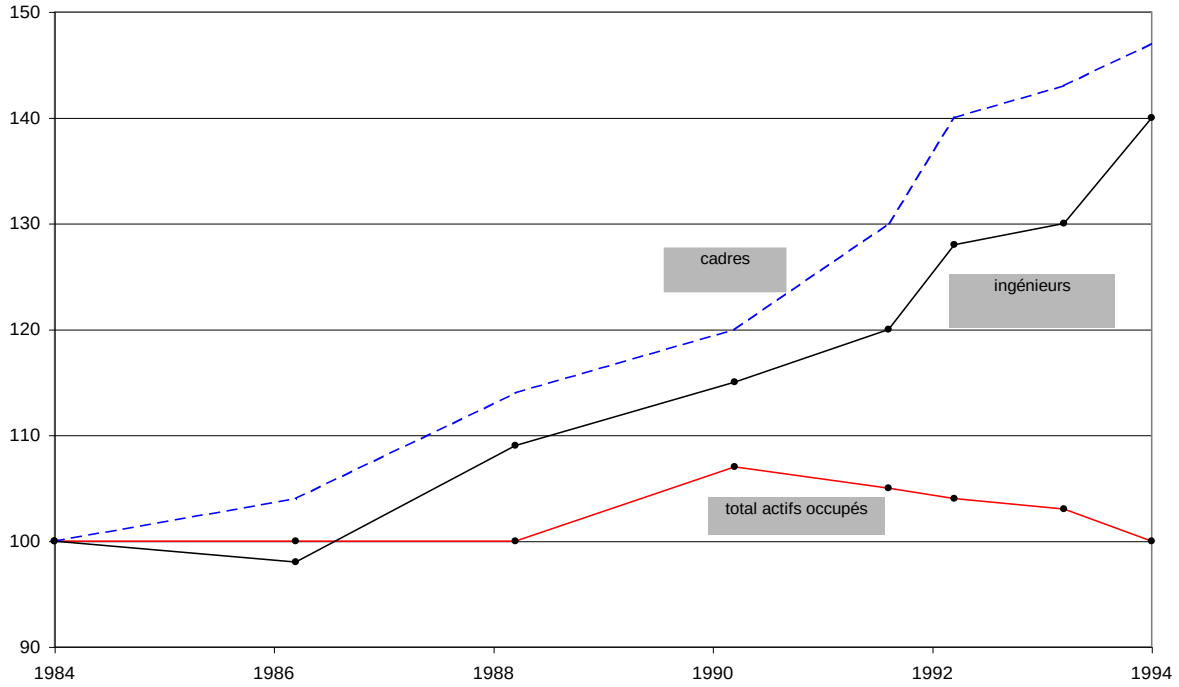
Engineering training always attracts attention in the evaluation work of the training. To better understand the debates on the growth of training-jobs among EUTs, we will briefly study this group.

Since 1989, Renault has undergone serious training changes concerning the updating of its engineering cadre. Since the development into EUT, the engineer is seen as a capital element. It is highlighted by the information network, given the theoretical and deductive knowledge as well as the occupation of managerial functions.

In other words, the engineer can be considered to have a defined role according to the "functional curricula" of the EUTs. From this follows a specific pedagogy based on the routines of professional responsibilities, the increase of technical content and the generation of careers closer to production functions.

This new engineer is an economic player in his own right; understood as an innovation in terms of socio-professionality or, again, as an update of the polytechnician model. The EUT organization preaches in favor of a solid basic scientific culture, oriented towards the technique of the concrete functions of production.

Figure 26 : Employment trends x socio-professional groups



Source: Renault statistics (1995)

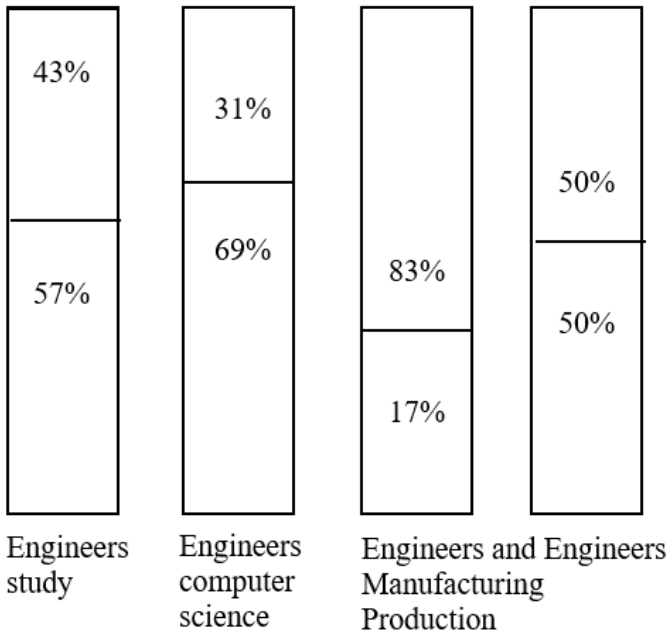
Two innovations follow in terms of highlighting this new role of engineer – *investments in knowledge acquisition in action.* They are based on the principle of responsibility of the relay form. This pedagogical principle makes particular reference to the relationship implemented at Renault actor/project, which the engineer inserts through a dialectic between the pole of experience of work situations, and the pole of constituted knowledge. The second innovation follows the first – *the new skills are defined at the end of continuing education involving a more important change that breaks with the mimicry of the Grande Ecole model (analogy of diplomas).*

The EUT is therefore moving forward to a remodeling of the training apparatus for engineers vis-à-vis the evidence of complexity of the productive system.

