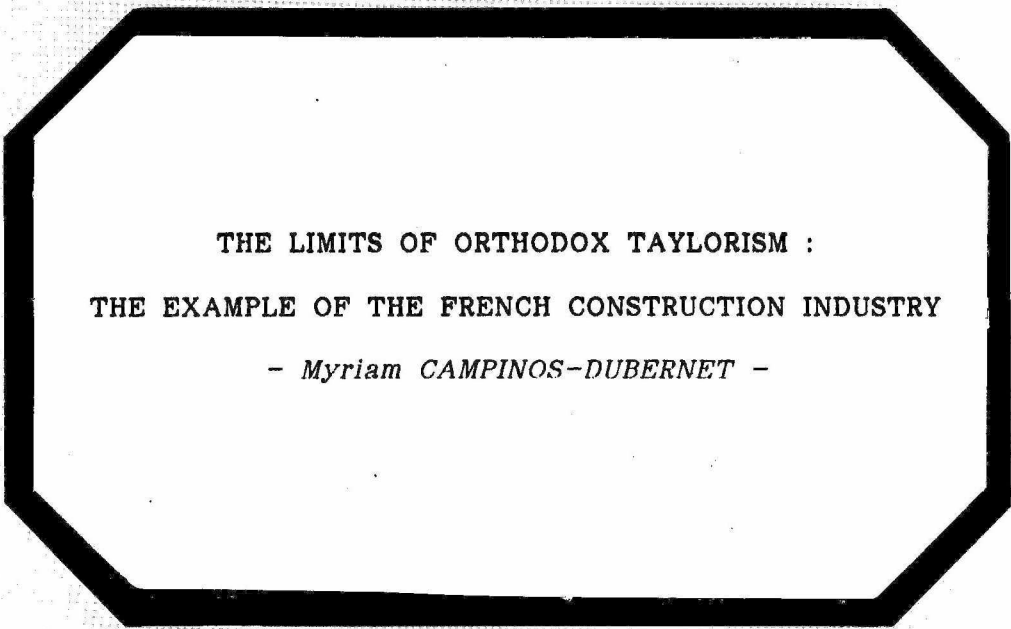


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THE LIMITS OF ORTHODOX TAYLORISM :  
THE EXAMPLE OF THE FRENCH CONSTRUCTION INDUSTRY

- *Myriam CAMPINOS-DUBERNET* -

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**THE LIMITS OF ORTHODOX TAYLORISM :**  
**THE EXAMPLE OF THE FRENCH CONSTRUCTION INDUSTRY**

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### SUMMARY

At the end of the 1970's in France the construction industry was generally considered to have escaped the influence of Taylorism because of the instability of the building process. Taylorist methods were judged suitable only for stable predictable processes where work could be prescribed and control applied in the Taylorist manner. However observations of operatives' work on building sites at the structural phase highlighted extensive task fragmentation thus calling into question the habitual characterization of construction. This paper will argue firstly that from 1970 on, with the beginning of the recession and tighter competition, a move had indeed been made towards "rationalization" in French construction firms. They had gradually, via the development of more and more sophisticated work study departments, adopted Taylorist forms of work organization in a manner applicable to a variable and divisible process where adaptability and flexibility must be retained even in the context of reduced operative autonomy. Secondly construction lost some of its specificity in work organization and "rationalization" due to the effects of the recession on manufacturing which had led in certain sectors to product instability and reduction in batch size. Thirdly if the Taylorist approach resolved certain problems for firms in terms of productivity, it has engendered others of a long term perspective and of which the construction industry is currently feeling the effects : pool of skilled labour, recruitment of young workers, training.

## INTRODUCTION

At the end of the 1970's the construction industry in France was generally considered to have totally escaped the influence of Taylorism despite the fact it had been one of the first industries to apply 'Scientific' Work Organization <sup>1</sup>. It was implicitly suggested <sup>2</sup> that the instability of the building production process (i.e. the importance of unit production and the fact that the place of production changes : 'spatial constraint') created particular technical problems for Scientific Work Organization. In other words, Taylorism was judged suitable only for stable, predictable processes (mass production) where specification, prescription and control could be applied in the Taylorist manner.

In the late 1970's the CEREQ carried out empirical investigations on structural and load-bearing work on construction sites (Amat et alli, 1980). The result did not lead to questioning the generally accepted characterization of the production process but rather the supposed consequences as regards applying Scientific Work Organization to construction. In fact, the results of the detailed observations made of operatives' work on site <sup>3</sup>, which in the first place aimed at understanding the relationship between techniques and organization, not only invalidated the existence of technological determinism on work organization but also demonstrated a high degree of fragmentation of operatives' work on the sites of large firms. Had there in fact been a move made towards 'rationalization' since, it is difficult to see how fragmentation could co-exist with improvisation and the absence of planning and control, even though job fragmentation is not inherent to Taylorism (Monthmoulin, 1981).

Thus there existed a much greater degree of fragmentation than expected, which led to asking when, how and why this evolution had taken place ? Since a shift towards rationalization in construction had always been denied, demonstrating its existence entailed describing very precisely the concrete forms it had taken \*. How had apparently unsolvable problems been resolved ? What type of problem had led to the transformation ? What had made it possible ? What firms had participated ? So, what appeared interesting was to determine whether the construction industry had been led to losing its specificity vis-à-vis batch production, or if it had resolved its specific problems.

