For a long time, researchers and practitioners considered productive automation as the result of scientific and technical progress and thus as a growth factor exogenous to the production sphere. The speed with which it was adopted and spread, together with its perfecting could vary depending on financial means and available competencies; however, many thought they could not do without if they wanted to increase productivity and quality. On a different level, there was a debate on the organisational and social effects of automation. This debate can usefully be summarised into the confrontation of three main research orientations by over simplifying it. For some, productive automation entailed a change in the content and the organisation of work, and consequently in the competencies needed (Touraine, 1955), for others, it had no effect on work itself, organisation choices were the only important things, and their origin was to be found in the education system and professional relationships of a given country (Maurice, 1980). Although it was considered marginal for a long time, a third research orientation is making its way to the front line today: productive automation is grasped as an endogenous and multiple phenomenon. It would assume different forms depending on the objectives and the economic and social presupposition which direct its conception and implementation. It would then effectively have organisational and social effects, and these would vary according to the forms it has, because it is a social construction in itself (Noble 1989, Freyssenet, 1992, 1997). The present chapter will try to develop this type of analysis by widening this point of view. In some of my previous work, I tried to show how the image that managers and engineers have of productivity and man at work bears a consequence on their automation choices (Freyssenet, 1989, 1994). Here, I will demonstrate that these images are part of profit strategies which differ from firm to firm. Two series of research will be the base for this demonstration.
The diversity in strategy and automation forms adopted by car manufacturers in the 80s and 90s is one of the main conclusions reached by Koichi Shimokawa, Ulrich Jurgens and Takahiro Fujimoto in their research work on assembly automation following two colloquiums they organised: Berlin in 1992 and Tokyo in 1993. As they point out in the book they co-wrote Transforming Automobile Industry, Experience in Automation and Work Organisation, this world-wide diversity can also be found in three regional poles for car production (Europe, North America, Japan), even if it is not always similar. Thus, strategies and automation forms are not linked to one particular company management model, be it national or regional, should such models exist.

So what are the causes for this diversity? According to Koichi Shimokawa, Ulrich Jurgens and Takahiro Fujimoto, the causes are the objectives, the contexts and the time of automation which have differed from firm to firm. Of course, everybody is concerned with competitiveness, they write. But some manufacturers brought automation to improve working conditions, others to face the variety in demand, others to increase the product quality and others yet to master new technologies. These differences in priority are rooted either in the constraints of the work market, or in the changes in car demand, or in the relationship with other manufacturers. As for the future, Koichi Shimokawa, Ulrich Jurgens and Takahiro Fujimoto believe that the next assembly automated systems will be the result of the hybrid of the various present strategies and assembly systems, and their making will depend on the history, the competence and the context of each firm.

I would like to go further in this analysis, starting not only from the cases reviewed in their book, but also from the results of the international research programme of the GERPISA, carried out from 1993 to 1996 on “Emergence of New Industrial Models in the Car Industry ”, that I co-ordinated with Robert Boyer (Freyssenet, Mair, Shimizu, Volpato, 1998; Boyer, Charron, Jurgens, Tolliday, 1998; Durand, Castillo, Stewart, 1998; Lung, Chanaron, Fujimoto, Raff, forthcoming; Boyer, Freyssenet, forthcoming) and from the work I carried out on automation, in particular in Renault (Freyssenet 1992, 1994, Decoster, Freyssenet, 1997). The object of the first section of this chapter is to spell out the questions left unresolved and which give an understanding of the diversity of strategies and automation forms, after a remainder of what Takahiro Fujimoto, co-author of the said book, said in particular with respect to characteristics and explanations. The second section will concentrate on understanding the basic reasons for diversity from the differences implemented by companies in profit strategies and from the industrial models they have built to put into practice these strategies within their own context. The third section will show how the others causes for the diversity in strategies and in automation forms come from the difficulties in building or using an industrial model in order to put into practice efficiently the chosen profit strategies.