Since 1984, the increase in engineering and managerial jobs has been accompanied by a slight rejuvenation. The current average age is 40.5 years after 10 years of experience. The majority of recruitments have resulted in an increase in the initial training of engineers (BAC+4). Recruitment of young graduates was frequent during the above period, especially between 1988 and 1992. Currently 50% of Renault's engineers have a Bac + 4 and recruitment for this category remains stable.

Engineering jobs are divided into four priority functions: design, IT, manufacturing and maintenance. Among these four, design and computer engineers have experienced exceptional growth over the past ten years. The rapid development of computer engineering positions is linked to the emergence and rise of information technologies. As far as manufacturing engineers are concerned, they have declined considerably because of the factor that has come in new (they are older) – the company keeps them for a long time (weight of experience) which also explains the factor of non-negligible internal promotions (see Graph 8).

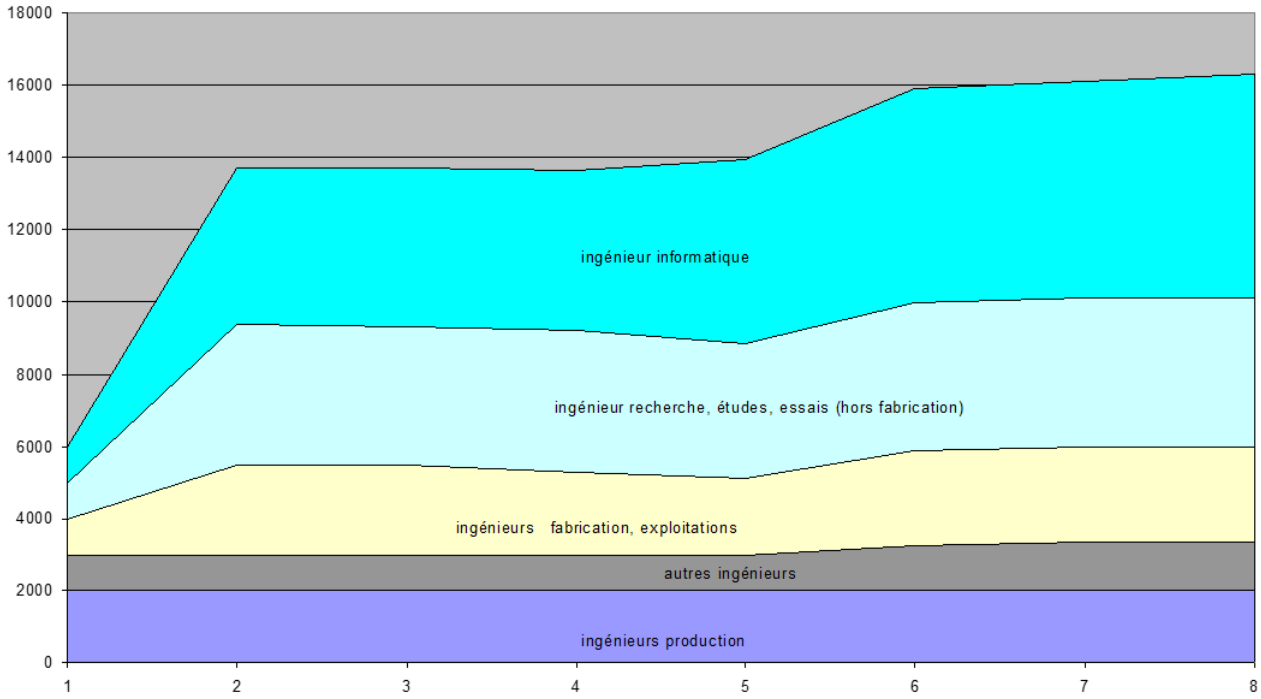
Figure 27: Important Functions for Engineers



Source: Renault – internal document – 1998

From Figure 9, we deduce that production engineers have evolved since 1986 compared to computer engineers, which are largely on the rise. This is explained by the increase in automation techniques. The latter carries out actions mainly at the level of computer-assisted training. In the growth rank, we have in second the research engineers, which express the policy of the company and its interest in the subject – innovation. Manufacturing and production engineers are considered a stable category.

Figure 28: Evolution of EngineeringUrs



Source: Renault archives (1998)
Note: author consider year 1- 1984 8-1997

4.2.9 Adaptation to technological change and promotion by individual category

Qualified personnel are the first to be affected by training actions. The exercise of a profession where the evolution of functions is permanent, either in groups where the tasks are complex, or in those who need to update knowledge and know-how.