In order to reply to these interrogations the empirical approach had to be continued. First of all, observations were made of work analysis methods, including estimations of times used in pre-site preparation in large French construction firms (Campinos-Dubernet, 1979). This study made possible the confirmation of a movement towards applying Scientific Work Organization and the forms taken. Subsequently we worked towards establishing the dynamics which had made this evolution possible (Campinos-Dubernet, 1984) : a bibliographical and statistical study of the evolution over the previous 30 years of the conditions of valorization of capital in the industry in relationship to technical, economic and social transformations. More precisely our aim was to apprehend how the conditions of the realization and of sharing value created (wages / labour market / type of labour used) had influenced the transformations in the conditions of using labour and their transmission within a section of the industry.

This paper is the result of a synthesis of the preceding investigations, and has two objectives. The first is to trace the history of rationalization in construction. The second, based on the concrete forms which Scientific Work Organization took in construction, is an interrogation on the capacity of Taylorism to overcome *variability*.

Therefore, given the difficulties of applying Taylorism to construction, the first section aims at demonstrating the limits and contradictions raised by the development of prescription and control in a *variable and divisible process*. They result from the conflict between, on the one hand, the reduced autonomy due to prescription, and on the other, the adaptability and flexibility, necessarily imposed by the constraint of the variability. Therefore my objective is to demonstrate the limits of Scientific Work Organisation in the context of a variable process. This problem is no longer specific to construction but also affects manufacturing in the current context of the reduction in batch size and product instability.

The second section deals with the shortlived attempts by certain French construction firms to apply Taylorism during the 'euphoric period' of the building boom of the sixties. These attempts failed because neither the prevailing economic and social conditions nor the technical conditions were suitable. However as will be demonstrated in section III from 1970 on with the start of the recession in construction, and therefore tighter competition, the newly introduced use of information technology<sup>5</sup> combined with absence of worker resistance, (large firms using mainly an immigrant labour force), led firms to introduce suitably adapted forms of Scientific Work Organisation which we thus term 'neo-Taylorist'.



The conclusion draws attention to the resulting contradiction both for labour and also for the firms in terms of skill, training and stabilising a sufficient pool of skilled labour in the French construction industry.

I - Orthodox taylorism : a system inadapted to divisible and variable processes : the case of the construction industry...

The characteristics of the labour process can only be analysed from the point of view of the conditions under which labour is used, i.e. in terms of the application of knowledge and skills. This approach would, for example, be used in the perspective of training, or to construct an employment classification. However, if we can suppose that the logic of the use of labour, whatever form it takes, is founded on (but not determined by) \* the realization of exchange value, i.e. from an economic standpoint the forms that work takes have to be articulated with their incidence on the formation of cost prices. This leads us to the problem of 'time economy' and the two main types of labour process associated with it (Coriat 1980, taken from Sohn-Rethel, 1977) :

a) A production process in which work-flow regulates production-flow and so determines the volume of production. Work-flow is revaluated in terms of speed and the number of operations accomplished for a given time unit.

This process is currently found in two forms present at the same time in *mass production* :

- *times allowed* : theoretically operatives remain in control of their work flow and the operations carried out have been previously analysed and timed. 'This form of work is the typical Taylorist form' (Coriat - 1980 : p. 51).

- *Standard times* : the time allotted to each operation is determined strictly by the flow of the conveyor belt and therefore *totally outside the operatives control*. 'This is the typical Fordian form of work' (Coriat 1980: 52).

b) A production process in which the production-flow is not determined by the work-flow. This situation is characterized by Coriat as *process industries*, i.e. an integrated production line of industrial robots. In this case the formation of exchange value is more dependant on machine time than on the operatives work-flow.

As is demonstrated by Coriat, this differentiation is of particular interest since it makes it possible to link the conditions under which labour is used with the formation of cost prices and, therefore, exchange values. So, with the first type of process the labour cost is variable but remains of significant weight in the cost structure. By speeding up work, the unit cost of the product can be reduced. In process industries the relative cost of labour represents a small part of the cost price. The main problem is to make the best possible use of plant since labour is more or less a fixed cost.

However, within the group of processes where work-flow regulates production-flow, it is necessary to make certain distinctions in order to account for the real constraints encountered in developing control over labour and the resulting characteristics of the use of labour. The classical differentiation is

drawn up and based on physical characteristics of the production processes, considered either for single unit production, or for batches. This differentiation does not allow us to classify the processes in terms of *control* within the context of 'time economy'. So we propose to take as our criteria of differentiation the distinction between physically stable, repetitive and therefore predictable processes, and, on the other hand, variable processes. In the second case the process is specified by external variability, i.e. quantitative (the batches vary in numbers produced), and also by the internal variability due to the different quantities of labour needed at different stages of production.

The work done by labour sociologists (such as Desbrousses and Pelolle, 1975, D. Linhart, 1978, de Tersac, 1978) and also by ergonomists (such as Wisner, 1971 and Laville et Teiger, 1974) has no doubt shown that batch production processes are not as stable as Taylorist organisation considered them to be and that, in reality, it is possible to demonstrate that there exists a gap between the theoretical Taylorist prescriptions and their concrete conditions of execution due to the variability of the human factor. Despite the variability factor that the human operator brings to stable processes, and despite the social limits of this type of organisation (absenteeism, scamped work, etc.), it is, nevertheless certain that labour productivity has increased considerably bringing changes to '*productivity norms*' ? (Aglietta, 1976 ; Boyer, 1979 ; Coriat, 1979).