The diversity of strategies and of automation forms. Unresolved questions

From the cases presented in the book and a very precise questionnaire survey carried out with the twelve Japanese car manufacturers, Takahiro Fujimoto identified four main automation strategies which differ in what the manufacturers want to improve and the means to reach that goal. What they want to improve can be spread along an axis from working conditions to the firm competitiveness. The means used can also be spread
along an axis going from an additive approach of automation to a systemic approach. Positioned perpendicularly, these two axes are the limits of four quadrants, corresponding to the four identified strategies, each inferring a particular form of automation. We will summarise them briefly and invite the reader to go to the original text for more details (Fujimoto, 1997). The “Human Fitting Automation” strategy aims to improve working conditions by automating the most physically demanding jobs one by one. It was adopted in the Toyota Tahara factory, and also in the Nissan Kyushu one. The “Human-Motivating Automation” strategy aims not only to improve working conditions, but also the work content using automation in particular to allow one working team to completely assemble part or the whole of a vehicle. It could characterise the Volvo-Uddevalla factory, and also the Toyota Kyushu one in certain respects. In the “Low-Cost Automation” strategy, automation choices are dependent on the cost-cutting objective in all aspects, including investments. Automation is limited in its spread and level to what is economically relevant. This happened in the Toyota factories in the 80s. The main features of the “High Tech Automation” strategy, which is based on a kind of technological optimism, are sophisticated pieces of equipment supposedly enabling one to reach a high level of productivity, quality and flexibility. According to the author, it was applied in Volkswagen Hall 54 in Volsburg and in the Fiat-Cassino factory.

This typology is a new and important contribution to the effort made to substitute to the classical representation of automation, the new vision of automation. The classical representation is homogeneous in its technical characteristics, changing with scientific and technical discoveries, and spreading out more or less quickly depending on the countries and the firms. The new vision of automation is varied in its objectives and forms, following the contexts which can be dominated either by work market requirements or by product market constraints, and because of approaches which can be systemic or on the contrary additive. Indeed, firms could not adopt the same strategies and the same forms of automation, as they had to solve different problems at different times and with different means.

The proposed typology enables us to understand why, in certain cases, the priority of automation is the improvement in working conditions and in others an increase in competitiveness, given the different economic and social contexts. On the other hand, it does not help us to understand why in the same context the additive approach is given preference over the systemic approach, or vice-versa. It does not help either to understand why (and the case is real) the improvement of working conditions was chosen in a context of competition and demand constraints.

Further to their main features, the forms of automation observed show secondary characteristics, the combination of which must also be explained. A first series of choices are in effect the general scheme of the assembly, that is to say: the type of assembling (complete assembling of vehicles in fixed and parallel stations as in Volvo-Uddevalla, additive line assembling as in nearly all assembling factories), the structure of the line (long, short, chopped, with secondary assembling lines for sub-units), the way the product moves (a non-stop or step-by-step conveyor, “Automated Guided Vehicles”). This first series of choices affects the following ones. The second series is the spread of automation, the types of jobs to be automated, the location of automated equipments in relation to the zones that remained manually handled (are they grouped in separate zones or are they scattered in the manually handled zones?) and in relation to how the product moves (is it fixed and sensitive, or mobile and synchronised with the
line, or is it a autonomous transfer line in itself?). The third choice is the level of adaptability of the automatic tools themselves and the part left for the worker: is the equipment mono or multi-product (through adaptation, sub-division or derivation of the line, or AGVs)? Are the part alignments done mechanically, with manual guiding or automatically with a video camera? What is the part left for the worker?

The GERPISA international programme “Emergence of New Industrial Models” allowed the study of the requirements of both work and the market, their origins, their long-term changes in the three world poles of car manufacturing, and the different means used by firms to answer them, thanks to the analysis of their trajectories et hybridisation processes. It would seem that many of the means used by firms are in fact part of the profit strategies and the industrial models that allow for such strategies to be carried out. In the following section, we will study these strategies and models to see what they imply in terms of automation strategies and forms.

The firms' profit strategies and the industrial models adopted to carry them out imply different forms of automation

A profit strategy is characterised by the source(s) of profit it privileges: volume, diversity, reliability, the equipment level, innovation, productive flexibility, technical changes, cost reduction for constant volume. In order to implement it effectively, one must have a product policy, a productive organisation and a wage structure which are consistent with it, in a word, an industrial model. There may be various ways of implementing continuously the same profit strategy. Hence, several industrial models can be built for one strategy only. It all depends on the management compromise that can be drawn up, bearing in mind the era and the environment, between the main actors: shareholders, managers, employees, trade unions, suppliers and distributors, public services.