At Renault, certain functions are more favoured over others. Thus, the functions of manager, technician and supervisor are benefited vis-à-vis a process of permanent training. More than 27% of executives and engineers are funded per year. This reality is due, first of all, to the facilitation given to the company in terms of their initial training and to reinforce the objectives of absorption/transmission of knowledge.

Table 28: category x training declared

Categories	Declared training (%) (including traineeships, seminars, endogenous training in the enterprise)
Engineers and executives	19,8%
technicians and supervisors	15,1%
Employees	12,2%
skilled workers	7,2%
Unskilled workers	5,8%

Source: Gerpisa (1996)

Manual workers are a category which also enjoys an advantage in terms of continuing training and its effects are confirmed in terms of the position held. This allows them to benefit from the

company's career plan, without major repercussions in terms of the activity performed. For this category, learning outcomes are converted directly into new operational skills and apprenticeships (see Table 30).

Table 29: socio-professional groups x upward occupational mobility

socio-professional groups	Upward occupational mobility
skilled workers	10,3
mastery	10,1
Qualified technicians	10,9
Technicians	6,3
Engineers	12,2
Frames	9,3

Source: Renault (1996)

Occupational mobility (see Table 30) seems to be at the crossroads of directly related factors, but they are not always compatible. Structural (management and strategic) and individual factors are inherent in the company's training plan and career plan (sec. 4.3). Even if they tend towards a logic of economic efficiency linked to specific projects, the training-promotion relationship is situated in a promotional perspective of skills. (see Figure 17).

4.2.10 An attempt to interpret continuing training among EUTs economically

There have been many attempts to introduce the criterion of staff performance into the salary relationship. The use of continuing training implies a reversal of logic, representing a possible way of incentive. Training as a device exogenous to production is in itself ambivalent, since it favours different statuses. In the case of UETs, it is taken as a means of improving or raising skills or qualifications, sometimes collective and sometimes individual. Training is "upstream" of remuneration and is understood as an investment in a specific project. Thus, it improves the competence/performance relationship as complementary to know-how. (Chapter 4, sec.4.1).

From the technical-organizational dimensions, it is possible to visualize the training effort through collective skills. The EUT has established as a measure the following expression: "the indicator of effort (or expectancy) of training of the enterprise is related to the volume of hours of courses, courses, seminars, etc., in the year of office":

$$\varepsilon_{it} = \delta_{it} \times \tau_{it} \qquad \text{(i3)}$$

ε_{it} is the indicator of training effort of the workforce and $\delta_{it} \times \tau_{it}$ represents the average duration of training i in year t multiplied by the rate of access to training.

We can therefore, from i3 compare the training effort by socio-professional groups, over a certain period of time, as shown by

Table 30:

Table 30: Evaluation of Training

Socio-professional groups	ε	Number participating in a training program	δ (in hours)	τ
Managers and Managers and Engineers	5,21	1.870	40	47,6
LAC + 2 technicians	4,32	10. 534	36	46,4
CAP/BEP workers	4,23	7.450	40	38,6
mastery	3,57	5043	40	32,6

Source: based on Renault statistics for the period 1995/1996

We can see that ε it is more significant in the managerial group than in the manual group, pointing to the initial training effort as very significant. Nevertheless, all categories benefit from recourse to continuing training, in terms of hours and integration rates. This reveals continuous training, both in the company and dependent on a flow of internal promotions, thus allowing the growth of technical learning and relevant knowledge.

SUMMARY OF SECTION 4.2

In recent years, the company has been ahead in the automotive market, with regard to technical-organizational changes. The analysis reveals the benefits of Renault's training policy towards increasing skills. In the defined network of skills, socio-professional groups are at the crossroads of their motivations.

Internal procurement policy focuses on the power of degrees over recruitment decisions. Thus appear two logics of coordination: one horizontal ex-ante and the other vertical ex-post. The hiring criteria have nevertheless gone through strategies related to new organizational models, relevant to the logic of information technology. Training, on the other hand, is not limited to learning tasks. Training team members and ensuring their supervision is important for the development and solidification of the company's professional framework. For a long time, training for management positions was reserved for professionals located in a privileged statute of the company (executives, engineers, etc.); There is currently another picture, resulting from continuing training: the trades sector was replaced by the development of teams, and training is accessible to all members of the UET.

4.3 Qualification Development Results

4.3.1 Introduction

Basic vocational training, as an effective remedy, presupposes the use by the enterprise of organisational principles, from upstream to downstream, adapted to its needs. The firm speech of Pierre Lefaucheux, Renault's first manager, concerning personnel, evokes as early as 1953 a concern for this training:

"We must admit, first of all, that the social aspect of the issues is always one of the first to be considered, that it must never be neglected, that everything must be done to improve the lot of the staff (both materially and morally)." These new men are considered essential to the change of orientation of the company's social policy."[81]

At Renault, training revolutionizes the business concept, through EUTs, by redefining it as an "apprenticeship organization". This integrates the major strategic choices and tools arranged in capital/man and capital/technology terms. In particular, training is experienced as a moment of valuing new operational routines and the acquisition of new skills.