There are limits as to how much labour efficiency can be increased by means of control and the strict execution of work prescriptions. These limits become very clear when we consider the problem posed by both the internal and external physical variability of processes. Variability needs flexible labour

organization and flexible use of tools and machinery. The way labour and capital are used must be adaptable and modifiable in order to integrate a series of predictable changes, theoretically predictable details (which it is, however, both costly and time consuming to integrate) \* and even completely unpredictable details and unknown factors †.

As far as the work itself is concerned, autonomy, or at least a limited autonomy, is essential to variable processes, otherwise the labour process loses its capacity to adapt : its flexibility. For time economy to be possible with a variable process, even if it is for the process as a whole rather than phase by phase, this usually implies gaining the cooperation of a ('polyvalent') workforce. Autonomy, indispensable to variability, is in contradiction with control by the detailed prescriptions of elementary operations (job, task, gesture). The contradiction is particularly important when it comes to executing strictly prescribed work procedures, for, as Taylor pointed out : *'There are those who conceive, those who execute'* and *'all rule-of-thumb methods'* must be avoided. The strict execution of the detailed, prescribed work procedures with the individualized control, as they were enforced by the orthodox Taylorist system, supposes the cutting out of variability. This is more essential than reducing unknown factors which by definition remain unpredictable. It is not surprising, therefore, that as the Taylorist system became more widely applied, tools and products were also standardized as this allowed full stabilization of production processes. In order to achieve sufficient savings the demand also had to be stabilized. This means setting up at the macro-economic levels, the mechanisms which can secure large and regular outlets, thus ensuring the economic efficiency of fixed, stable processes. The problems which remained unresolved for

the construction industry were stabilizing production processes and widening demand. This explains why the Taylorist system did not work in construction.

When the triumph of Taylorism and so called Scientific Work Organisation was incarnated by the automobile industry, the construction industry also attempted, in the same way, to increase labour productivity and this at a period when the scale of sites was growing. They tried to introduce a batch-type production, a stabilised labour process and off-site production in factories with fixed jobs. Only foundation work, erection and finishing were done on the site. This was the period of heavy prefabrication. It failed however for both technical and economic reasons : the systems were too rigid and the market was too small within the profitable work zone around a pre-fab factory (i.e. problem of transport costs for bulky concrete sections).

In the early 60's most firms in the construction industry returned to the practice of '*on-site mixing*' and the use of shuttering systems (moulds and formers) and various types of sophisticated shuttering systems which were more flexible and better adapted to site variability than prefabrication and to the types of construction and their location. However, despite the stabilising effect of multiplying identical units (dwellings, offices, classrooms, bedrooms, etc.), the external variability nevertheless remained considerable. In addition there was the problem of the internal variability, the quantity of work required from the start to the completion of a site. (the problem is to organise labour in such a way as to obtain a smoothed-out '*Gauss*' curve and to avoid transferring from one site to another and back). This is further complicated by much greater sequencing and programming <sup>10</sup> constraints than in an assembly industry with a stable process. These constraints impose stoppages on the workers and necessi-

tate 'polyvalence' in order to reduce lost time and make the best of work time. So the result of this variability is that there are few specific jobs, with the exception of crane-drivers, concrete mixers (when the concrete is mixed on site) etc. It is impossible to individualise employment. The gang replaces the traditional couple : the tradesman-improver. The gang's output depends on the way they work as a group and not the sum total of a group of individuals' output <sup>11</sup>.

So, analysing work into elementary operations which are then strictly executed is by definition not adapted to the problems encountered and could only end in failure, and that is the case even if we do not take into consideration strong workers' resistance and the lack of constraints on the valorization process.

However, at the beginning of the seventies the general context of industrial organization evolved very clearly. In contrast to a relative consensus in the preceding period, worker resistance to Taylorist methods begins to pose problems <sup>12</sup>. Absenteeism, labour turn-over and skimping become more and more frequent not only in France but also in Italy and the United States. Their effects, in addition to the evolution in the economic conditions (scale reduction in production, product instability) forced management in manufacturing to adopt less rigid forms of organization. One of the results was job enrichment, another setting up 'semi-autonomous groups', both being considered by certain sociologists as calling into question Taylorism (Durant - 1974). Others saw in these developments a mere adaptation of Taylorism to new conditions and spoke of 'neo-Taylorism'.

Whichever interpretation one opts for -and I would opt more for the second- it appears certain that the more flexible forms of control were more suited to the way labour was used in construction. They allowed for both the collective nature of the work to be taken into account and the relative instability of certain labour processes to be integrated. Using 'time blocks' <sup>13</sup>, as in maintenance departments in factories, allowed for a lesser degree of task fragmentation and so to measure and control non-repetitive jobs. In the same way work was prescribed not at task, but at module (groups of tasks) level and this factor, added to a relative decentralization of the organization of the firm (Aglietta, 1976 : 218 - 224), was a way of *integrating variability* and conciliating adaptability and control without calling into question essential principles of hierarchical authority and productivity.