The strategy making economies of scale a priority was efficiently put into practice through the Ford model. Today, no firm will produce a sole high volume model, like Ford did from 1909 to 1927 or Volkswagen from 1947 to 1973. However, some firms will produce three or four models only, each with its own specific platform, with only one or two body possibilities and very few options. This is a volume strategy only for the market segments that make it viable. It supposes that an important part of the customers of each of these segments has homogeneous needs and expectations on the long term. The Ford model is the one that historically implemented this strategy by specialising lines, men and machines for a number of years, and by constantly trying to increase productivity. As we know, this model is founded on a compromise characterised by employees accepting repetitive work and the constraints of productivity growth in exchange for a regular increase in the purchasing power of their salaries. It can only remain viable if this company management compromise lasts. When the market conditions are the ones mentioned above (as in South-Korea for about twelve years), automation comes as specialised equipment that can function for a while at a high pace, i.e. all at once stiff, simple to use and solid equipment (Chung 1998). Initial investments are high, but they are paid off through the large volumes. Equipment is only very partially reusable for the subsequent car models, but their maintenance is cheaper thanks to their lack of sophistication. For stamping, as well as for welding, automated specialised transfer lines are usually used. Because of the relative complexity
of the product and of the manual operations that remain, it has been difficult to automate assembling. Joining of the body and mechanical parts, installing the wheels and the front ends are operations that can be automated on this mode. They constitute automated zones distinct from the manual zones. The part left for the worker remains limited. Manual operations become even more repetitive because of the reduction in the cycle length, the operating of the automated specialised transfer lines can be left to operators without any particular skills.

The second clearly identifiable profit strategy is the strategy which puts first and makes the economies of scale and the effects of variety compatible. It consists in increasing the number of car models offered while communizing the biggest possible number of their parts and pieces. It supposes a diversity in the expectations of customers towards the automobile following a relatively regular continuum from the bottom to the top-of-the-range and hence a low differentiated income distribution. Customers want a diversity in use, appearance and equipment but accept numerous non-visible common elements. In order to remain profitable, this strategy needs either that the demand for this type of product range increases both nationally and internationally, or that the firm widen its market share by buying out other firms keeping their models but installing on them common mechanical parts and components. It has been pursued by firms like General Motors since the 20s, Ford, Renault, Peugeot, Fiat, Nissan since the 60s and Volkswagen since 1974. The industrial model which successfully implemented this strategy is the Sloanist model, and only General Motors from 1945 to 1974 and Volkswagen since 1974 have succeeded to live on a long term basis (Freyssenet 1998). It is founded on a company compromise which consists in the workers to accept a repetitive and polyvalent job, in exchange for career and salary progression depending on the number of jobs. Assembling lines as well as machines and manufacturing workers must be able to ensure diversity and variation in the volume to be produced. The lines are chopped with buffer stocks allowing to absorb assembling time variation depending on the type of vehicle being assembled and various incidents due to diversity, and to prevent line stoppage. Automated machines are adaptable to the variety of bodies and equipment levels of cars. The specialised transfer lines enable the rapid replacement and tuning of press matrices. Welding lines are made up of a multi-product main line (thanks to robots or specialised welding machines put in derivation), fed by secondary lines or welding units. This fishbone structure tends to be more frequent in assembling. Indeed, it allows for diversity to be put upstream the main line, where automated equipment is concentrated with module fixation operations. The "wedding" of the body and the underbody is done in multi-products fixed automated installations (Wilhelm 1997, Naitoh, Yamamoto, Kodama, Honda 1998, Decoster, Freyssenet 1998, Jürgens 1998). The automated installations are sophisticated and compact. The operators do not have to control their functioning, but only to intervene to restart production fast in case of stoppage, leaving repairs to maintenance workers and reliability to technicians and engineers.

The innovation and flexibility profit strategy consists in the conception of vehicles corresponding to emerging demands, and in their massive production if the orders confirm what was anticipated. This must be done before the other car manufacturers (those pursuing a 'volume and diversity' strategy in particular) come and copy them. It was the strategy chosen by firms like Chrysler, Honda, Mitsubishi, and more recently Renault. It supposes societies in which new social groups appear with their own expectations and needs. Income redistribution is advantageous for new competencies
appearing or for initiatives that are taken, all this without creating considerable inequalities. Global demand can grow or not, but it renews itself within its structure. Thus the range of models is not organised in a regular hierarchy following a stable income scale with a foreseeable evolution, but it is organised in consistent models, with their own platform, according to the expectations of the emerging social groups. The Honda industrial model is the one that successfully represents this profit strategy, as the other firms which pursued this strategy have never up until now been able to acquire consistent means to make up an industrial model. The Honda model is founded on a company management compromise where expertise and individual initiative are valued at all levels in exchange for the best working conditions and salaries in the sector (Mair, 1998). Above all, the socio-productive organisation allows the rapid allocation means and labour to the innovative vehicle(s) which has (have) found its (their) customers. It is characterised not only by ergonomic work stations but also by the fact that these can be adapted by the workers. The manufacturing integration rate is low. Assembling lines are short and easily adaptable. Parts are delivered by the suppliers assembled in small and medium-size sub-units. Automation in assembling is in fact reduced to assisting systems for the joining of heavy or bulky components. The important part left for the worker and the improvement of working conditions are inherent to the Honda model. These characteristics preceded the work market slump in Japan from 1988 to 1992, even if this led Honda to experience even more "human" organisations (Tanase, Matsuo, Shimokawa, 1998).