Training needs include certain manpower planning criteria, such as: the financing of training courses and the generation of actions to assess their numbers.

The company's training plan has a specific budget for continuing education (around 3.2% of its turnover), which corresponds to the essential expectations for staff training at Renault. The decision to train is first taken by a works council which is attentive to sensitive issues relating to vocational training (general orientation, medium-term training plan, contacts with educational bodies, etc.). integration of young professionals, etc.) at the heart of the EUTs.

This section will first show the results of the implementation of an ongoing training model. The punctual evaluation of certain results, offers us a more attentive reflection on skills, professionalism, the integration of graduates and, the career plan. In this conceptual labyrinth, we observe a society (Renault Frères) formed in the middle of two wars (1918; 1945) and which is leaning towards models exogenous to its conjuncture. Therefore, this produces specific skills, limited by its corporate culture (sec.4.1, chap.4).

4.3.2 Renault's competency model

Currently, the model used by the company is part of a collective of intentions where agents work in autonomous cells (called UETs). In this environment, individual exchanges of knowledge

[81] Pierre Lefaucheux in Perriaux (1998) Renault et les sciences sociales.

develop, while preserving a collective dimension. The hierarchical approach is moving towards the horizontal coordination model, seeking instead an improvement in relations between agents.

From this, four important dimensions stand out:

- The use of diploma and qualifying courses;
- A network for the recycling of know-how establishing new skills with regard to information technologies;
- Tool usage indicators (regarding the number of failures; the number of scraps; handling times by group and actor-project unit; delivery and contacts between suppliers and project actors);
- The evaluation of the behaviour of the project actors in their respective work cells (UET) – the indicators of absenteeism, the mastery of individual and collective knowledge; The transmission of knowledge within the deadlines imposed by the hierarchical superior project officer.

The organization highlights a hybrid character of treatment of individual learning through the work collective. This "substitution" of the study methodology concerning the transmission of knowledge consecrates Renault as revolutionary methods of work organization in France. The competency model is considered intelligent[82]. It focuses on the individual and his or her ability to learn; working on the rational transmission of information.

This understanding of the model has two identities: learning and autonomy, which will be divided by Renault's learning system into two paths:

- The dualism of the optimization of learning type continuous training – this favors the reduction of the uncertainty of difficulties of the agents, granting them greater autonomy;
- The processing of imperfect information in locus – this axis calls into question the role of actors/projects. Each piece of information must be transmitted in a complete way (perfect information), in order to optimize the production cycle. Nevertheless, hazards are an important condition for groups with regard to the monopolization of knowledge. Learning is seen as ineffective. The evaluation problem is at ex-post level insofar as the objectives that allow the workshop to be evaluated.

In an attempt to eliminate these problems, which raise exogenous short- and medium-term uncertainties, the Directorate-General has decided in favour of an antinomic organisational

[82] An idea that goes hand in hand with that of the smart workshop.

mechanism (set up in 1999) favouring the treatment of productive problems, such as: ex-post risks of learning choices and difficult groups.

To promote the transparency of actions between actors, each autonomous unit writes monthly productivity reports, describing their uncertainties and prospects.

In a second step, this organizational device designates rules of work and control of work, based in two pairs: learning/autonomy and control/hierarchical coordination. To promote maximum efficiency, the company divides responsibilities by priority of processing in the short and medium term (difficult periods when implementing a technological innovation), including evaluation, specialization in polyfunctional terms and[83] procedures to be followed in the workshop,

4.3.3 Management Evaluation

Renault's General Management and Human ReSources Director François Foix have decided to evaluate its staff, focusing on certain criteria:

- the Elementary Work Units, as an efficient collective, have certain needs arising from the evaluation of systematic work, in the short and medium term;
- Operators have a greater incentive to meet the requirements of the platform to which they are attached. They have the necessary time for any malfunctions or tensions in the production flow;
- the autonomy of the units by respecting the actors/projects is granted by taking advantage in return of the learning generated by the versatility and the collective work;
- The collective (the workshop) is able to evaluate its own individual performance focused on the progressive improvement of results. Each schedule is established respecting man/machine expectations and, also by examining the difficulties managed in the maintenance of the machines, management, etc. or other factors that may jeopardize the confidence of the company and its employees.

These directives were implemented during the development of the technocentre in Guillancourt. They represent an advantage for human reSource management, in terms of real-time coordination in the workshop, as part of the hybrid flexible regime adopted. This reaffirms a constant preference for horizontal coordination controlling the treatment of productive hazards and the reliability of the production process. The purpose of the EUT organization is to organize staff with a

[83] The variety of new apprenticeships for operators who do not have the same qualifications (without worrying about stocks or deadlines)

high degree of specialization and prescription with autonomy in the management of short-term problems.

4.3.4 EUT - The democratic training management plan

First of all, the company's career plan leads to a broader production of knowledge and know-how with a pooling within the project teams. The emergence of EUTs suggests a reduction in power in the company in order to alleviate tensions linked to the selectivity of access to training.