Though these modifications result from the conjunction of certain social and economic constraints, they were in addition partially facilitated by what was taking place at a technical level. Computers made it possible to take into account the variability in so far as it became possible to control flexibility (Durand, 1978). They also speeded up stock-taking and reduced the time needed to deal with the mass of information characteristic of a variable process. They also simplified ways of dealing with the problems of programming and sequencing, and helped deal with the spatial constraint. (Regional Offices of national companies could use computers to obtain information on prices practised in other regions and align themselves on those prices where favorable).

All these technical and organisational modifications made rationalization possible and to a certain extent resolved the contradiction between autonomy and control. However, given the different starting points in industry and

in construction, the consequences of the adaptation were different. Whereas in industry autonomy increased, in construction it was the control which increased. It is possible nevertheless that the reduced autonomy in construction is still greater than the increased autonomy in the fragmented work situation of manufacturing.

## II - 1950 to 1968 - 1970 : An attempt to apply orthodox taylorism

This period was marked by a great increase in construction demand given construction's central role in the intensive accumulation process which developed after the war. Dwellings had to be constructed on a large scale and in a relatively short time to meet the profound changes in the social and professional structures and hence the geographical redistribution of the working population <sup>14</sup>. During this period construction was in a particularly favourable position as far as relative prices were concerned (Lapierre-Donzel, 1980).

So to summarise the situation : despite their claims to the contrary, management's main aim at this period was not to reduce production costs via the reduction of labour costs since the constraints of the valorization process were not sufficient to make it necessary <sup>15</sup>. In fact, what was at stake, was to be able to construct dwellings on a large scale in order to satisfy needs rapidly.

Two main tendencies developed in industrialized processes : the first, a shortlived minority tendency, was a rigid adaptation of Taylorism and the second, the predominant one, the significance of which can be compared to that of the transformations which took place in industry during the nineteenth century.



1 - The dominant tendency : the problem of variability is not overcome and control is delegated

It should be noted that during this period there was a definite break with the type of work done in the pre-war period. Before the war in France the construction of very large blocks of flats and offices was at a purely experimental stage.

During the 1950's in the Paris Region sites of several hundred, even several thousand flats were quite common. These big sites considerably modified the problems associated with the conception of a building. Aesthetic considerations became less important than technical considerations (foundations, calculating resistance of materials and reinforced concrete, etc.). Given the increased complexity of techniques used, for the firms constructing these big sites the main preoccupation was producing technical studies done either in-house or by consultants <sup>16</sup>. An immediate consequence of the evolution was that architects lost some of their influence and the numbers of technical staff increased (engineers, draughtsmen and technicians).

Cost estimations for the different stages of the project and for the construction work were still done in a very traditional manner. Firms used schedule prices <sup>17</sup> which allowed the firm to fix the invoiced price but without necessarily knowing either the cost price or their profit margin.

As far as the site was concerned, the most striking aspect was the extent to which site management (i.e. the contract manager and the site agent) were independent : *'It's better to leave the site agent in charge because it's*

*very difficult to control the way the work is advancing*" (Campinos-Dubernet-1979). The site was usually financially independent. They disposed of a fixed budget and out of this a certain profit had to be made. The extent of the pressure created by this system depended on how good the estimate was. Given the type of management, it was rarely based on a forecast of the cost. The situation was in fact one of delegating authority but controlling via the budget allowed.

Quite often head office did not have the exact site accounts. Some of the money went to a special fund ('caisse noire') used by the site agent to take on and pay what was called his 'court' <sup>18</sup>.

At the start of work on the site the contract manager and the site agent had a more or less detailed technical plan. They were very autonomous as far as setting up the site and choosing the equipment was concerned. (It was often left up to them buy the shuttering <sup>19</sup> and to decide how they organized and used labour.)

The contract manager was usually in charge of relations between the site and the firm, the finances and the general organization of the site, as well as making sure that work was done within the time limits set up by head office. The site agent was often in charge of labour organization, hiring and firing, deciding on salaries and hence the classification, organizing the gangs and allotting the work as it advanced. The site agent often moved from one site to the next with 'his' gangers and 'his' workers, or at least the basic group. The contract manager might also have 'his' site agents.

The organization of the site remained very traditional in so far as the site agent and the contract manager were like the employers of an 'autonomous firm' and the work organization adopted was not based on a pre-established choice made after due analysis of labour, operational cycles and time measurement. Work efficiency depended mainly on the pressure exerted by management on the workers and the methods of payment (lump gangs, payment by results). So, despite technical change, the organization and the means of time economy used were not very different from what happened in the 19th century with the move from work in the home to the discipline of the workshop (Marglin, 1973 - Germe, 1978). These sites, which might employ at the same time about a hundred operatives from the same structural work building firm, were a complete break with what the operatives were used to on small traditional sites in so far as they had less independence. On the latter, there were a small number of workers, no supervision (it was financially impossible to have a foreman, not to mention a site agent, on each site). The tradesmen and their improvers were very independent. The clerk or the boss came periodically and checked the work done (quantity and quality) vis-à-vis the work paid for.