The fourth strategy is the one putting first the permanent reduction of costs for constant volume. Even when a market allows for example economies of scale, or to have quality paid for, the company carries on regardless to reduce its costs for constant volume, as one is never safe from a change in the economic set-up, the failure of a model, a change in the state economic policy, a variation in the exchange rate or the competition of a more effective manufacturer. In order to be successful, this strategy supposes to find means that make it acceptable to employees, suppliers, ... and even competitors. Indeed it is very demanding for the employees and the suppliers and exacting for competitors. Toyota succeeded in doing this for about 40 years (1952-1990), obtaining a direct contribution from its employees and suppliers in the reduction of standard time slots (Shimizu, K., 1998). They managed to limit their competitive advantage to the point beyond which protectionist reactions would have prevented any international expansion. The company management compromise founding this model is the participation and permanent reduction of costs in exchange for employment and salary increase guarantees for employees and order guarantee for suppliers. In general, reorganisation is used first for the improvement of performances, the introduction of new machines comes after. Existing machines are improved and transformed to their maximum before they are replaced. These organisational and technical changes prepare for automation, which then happens progressively and at the lowest costs. The lines are continuous without buffer stocks, so that problems of line stoppage appear immediately and are solved rapidly. For the same reason, automated equipment has a low level of sophistication, that way the causes of breakdown and anomalies are easily found. The level of automation is only increased following the knowledge and control of perturbing factors. These are spread throughout the assembling lines. The operators of nearby manual work stations intervene as whenever it is necessary.

The fifth profit strategy is the one putting first specialisation in top-of-the-range and the quality of vehicles. It is (was, for some maybe) the strategy of BMW, Mercedes,
Saab, Volvo. It supposes that part of the customers are ready to pay the price for quality and social difference, i.e. well off customers. The manufacturer who adopts this strategy is not looking for volume. Too wide a diffusion would make the product ordinary and reduce the attraction. Margins are made on a high price. This price is part of the product definition as much as the quality of the mechanics, the equipment and the finishing and the other socially distinctive signs. The customers concerned are more or less spread out depending on the type of redistribution of the country national income, but by nature remains limited. That is why manufacturers choosing this strategy aim both at the domestic and international markets right from the start. The management compromise of these companies is based on the diversity and quality of work from the workers in exchange for better working, salary and stability conditions than with other more general manufacturers. The workforce is more polyvalent and used to option and version variations for the same model. Cycle times are longer as speed is less important than execution quality. Neither the press line nor the welding line are high paced. They do not need to be highly automated. Assembling lines are chopped and separated with large buffer stocks. There are numerous help systems for joining operations, as well as ergonomic tools making the work easier, such as the rolling-axis transport system (Hsieh, Schmahls, Seliger 1997). The line can be replaced by AGVs which, though expensive, give even more flexibility and above all better working conditions. Having the specialised German and Swedish manufacturers looking at automation from the point of view of the improvement of working conditions is not that surprising, even though they were faced with the same constraints from the work market as major European firms. The lengthening of the cycle time, work groups, assembling in fixed modules, joining assistance, and transfer automation also enabled a response to increased requirements in quality and to manage diversity more easily. These are essential conditions for the specialised manufacturers. The experiences went the furthest with them, all the way to the complete suppression of the assembling line principle and its replacement with complete assembling of cars in fixed parallel stations with two or four workers (Engström, Medbo, 1995, Ellegard, 1995, 1997, Nilsson, 1995).