The management of training at EUT therefore reveals a particular interest in resolving the tensions managed by the old modes of participation and which are still present in the workshop. Adaptation to new knowledge is done in such a way as to be able to integrate the actors into the technological process, providing them with a new conception of training followed by a broader learning. This promotes the agent as the bearer of a key skill in the work cell.

4.3.5 The company's career plan

Renault's career plan is an essential part of a context of profound change and constant evolution. The company's perspective is based on reciprocal content and, in a medium and long-term perspective, through a policy of technological innovation and participatory management.

Four main axes are articulated by this policy:

- "Grasp and prepare for company developments" the emphasis is on anticipating a central and local negotiation network;
- Manage the professional career of the EUTs, including in particular the gradual extension to employees, technicians, supervisors and workers in the annual individual career interview;
- The company's continuing education project is connected to the objectives of the professionalization plan for operators, maintenance agents, and scheduling in a spirit of continuous professional development;
- Establishment of a permanent evaluation regime for base units.

In particular, the transition to a project puts strong pressure on managers who must be exploited in more traditional functions. The opportunities are rather suitable with the availability of the actors/projects.

Ultimately, the tasks of "professional mobility" are taken into account by the career committees, which themselves are subject to evaluation. Profile management envisages a more fluid

flow of people who have an easier adaptation to organizational changes. From this follows the examination of adaptive knowledge to the other units.

4.3.6 Training specialties

All staff distributed in the EUTs, have the opportunity to follow training inside or outside, regardless of their team/project regime. From there, some training courses are sought in a more objective way as shown in Table 32:

Table 31: Most sought-after training

Internal or external internships in training specialties	(%)
management	7,4
Human ReSources Management	7,7
Occupational and environmental safety	6,5
Computer and desktop computer system including programming and teleprocessing and computer-aided office scheduling Computer aided maintenance	12,5
finance	1,9
marketing	5,5
Languages	4,8
techniques for the production of goods and services including other techniques operation and system maintenance. automated quality control new materials, products and services other training content	47,1

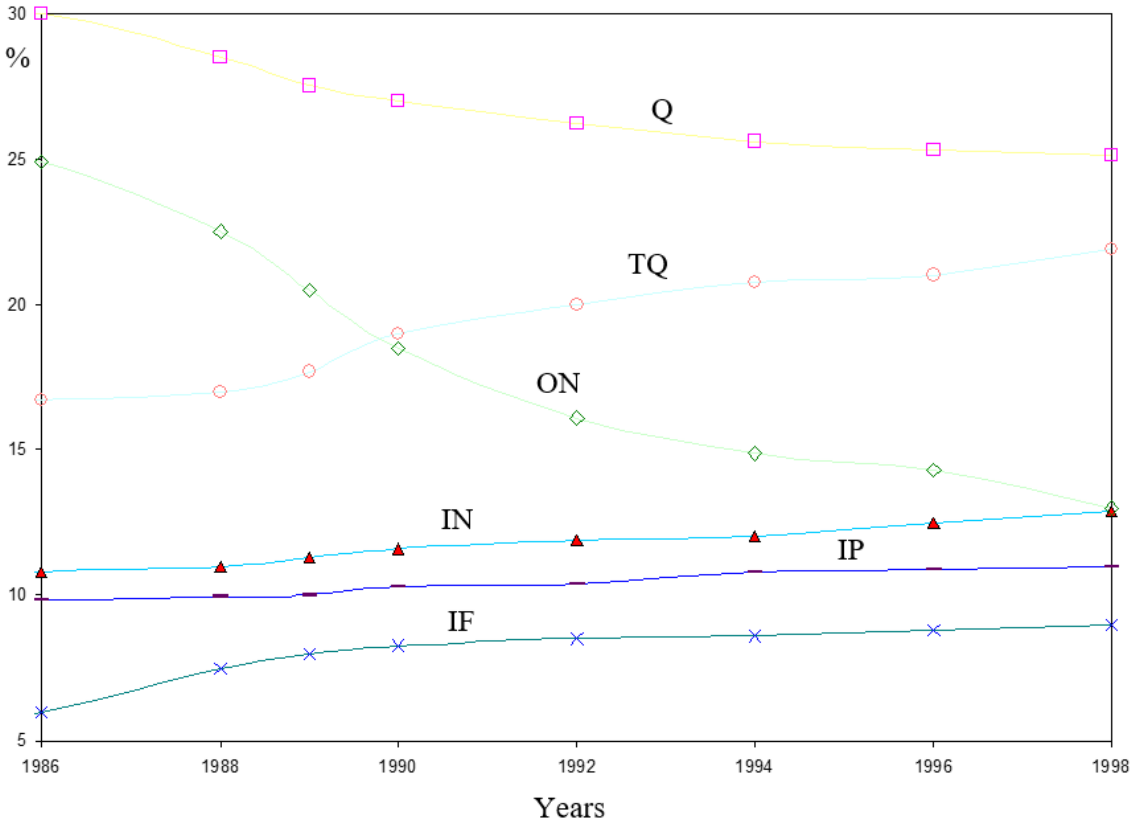
Source: Renault static archives (1996)

4.3.7 The evolution of qualification structures from EUTs

The evolution of qualification structures from the arrangement in autonomous cells has led to a modernization in three stages:

- the separation of jobs from training;
- reclassification of positions based on diplomas;
- the redeployment of specific training into multifunctional content.