This change was not negligible for traditional labour used to a certain independence. For certain categories of labour and particularly those from rural areas the loss of these specific advantages could be quite important,<sup>20</sup> even though the development of site supervision and discipline, particularly noticeable in load-bearing and structural construction, was not at this stage comparable with what the factory workers with a fixed job experienced. This loss of advantages was little compensated by wages. On the one hand jobs involving shuttering material were considered unskilled <sup>21</sup>. On the other, these jobs, concentrated in urban areas (industrialised systems only being found in

certain regions), did offer slightly higher salaries than the traditional building jobs found in rural areas. The salaries were however still clearly inferior to those in other industries and particularly the '*leader industries*' (Silvestre, 1978 - Boyer, 1978) which were also concentrated in urban areas. So what happened was that French workers left the sector <sup>22</sup> (Thelot, 1973) and were replaced by immigrant workers (mainly from 1963 onwards). It was with these immigrant workers that the 'industrialisation of the construction industry' took place.

· 2 - The minority tendency : an attempt to use the Taylorist system

Between 1961 and 1967 certain big firms tried to rationalize site organization using the Taylorist model. The result was :

- work study offices were set up to deal with planning, labour organization (based on work analysis and choice of the way the work was to be done, plant used etc.) and also to control time and quantity aspects of the execution of the work ;

- the choice of a bureaucratic type of organization with a marked division between conception and execution, the result of which was to reduce the role of site supervision to the mere carrying out of orders. The latter were continually supervised by the work study office and its representatives. It was at this level that there was a conflict. This type of organization in fact supposes that the work study offices really master how the work is done. If their understanding of variability is not sufficient this will create the basis (or objective reasons) for its failure. This concerns both the organization and the discipline which puts into question the traditional prerogatives both of contract

managers and, even more so, of site agents in charge of labour organization on the site, and results in a deterioration of the operatives' conditions. Given the situation it was easy for those whose autonomy was directly threatened to prove that the system, the failure of which was in their interest, was inefficient <sup>23</sup>.

One can attribute this failure to several causes : technical, economic and social. The techniques used lacked 'maturity', it was difficult to integrate the variability and to cut down on the unpredictable sides of production. Economically traditional organization could be very profitable. Traditionally site supervision was used to being independent as were also, to a certain extent, the operatives, whose independence had already been affected by work organization on large sites. Thus the work study methods were a failure and management was incapable of imposing the balance of power they needed. So, for this period, just a few limited experiences remain. Contrary to what was to happen about 10 years later, general conditions during this period were not an adequate basis on which a firm could build its strategy.

### **III - 1968 - 1980 : The development of rationalization**

1968 - 1970 was a period of abrupt change, transforming significantly the conditions under which labour was used, particularly for manual work. This change continued throughout the following decade. There was an unprecedented increase in the hourly productivity of the sector, much greater than that for per capita productivity. (This difference can be demonstrated statistically until 1975 <sup>24</sup> (Lapierre-Donzel, 1980 - Billaudot et alii, 1980). There were also important modifications in the employment structure <sup>25</sup>.

It is surprising to note that in 1970, after almost 20 years of rapid accumulation and important technological changes, the employment structure by size of firm was fairly homogeneous, which indicates little differentiation in the conditions of the use of labour. However, from 1970 to 1980 the employment structure by size of firm changed. By the end of the period the difference was greater between smaller and larger firms, the latter having evolved towards a structure comparable to that of industry.

The main characteristic of this evolution was a large, steady, relative decrease in the numbers of manual workers in comparison to all other employees. This was particularly true of structural and load-bearing construction where redundancies hit manual workers most. At the same time there was a real increase in the numbers of jobs associated with the technical studies and the pre-production preparation, and also of site supervision (site managers and site foremen). This is indicative of a very clear move towards rationalization which, though it only directly concerned 10 % of employees, had repercussions throughout the sector because of the relationships created at all levels through market competition and sub-contracting. It took place in an economic context very different from the previous 20 years.

This evolution seems to have been the result of the convergence of a series of factors :

- the conditions of the valorization process had deteriorated due to a big increase in salaries in 1968 (see below). It was momentarily difficult to raise prices in accordance, as had been done in the past (Lapierre-Donzel, 1980) and so the result was a modification in the distribution of the value added ;

- from 1970 on competition increased in structural and load-bearing construction due to a reduction in new work . With the beginning of the recession this situation developed and spread across the sector ;

- the 'Grenelle Agreement' (1968) decreased official working hours, a very important factor in the evolution of the way labour was used <sup>26</sup> ;

- the organizational problems of construction became less specific due to the greater variability of processes in industry and the new possibilities introduced by the use of computers for the administration of production, and to the integration of that part of variability which can be controlled and reduced.

So from 1969 to 1980, an important transformation in the way labour was used became widespread. Most of the firms doing structural building and public works who did not already have a work study department, set one up. The solutions adopted to develop control over work were different depending on whether the firm had already tried to use the Taylorist system or not. Some tried persuasion, others force ; but behind the two attitudes was the same reasoning. The short-lived difference was just one of immediate aims and the degree of autonomy retained.

1 - The first stage : flexible job prescriptions and work study done by consultants

The main difficulty for site management, as far as site organization was concerned, was to stop the improvisation, and even disorder, which reigned. They had to do this without creating a conflictual situation and in the know-

ledge that, on the one hand, time and motion analysis did not necessarily mean that work would be executed accordingly, and, on the other, that work study would mean being able to master sufficiently what had previously been delegated. So they had to make sure that those whose autonomy was being limited were given sufficient information <sup>27</sup>

**a) Persuading and working with site supervision**

The difficulty was to convince those on site that the work study department was not there to impose a solution but to help them to solve their problems. Once this worked the effect would be felt throughout the firm, especially in firms specialised in particular types of work.