The sixth strategy is the variety and flexibility one. It characterised British manufacturers in the 50s and 60s, and Mazda in the 80s, however this manufacturer was unable to use it successfully due to an inappropriate market for this strategy and to insufficiently consistent means. Indeed, the "variety and flexibility" strategy consists in offering car models to social groups with specific needs and expectations. It supposes a society where the distribution of national income is all at once unequal and stratified. It is quite possible that the conditions necessary for such a strategy to be successful might reappear with the deregulation of salary scales and employment structures. This strategy requires the rapid creation of new models and production in medium run of a wide variety of vehicles with few parts in common. That is why vehicle modularization, manual assembling of modules on sub-assembling lines and automated fixing modules on the main line are a way towards solving the difficulty (Kinutami 1997).

The last profit strategy is the production of luxury and sports cars pursued by Rolls-Royce, Porsche, Maserati, Lamborghini, etc. It consists in creating and producing luxury and sport cars in very short runs and for a very high price, symbolising all at once the wealth and personal tastes of the owner through the level of personalisation, notably in the equipment. The production of a manufacturing type in fixed stations does not prevent automation, in particular assistance from machines with digital command for the machining and the fitting of parts.
It is difficult to find consistence between the profit strategy, the socio-productive organisation and the form of automation

If firms applied the automation form consistent with the industrial model they created or use, the number of forms of automation would be limited to the number of identified industrial models. Reality is of course much more diverse. Not only do firms sharing the same context and pursuing the same profit strategy turn to different forms of automation, but they also implement different forms of automation within their plants. Does this mean there is no rule? The diversity inter and intra-firm, larger than the number of existing industrial models, can be explained by two main facts: firms embodying a model must change from time to time, firms that cannot find a management compromise to bring consistence between the various means used are by far the most numerous. Hence multiple and sometimes contradictory automation forms.

All the firms that either created or used one particular industrial model met with difficulties after a more or less long period of success, and have had to change their socio-productive organisation, their employee relations, or even their product policy. There are two reasons to this: either success modified the conditions that made the company management compromise possible; or, the type of growth and redistribution of national income changed, following changes in the competitive relationships between countries, and thus the profit strategy pursued lost its pertinence (Boyer, Freyssenet, forthcoming). General Motors met with these two types situations one after the other. They implemented the "volume and diversity" profit strategy successfully inventing and embodying the Sloanian model in the 50s and 60s, to the point that many firms tried to imitate it at the time (Freyssenet, 1998). But the entering of a replacement market at the end of the 60s, the difficulty in exporting American cars because of their specificities, and the impossibility to absorb another manufacturer stopped the volume growth indispensable to this strategy, as well as the increase in the staff, the internal professional mobility and the salary progression which are all part of the Sloanist management compromise. The dynamic of the model was further stopped by the 1974 slump. Due to the increase of the energy bill and of the competition, the USA has had to change the way national income was redistributed to become competitive. With escalating social and economic inequalities, the "volume and diversity" strategy lost in pertinence. GM had to add to the variety of their offer without being able to increase the commonising rate of their platform. With these difficulties, GM first tried to improve their productivity and the quality of their products by giving way early, beginning of the 70s, to automation and robotization, while the origin of their problems were to be found in products ill adapted to exports and which were beginning to become so on the domestic market. Automation was GM trying to adapt, thinking they could keep their model and strategy. Actually, not only was automation inappropriate and costly to solve GM's competitiveness, but it also enhanced it bringing about further staff reductions and further destabilisation of the company management compromise.

In 1990, the Toyota model was presented as the example of what the future industrial model should be. The same year, this very model reached the limit of social acceptance within Toyota. The boom in Japan domestic demand and the impossibility to recruit enough young employees because of harsh working conditions led supervisors and workers to refuse the increase in overtime, and on a larger scale the work and salary...
system. Toyota then had to overturn their production system and to find new ways of to involve employees in cost reduction for constant volume (Shimizu, 1998). They drastically reduced, or even suppressed as in the Toyota-Kyushu factory, the obligation that each team had to reduce their standard assembling times. They chopped assembling lines in separate parts with buffer stocks to limit the pressure from continuous flow. They rearranged work stations to suppress painful positions. The automation form was affected by this. Automated equipment was simplified, its functioning made even more visible and controllable to the workers of the team, so that they could improve it if necessary (Niimi, Matsudaira, 1997). But this new form coexists with ancient forms that will only disappear with a change in the car models. It is also possible that the new situation of the work market in Japan and the changes in Toyota product policy will lead to yet another form before the present one spreads out. Indeed, Toyota is searching. They have not managed to find again the internal consistence they had for several decades. It is also possible that they are changing their profit strategy, as certain new directions and manager announcements would lead us to believe.