Figure 29: The requalification process



OQ – skilled workers TQ – skilled technician
ON – unskilled worker IM – maintenance engineer
IP – Production Engineer IF – Manufacturing Engineer

In the training process implemented by Renault in general, everyone benefits. Nevertheless, the higher categories, which have a good initial base, have more advantageous access rates than others. We can see from Figure 10 that the training plan has benefited certain categories over others. In the definition of intelligent skills network, certain groups are paramount with regard to the production of skills, even favouring some who have not benefited in the same level.

The network organization currently favours the homogenization of the intervention of the regional directorates, by grouping together expertise professions in the General Management, headquarters in France. The strategy counts with an integration of regional management towards a commercial strategy and an increase in the scope of interventions. This confirms the premise of a flexible organization.

Renault's distribution network, the first in France (30% of car sales and 39% of after-sales) is supported by 450 businesses from the primary network (dealerships, subsidiaries and Renault establishments) and more than 6,000 agents. Attached to the France Network Department, the 10 regional directorates are the relay to the trade policy network, developed by the France Sales Department, via the business advisors in the field. However, that target organization has:

4.3.7.1 Redeploying skills in the field

- the regional directorates would expand their geographical scope of activity from 10 to 7 (on average 63 cases, 65,000 NV contracts and 905 agents) for better national coverage. Their mission: to deploy the commercial policy and ensure the evolution of the network.
- Within these regional departments, 38 "Network Team" composed of 114 people (compared to 72 business advisors currently) would be responsible for commercial performance in their sector and responsible for supporting the structural transformation of business. Each regional department would consist on average of 5 teams of 3 people: the "Network Team Manager" would supervise the "Sales Manager", in charge of the commercial animation of VN & VO sales and the "Services Manager", for parts & services. each Team would take care of 10 to 12 concessions.
- In addition, the posts of specialized experts would be grouped together in the Central Directorate of the France Network in order to free the regional directorates from tasks that can be centralized. These are network development advisors, sales, services, quality, network HR advisors ....
- Finally, the regional commercial vehicle centres would be redeployed from a national centre based in lssy-les-Moulineaux and 2 regional "relay" centres in Dijon and Marseille.

Integrate the seven regional directors into an upstream reflection through their participation in the deployment committee, created by the France Sales Department, which would be responsible for strategic sales issues, in order to include this field experience in the reflections.

Ensure global strategic coherence – Through this Deployment Committee, the France Network Management would ensure forward management over 4 rolling months, 2-month anticipation and better coordination between the France Sales Department departments.

Set up 3 information systems – In order to facilitate access to decision-making information, these three systems are set up: "DCS intranet", "Osiris" (France network management system) and "New distribution" (organization reducing delivery times to the customer).

A redundancy plan provides for 99 job cuts in regional directorates. An RPR plan is being studied. Age measures will be provided, each person concerned will benefit from an internal job offer.

SUMMARY OF SECTION 4.3

The modernization of Renault's productive fabric requires, first of all, the expansion of professional content, developing learning opportunities in the work process, among the EUTs.

Vocational training as a priority element in the development of the organization requires certain complex conditions with regard to the qualification plan. Qualification is emphasized vis-à-vis the collective, as a trivial choice of the skills process. Interdisciplinary is the key to training in EUTs. Such integration implies more a gigantic expansion of the content of professional actions, targets of a new internal reorientation of the learning methodology. The latter is expressed through the transmission of information between units.

This information network consists of a polydirectional transmission of knowledge. It thus articulates the qualification needs experienced in productive activity with the expected results vis-à-vis organizational changes.

SUMMARY OF CHAPTER 4

The methods of evaluation of training – qualification, are able to reformulate since the arrival of hybrid management models. On this basis, some estimation programmes concerning career functions and cost-benefit analysis were implemented.

In our theme as a whole, we were able to analyze the company with regard to three dimensions: 1) the new parameters of production organization in the search for technical-organizational changes; 2) versatility in the quest for new skills and 3) the innovation process perceived as a response to competitive implications.

The highlighting of these three key points led us to question this new emerging formation. The synthesis of results followed a three-part process: 1) the method of setting up the management of professionals and the transformation of socio-professional groups; 2) supervisors, maintenance technicians and project qualification; 3) current forms of high workers' qualifications.

The organisational practices, studied in this chapter, attribute a new status to the actors/projects: they are **skills generators.** EUTs are expectations of better economic performance making work evolve continuously. Now, the workshop has become a complex place of production, losing the simplism of manufacturing. These logics are polarized on the workshop, which remains a place where a set of requirements expressed within the global production space are focused, entangled and tested in real scale. This is the idea of a smart workshop.

OVERALL CONCLUSION

The technological dimension of the automotive sector is characterised by a high degree of convergence. Renault's pioneering experience, at the time of the "Ecole Technique de Renault", validated the premises of training provided with the aim of more rational productivity. These experiences give rise to a particular concept of managerial culture. New cognitive reSources have emerged as credible socio-technical targets that played a fundamental role in the arrival of the automation process in the mid-80s.