An important aspect was that the first time and motion study employees were former production managers who both mastered the technical problems and, given their own previous experience, could understand why site management would be reticent and thus be the best placed to convince them.

Secondly, the site 'bought' the service provided by the work study department, i.e. the site defined the project with the work study department, held full responsibility for what was decided, and 'paid the service' from the budget allocated to the site.

The work study department had to show they were efficient concerning time limits (because of the problem of fines for late finishes) and also profit margins, in which production managers often had a direct financial inte



rest. There was a better chance of the work prescriptions being applied when they had been negotiated completely, than if they had been imposed in an authoritarian manner.

In addition this system allowed the work study departments to modify their services gradually according to the information available. They could slowly accumulate the data needed for systematic preparation and so be sure of really mastering the labour process before proposing more detailed prescriptions : *'To begin with we can't pull our weight next to the site, they're used to working with their own time calculations'*. This system also allowed the work study department to strengthen progressively their positions vis-à-vis the 'estimator surveyors' <sup>28</sup> whose work they slowly replaced.

#### **b) Progressive development in the way the work is prepared**

The first area dealt with by the work study department generally concerned the choice of equipment (cranes) <sup>29</sup> and the initial setting up of the site. Shortly after they also dealt with the planned synthesis of production ('load levelling', 'scheduling'). The central aspect of this planned sequencing, and later the production plan which was added to it, was the use of the cranes which came at the beginning of each cycle <sup>30</sup>. The way the structural work advanced depended to a great extent on the workflow of the cranes. The workload plan for each crane was based on spatial (area covered by the crane) and temporal (how shuttering was rotated) distribution. Using a bar chart plan it was possible to follow up from day to day the elements completed (pillars,

beams, floors, etc.) and the main operations which they entailed (shuttering, concreting, etc.). Both the time taken and the quantities used are registered as work advances.

In order to plan the way the work would be carried out, estimations of work times were made. This was done by units calculated from ratios and was not the result of analysis or timekeeping since individual tasks were not analysed, nor prescriptions made. The only prescriptions were the number of workers per day, and the number of gangs by type of work and crane areas. The number of workers in the gang was rarely given and their qualifications even less often. It was up to the site agent to organize the work taking into account the guide lines he was given in the form of overall quantities <sup>31</sup>. As long as he kept to them, he could organize things as he wanted. He made up the gangs. He knew the men and could put them together according to who got on with whom. A foreman often had a stable group of 10 - 15 workers with him.

**c) Greater division of labour in comparison with the delegating system**

Even if the degree of planning was not pushed further than the number of gangs per type of work and per day, the consequences of refining the 'guide line' system, in comparison with the way it had previously been used, led to a great increase in serious accidents as well as a very definitive increase in the division of labour. At the same time the characteristics of the gang did not particularly change.

There were two main types of gangs. The first, homogeneous, was made up of skilled workers. The second was known as the 'core' <sup>32</sup>. The first type of gang was often made up of labour only sub-contractors, taken on together, paid in the same way according to the quantity produced. A labourer employed by the firm is attached to the gang. The more common of the two systems, and the older, is the second, the 'core'. More than half of the gang is made up of highly skilled workers (OQ 3, OQH) <sup>33</sup> who have usually been with the firm for a long time. The rest is made up of casual workers ; The workers are very often allowed to organize themselves within the limits of the 'guide lines'. The skilled jobs are distributed in no special way amongst the skilled workers in the gang, and the labourers work with them. Even though they worked as mates and did not perform the most skilled tasks, through repetition, observation and experience they gradually acquired a certain skill in the successive firms they worked for. This system continued to make on-the-job apprenticeship possible. Depending on what point the work had reached on the site, the workers may have had a greater or smaller selection of tasks to carry out. Just a few firms worked on the basis of a skill hierarchy <sup>34</sup> and then it was the site management who carried out the most skilled tasks. This approach was based on a very high level of technical specialization and was not very common.

Time economy was not based on strict prescriptions, but on the notion of 'guide-lines' and , because of the payment by results system (which had not been common with the old form of organization), could reduce the number of workers for a particular job. The job's cycle, however, could not be reduced (i.e. the time necessary for cement to take) <sup>35</sup>.

The site agent's independence was not really in question at this stage in the organization. The work study department whose service was bought, did not participate in the final financial and managerial control. However, since the time taken was more and more systematically registered, and this was one important use of computers, it made it possible to compare the efficiency of the different solutions and to create the conditions which would allow greater job analysis and more detailed prescriptions.

## 2 - Work study consultants and 'Neo-Taylorist' organization

Under this system time and motion study was no longer a service with the 'client', i.e. the site, participating in its definition. It had become a compulsory service for site management, with a clearly defined zone of intervention. It entailed very detailed work analysis (measuring, selecting and imposing the way the job is to be carried out). At this stage the traditional role of the site agent was very definitely under attack.

However, even though it was obligatory for site supervision to have recourse to the services of the work study office, they were not in a totally subordinate position since the site manager was nevertheless still responsible for making decisions at a technical as well as at an organizational level. So work study played the role of 'consultant'. The system was fairly flexible as it allowed for relative decentralization of decision making. The mixed group type of gang was used <sup>36</sup> so as to be more adaptable.