But the diversity in automation forms is mostly due to most firms' incapability to have some consistence between product policy, their productive organisation and their employee relations and with the profit strategy they are pursuing. The reasons are many.

Not many realise the necessity of consistence, in particular of technical choices with social choices and strategic choices. For them, these choices are in different domains with their own independent logic. That is why one can see many cases where automated installations are compact for space saving and difficult to reach for reasons of security, whereas it is officially required of operators-supervisors to closely follow the functioning of these installations to prevent or see anomalies, so that they can find and take care of the primary causes, and thus narrow the flow and reduce the assembling time (Freyssenet, 1994).

The construction of a long-term company management compromise around the means to be used is a very difficult process to bring to its term. Beyond the fact that some of the actors are not necessarily conscious of the importance of this compromise for the life of the company, they have to be able to create it, i.e. to have at the same time macro-economic and society conditions which hardly ever happens as they are the result of quite unintentional processes. A number of employees and trade unions in Europe, the USA and also Japan thought for a long time that it was up to car manufacturers to improve continuously the employee situations, and that the managers should find the means alone. Some of the latter were not far from the idea themselves. The imperative of competitiveness following the oil crisis reminded the main actors of their necessary implication in the construction of a new management compromise. But the rapid increase of unemployment in many countries, the softening of employment laws and the weakening of trade unions created a political and social situation that allowed many firms to do without the real construction of this new compromise, with employees being obliged to accept the new working norms. Since many things had become possible, firms were deprived of the obligation of consistence imposed by any one management compromise. Hence some of the easy, immediate and one-off earnings that they get are sometimes lost due to the malfunctioning they generate.

Profit strategy and management compromise are the subject of debates within the firm, when the different parties admit their necessity. Groups argue about their pertinence and their lasting. One method of influencing one way or the other is to have decisions made on aspects of the organisation that bear neither any apparent link with
the firm's strategy nor with the internal balance between the actors. The sheer accumulation of these decisions will make one particular orientation irrevocable. This is the way with automation forms which can be justified with technical considerations, or with the immediate earnings in personnel that they bring, or still with the improvement in working conditions that they supposedly make, whereas they carry a new orientation of the profit strategy, because of the financial means they take from other uses, or a hidden change in the socio-productive organisation.

The automation form to be used is not directly, easily and precisely deducted from the profit strategy pursued, nor from the construction of the management compromise. What rate of flexibility should one try to reach for automated equipment when one is pursuing a "volume and diversity" strategy and looking for employees participation, such as Fiat, for example? The way this manufacturer hesitated when trying to find the adequate automation form, from the "Mascherone automatico" to the "Fabbrica Integrata" having used the "Robogate", clearly illustrates the difficulty (Camuffo, Volpato, 1997).

Leading a company is a difficult task, and often enough, managers who cannot find the specific solutions resort to imitate what seems to be working with their competitors. To start with, this process leads us to believe in a convergence towards similar solutions. But the different results obtained with the same technical solution come to show once more that these results depend on the conditions in which a technique is used as much as the technique itself. A solution can only be the answer, i.e. contributes to the upturn of the company's performances, if it is consistent with the rest of the organisation and the strategy.

Lastly, company managers do not always realise which profit strategy they are pursuing, or more precisely which is effectively at the start of their performance. As a consequence, they might be led to inconsistent automation choices. Other managers believe they can conciliate several profit strategies. This is how, in the recent past, several manufacturers have been offering to create and produce innovative models as an answer to the new expectations of one part of the customers, as they appear in a number of countries, and this on top of their classical offer. But unlike a new model within the classical offer, an innovative model has one particularity: either it is a failure, or its success comes as a surprise. This means a flexible company in all areas: financial, social, organisational and technical, one which can failure or success. And a firm pursuing a classical product policy is not structured to that effect.

Conclusion

The diversity in automation forms between the different firms lies first in their difference in profit strategy and industrial models. Secondly, it lies in the inescapable crisis met by these models, often then generating multiple and contradictory technical forms within the firms themselves. Last but not least, it lies in the difficulty for firms to embody completely one particular industrial model. This would mean that they have to create and keep alive a company management compromise between the main actors on the means to be used (product policy, productive organisation, employment relationships) to implement the profit strategy pursued, the economic and social pertinence of which might be rudely called into question because of a change in the type of growth and national income redistribution, as has happened twice since the 60s.
References