*The Japan effect***,** in the automotive industry has led to a "continuation" of learning from automation, thus redefining the role of actors. It was necessary to resolve to "transform the role of the actors through the central technical services to the manufacturing frameworks. Finally, this passage signified a "paradigmatic revolution" in terms of learning. This made it possible to take into account the collective nature of the acts of work towards a technical rationality, or even rationalization of the exploitation of knowledge.

Renault has undergone significant organizational changes that have caused errors in terms of learning. The experience of old learning methods and the availability of new cognitive reSources have been the organisational targets of the new methods translated into the development of its current model of work organisation : the Elementary Work Units (UETs). In short, contingent and differentiated intermediate forms (as well as the effects of knowledge circulation) favour a comparison with a homogenization of qualification resulting in new exploitation of knowledge. The importation of the JAT, has reviewed the technical reality of the company. However, the JAT being designed in Japan was thought first in the local configuration, on the contrary the reality of the France, has drawn up another approach of JAT converging towards a "one best way socio-technical.

4.4 Lived training

Renault, in its technical career has had serious training difficulties. Rather, they have been associated with a complementary and not a fundamental approach. The training since 1985, is then the subject of multiple arrangements, because of the critical state of which it was. Undoubtedly, institutionalization puts an end to the shortage of well-trained managers and operators. In 1991, interposed research was set up, thanks to a new framework of integration with service providers and

partners such as GIP – industrial changes and GERPISA[84]. Renault is internally seen as the company of one best way[85].

This leads to a reference to the classic discourse on the organization of work as a *generator of training linked to the issue of new skills*, previously considered in the trades/project. Training related to new professionals reaches the company's career plan indiscriminately, increasingly promoting a flow of professional promotion. Behind these premises lie special subtleties such as the perpetuation of a professional culture around a pivotal notion : *qualification in terms of economic efficiency*. In addition, the players in the game apprehend a new concept of training, synonymous with qualification. It is therefore always a question of the company deciding to operationalize the adaptations of the qualification to the workplace, allowing a perfect hierarchical harmony. This is likely to start from the implementation of a complement: **continuing education**. The latter calls into question the transformation of pedagogical practices raising problems of articulation between work and organization. This revolution, generated by training, gives rise to elementary production units in the company.

4.5 UET – The learning history at Renault

The objective of the EUT is to carry out a collection of knowledge (knowledge capture) and not only to serve as a support for the assessment of individual competences.

This position has forced Renault to exclude the remuneration of individual skills - the actors are involved in a collective approach. Evolutions, social benefits, technological changes and those of training are experienced in the group. Undoubtedly, the individual role of the actor in his project is important, but it is only spotted in his micro-environment, where all the other actors have approaches of equal responsibility.

The management of UETs is focused on a paradigm shift. It is based on the evolution of cell work and on an acceleration of technological innovation from which the skills to be developed originate.

[84]From 1953-68 – Domination of the design department and personnel management.
From 1971-90 – A research network is established in which multiple parties are engaged (Patrick Fridenson, C. Midler, G. Bonnafoc and M. Freyssenet) and from 1990 the anchoring of training is strongly developed in the socio-economic group in the DR of which there are networks institutionalized by partnerships (and including the National Education) and other research groups.
[85] Véronique Beillan in Perriaux (1998)

The development of these skills constitutes a potential for individual and collective adaptation that promotes responsiveness[86] - constitutive part of a new methodology for understanding knowledge.

The knowledge of the agents, capitalized in the UETs, is assimilated as instrumentation of an efficient workshop, certain variables such as the treatment and elimination of breakdowns ensure horizons of a policy of confidence of the company (reliability). Learning becomes an adjustment feature in units; promoting, as a first step, a reconversion of acquired collective skills, unbalanced by the previous organization. One of the consequences noted is increased maintenance services; the best elements assigned to the rows (where they were, in the short term, the most useful). A dynamic of performance improvement is implemented based on the strengthening of weak links and by hiring BTS, BAC, BAC + 2, and young engineers.

Some data support the assumptions made in the first chapters of this study. We reaffirm our belief: ***Training models are the result of technological changes sought by the company***. The latter takes a position of supporter of flexible regimes inspired by the "Japanese", it is always a careful look at its technical culture.

We have convinced ourselves that the UET organizational model has favoured an original re-evaluation process since the arrival of the Japanese model at Renault. The impact of flexible technical changes and the never-ending quest for a better position in the market, triggered a process of top-down review of this company's procedures. The models originating from the JAT (platforms/project; trades/projects) required gigantic efforts to change the qualification of staff and the polyfunctionality regime (old-fashioned).

We believe that we have testified during this work to the importance of organizational integration linked to a logic of rationalization of knowledge production. We highlighted the fact that organizational relations are evolving towards a logic of cooperation based on a principle of innovation, creation, collective accumulation of knowledge and the exchange of knowledge. Thus, coordination cannot be reduced to a simple hierarchical logic. On the contrary, it can lead the construction of knowledge, either to the issues of incentive principles, or by using its decision-making power.