The few companies which had installed such a detailed level of prescription by 1979 had previously attempted, unsuccessfully, to apply the orthodox Taylorist model. In comparison with other companies their understanding of the production process was very considerable since they had been registering data since the early sixties. One can also suppose that as the work study department of the 'services' type stabilized the service supplied, it became closer to time and motion study 'constultancy'.

**a) Conflict with the middle ranks of the staff hierarchy : the problem of the site agent**

In order to impose their new methods of organization, management had to attack the 'feudal' privileges of the site agent. The only way to do it was by recruiting young site agents and gradually replacing the others. In the same way the jobs which made up the site agent's 'court' <sup>37</sup>, and which had constituted an important aspect of his power, were done away with <sup>38</sup>. Thus a whole personalized aspect of the relationship system disappeared and was replaced by work study.

**b) The final stage : the degree of job prescriptions becomes increasingly detailed**

The level of analysis does not go as far as with the science of motion study. Elementary tasks are grouped together and correspond to given time-blocks. This is the way Taylorism has, in recent years, been applied to

non-repetitive work <sup>39</sup>. After 10 years of time analysis, a handbook has been put together made up of 3.000 to 4.000 time standards calculated in 1/100's of an hour. For new types of work the job is broken down, analysed and timed.

The control over estimated times seems to be sufficiently precise for these times to be more than just a reference point for preparing site work. They can in fact be corrected and adjusted depending on results which allow the firm not only to refine the times with accumulated experience from site to site, and improve the way information is collected and dealt with (including the masked time factors), but also to reduce the times during the period of construction of a site.

It was noted that habit decreased the time operatives take to do a given job and so it is possible to reduce time as the successive building cycles are completed. A study of what is called '*an individual's work load curve*' made it possible to reduce the amount of work included. This was done not by reducing the time needed for the gang to complete a work cycle, but by, as work progressed, floor by floor, gradually reducing the number of men put on a particular job, or by giving a gang of a fixed number of men additional tasks as the building went up <sup>40</sup>.

So the way the operation will be done, is analysed, measured, selected and consequently imposed on the site agent. For each phase (as it is defined in the bar-chart plan, less costly than critical path planning) the number of workers will be precisely defined. However, the detail is not taken to the point of specifying the qualifications of the members of the gang which can be considered a standard average gang with a standard, average structure.

**c) Extensive work fragmentation**

Job prescriptions are very detailed and imposed. Each worker is given a certain number of precise tasks. Whatever the technique used, job fragmentation is at its greatest to date. However, the logic on which the distribution of skilled tasks is based is essentially dependent on a logic of output. In fact the gangs are of the 'noyau' <sup>41</sup> type and contrary to certain expectations there is a relatively large number of skilled workers.

There are two reasons for this, linked to the fact that having a labour force capable of 'adapting' and 'changing' leads to time economy through :

- the possibility of reducing wasted time by giving a broad spectrum of tasks to one worker depending on the stage or building ;

- the quality of the work done which reduces skimping etc., the control of which is very difficult. Skill assures better quality of work.

## CONCLUSION

Given the constraints imposed by the variability of the production process, it has only been possible to 'rationalize' labour in the construction industry by using adapted forms of Taylorism, thus known as neo-Taylorism. In order to take into account these constraints a certain uncompressible margin of autonomy has to be left for it to be possible to achieve an economy of time through control. So it seems probable that the reduced autonomy of construction operatives is greater than that of operatives in a 'semi-autonomous group' carrying out a broadened range of tasks (Durand - 1974).

However, in comparison with the former system of site organization, it is nevertheless true that the rationalization adopted in construction, with a high degree of specialization and fragmentation of tasks, led to a loss of skill 'polyvalence' for the operatives. The tendencies of the seventies resulted in two fundamental changes : the first concerning the way skill is passed on, the second concerning labour-force policies in firms.

First of all, training, the traditional dominant form of skill transferal, which took place on-the-job, was no longer practicable given the intensification of labour resulting from the fact that the times allowed had been reduced.

As far as labour-force policies are concerned, the conjunction of a period of recession with the increase in labour efficiency led to a reduction in the number of operatives, thus disturbing the normal mechanisms of mobility. When there is no more recruitment, upward mobility inside a firm (passing from



'casual' to 'core' labour <sup>42)</sup> becomes difficult. Furthermore, the tightening of the labour market with the recession considerably reduced voluntary mobility from one firm to another. For the French construction industry this external mobility was the other traditional way of doing an apprenticeship. In addition the firms themselves, by means of salary raises (SEDES, 1978), developed explicit policies of stabilizing the 'core' <sup>43)</sup>. In construction firms, the system of prescribing work adopted, unlike that in orthodox Taylorism, is not such that output can be obtained independently of the individuals working and their collective work habits. Therefore a highly unstable work-force with a high turn-over rate is detrimental for the firm.

Consequently, after ten to fifteen years of 'rationalization', the firms which have adopted this type of organization employ a labour-force which has lost its capacity to adapt in terms of skill. The hiatus between this situation and the current evolution of product markets is becoming larger and larger. On the one hand the labour-force from part of the construction industry has lost its former 'flexibility', in term of skills ; on the other, markets have become increasingly variable and unstable (smaller sites, development of repair and maintenance and rehabilitation (Campagnac et alii, 1985)). Added to this loss of flexibility, is the problem of a work-force, mainly of foreign origin, whose average age is increasing and with whom it is not easy to integrate young workers, whether they be French or second generation immigrants who had their schooling in France.