This study shows that it was important to draw up a problematic framework around vocational training among UETs, and the way in which it was conceived within the company. Training is perceived as essential and therefore as an imperative mode of understanding the transformations of work. It is reflected on the basis of the lived experiences of each group, in a specific project, giving

[86] Reactivity means the company's ability to quickly develop original behaviors, in the face of unpredictable situations (adaptive rationality). This term goes hand in hand with the idea of production flexibility.

priority to an intergroup expansion of information and the evolution of competences at the collective level.

In this respect, changes are being observed in the company's policy on pedagogical training strategies. Nevertheless, the reports identified some important difficulties:

(i) the problems of adaptation to the new training implemented;
(ii) the continued use of old methods by some actors;
(iii) the choice between versatility and specialization;
(iv) the influence of training on career plan policy;
(v) the role of technical representations and their weight on the determination of the training content and facilitator;

The first two points stem from the implementation of the training model. It produces such an impact that it generates resistance in certain occupational groups in a specific or multiple cell.

The third point refers to the problem of the challenges of skills management, to the coherence of various organizational practices, particularly with a view to flexibility. By developing concrete training methods (see Figure 25) adapted to the operating objectives, there is a reluctance to the versatility sought, concerning a specific function and training more open to the exchange of the group. Thus, the company may not achieve the desired flexibility. Vocational training, then, is considered as an out-put mechanism of initial training, articulating the capacity of actors/projects with different functions. This creates internal resistance to changes, damaging the training work.

The fourth point refers to the training-job dilemma. The principle of EUT focuses on collective skills whose combinatorial knowledge to each group/project results from a so-called optimal complementarity. This implies a synergism of the skills acquired individually available to the collective. This refers to mobility intentionally guided by various trainings. All groups benefited from a regular training course. Nevertheless, in a regime of semi-horizontal hierarchy, the definition of positions by criteria of election, intellectual and cognitive apprehension is still imposed. The company's policy works according to a search for homogenization of non-rigid groups, hence the fact that each group/project or UET, holds a specific knowledge. These refer to the examination for certain elements that may conflict with the principles of the units, namely: "learning knowledge" and "effective production of competences".

The fifth point highlights the difficulties of administering the technical competency framework. Initially, the technical tools made available to the actors can cause hazards in productivity and, secondly, it can have instability in the environment of the UETs. To this is added an anticipation and the prediction of technical problems and, the adaptation of the actors, validating the principle of imperfect rationality to which the company is subject. Finally, this point involves the difficult

adjustments of a new technological base which constantly refers to problems of inadequate training. Aiming to eliminate this problem, UETs work in solidarity. This behavior leads to a logic that breaks with the possession of knowledge at the individual level. The project is defined by the group as well as the training content and skills.

4.6 The hypotheses worked

We guided our work through the dynamic effect of technical-organizational changes according to two hypotheses:

The first hypothesis relates to the period following a technological change. The company is committed to a redefinition of its organizational parameters. This, in a scale of values in terms of training an optimal maximization of professional profiles. In other words, technological changes cause organizational change through adaptation and adoption of new learning, generating new knowledge.

The second hypothesis links the ex-post restructuring of the engendered learning process to organizational change, giving the possibility of an in-put training process of productive activity. Knowing that in a horizon of imperfect rationality, the company must expect dysfunctions caused by the new organization, in terms of established profiles. In this terms, EUTs are designed to facilitate organizational coordination.

It seems important to us to bring some nuances to the hypotheses stated:

- The first concerns the phases of restructuring of the productive workforce and the supervision of training in autonomous cells, as in the case of EUT at Renault. The change of organization in EUT can be able to develop responsiveness as well as the reduction of hierarchical lines to allow a better flow of information between agents.
- The second, the level of the group in terms of training is increasing, so we notice a better identification of collective skills and individual learning. The second claims a bond of trust between the trainer and the actor in training.
- The third nuance shows the management of hazards to overcome difficult professional situations and the requirements of polyfunctionality.
- The latter reveals the association of organizational change with the consolidation of functions resulting in the restructuring of the career plan and the reduction of the productive workforce. Some functions are considered as a mission of expertise, often associated with high-level theoretical know-how. Other functions are appraised by their adaptive knowledge and still others, by professional mastery. In a collective context, as for the EUTs, there is no rapid evolution at the level of personal promotion, which can generate demobilization. Occasionally, there is a redefinition of the

effective contingent that will be operationalized the employability of a new skills management to develop proactive or contingent animation strategies.

The observations made in this thesis help to clarify how the company should approach vocational training. We distinguish two important points: the first is that of the criteria for evaluating trainers and training content. The second is the management of skills to defuse union demands. By engaging in a costly policy, such as that of continuing training, the company highlights the value added to the individual skills of each agent by showing a tacit compromise between them. This strengthens the company-employee link, preventing the penetration of crises.

The importance of developing global quality policies is accompanied by rising market pressures. The ability of staff to take initiatives remains, as by the EUTs, new avenues for the exploitation of knowledge, management and a new vision of hierarchy.

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