Thus new contradictions appear and are far from being resolved. Nevertheless, whatever solutions firms adopt, and whatever the reactions from the young new entrants into the French construction industry, the effects of

the minority movement of rationalization have been very great throughout the industry, going far beyond the immediate impact.

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NOTES

1. Cf. GILBRETH K. and his analysis of the bricklayer's work.
2. In comparison with other sectors such as the automobile industry, there has been little work done on construction in labour sociology.
3. The survey covered sixty sites in five different regions. A total of 281 operatives doing structural work were observed, 18 gangers and 35 site agents.
4. Cf. also J. KELLY and S. WOOD (1984 : 258)
5. I am not suggesting that the chain of causality necessarily determined the result observed in France. The example of other countries, and in particular Britain, clearly demonstrates that the determining factor is the social context in which the developments take place.
6. This does not mean that the economic aspect determines the exact way labour is used, which can vary considerably, as has been demonstrated by many studies, but these forms have to be compatible with antagonistic salary relations.

7. Production standards : socially dominant conditions of production in a given branch. Cf. Aglietta, 1976 : 247. This notion is also frequently used by the school of thought known in France as the 'School of regulation' (cf. Aglietta, Boyer, Coriat, Lipietz). Their analysis underlines the correspondence or non-correspondence between standards of production and the standards of living for wage-earners as regards the volume and the origin of the commodities they consume for a given country at a given period. A good example is the recession of 1929 explained within this theoretical frame-work by the non-correspondence between these two types of standards, whilst on the other hand post second world war growth is due to a correspondence resulting from the institutional forms adopted concerning the sharing of created value which regulated the mechanisms for fixing wages (Boyer, 1986).
  
8. In the early 70's reviews for work study offices frequently bring up the problem that there were not only technical but also economic difficulties. These are linked to the number of forecast time standards and to the control of a variable process that is necessary in order to achieve sufficient reliability. These difficulties, in addition to the worker resistance that the general application caused, created the need to film production.
  
9. It is common to treat all the variable factors of production as unknown factors. We consider this incorrect in so far as certain variable factors are totally predictable despite the technically, economically and socially difficult conditions. This is the '*reducible variability*'. On the other hand '*unknown factors*' correspond to that part of variability which cannot be reduced given that, by definition, they remain unpredictable. Whatever progress is made in work analysis in developing the use of information technology and in refining control methods, the '*unknown factors*' will remain unpredictable. Cf. R. Gallois '*Les jeux et les hommes ; le masque et le vertige*' (Gallimard, 1967, Collection Idées, pages 55 - 56).
  
10. The term in French is '*contraintes d'enclenchement*' which means that it is impossible to start a task before completion of the preceding one.
  
11. This is not just the result of their individual skill but the ability to work together, and to be integrated in the group according to cultural, even personal standards. Thus there is the problem, frequently pointed out in construction, of putting together the gang. It is more or less openly acknowledged that workers from the same country speaking the same language and with the same history are put to work together. At this point we come back to the notion of the '*collective worker*' and '*collective qualification*' which goes further than the individual qualification of the individuals making up the group (JF. Troussier, 1981).

12. Union strategy in France during the period of economic growth consisted in implicitly accepting the following compromise : management was allowed an almost total control over work organization in return for constant growth of employees buying power and their acquiring a 'social statute'. Thus it is understandable in this context that Taylorist methods could have been much more widely applied in France than in Britain at the same period.
13. Cf. article by J. Bernard in Travail et Méthodes pages 306 - 307 / 1974. 'Non repetitive work has become measurable and controllable in a correct and economic way'. Definition of 'time block' : firstly, these can be defined as work elements with a same aim, without the method of carrying out the operations being stable, or even the sequences being the same, or even similar. The time adopted for a 'block' is a 'work value' which therefore includes rest time and means that the time of carrying out is at the pace we have chosen'.
14. In France, contrary to Britain, large-scale rural migration came late. It took place in the 1950's. If we consider the economically active section of the total population, employment related to agriculture represented 36,5 % in 1946 but fell to 21 % in 1962, 12 % in 1972 and about 7 % in 1981.
15. When we carried out the survey in work study offices we were naively surprised to discover that most big companies did not have work study departments until 1968 - 1971. As one person interviewed told us : 'the profit margin was so big before that, that only idiots didn't make money'. Prices were fixed using the lists (see footnote 17) and even if we reduced the profit margin by 10 - 15 % we still made money'.
16. The 'OPQCB qualification' system (Organisme Professionnel de Qualification et de Classification du Bâtiment et des Activités Annexes) was set up to guarantee the client a certain technological quality. It was sometimes used to limit access to certain important markets.
17. In French called 'système de la série ou du bordereau' : cf. Robert dictionary where this is defined as an administrative or syndicate document in which a tariff is fixed for each trade and to which the contracting parties refer in order to make an estimate. These prices are both the average price and the selling price.
18. 'They (i.e. site management) don't like head office looking into site expenses'. These are : labour costs for all the time the site is under construction and other costs which might just be for a short period : site supervision, concrete mixer, crane-driver, site mechanic, and the errand boys who provide materials and drinks for the operatives. Some companies call all these jobs 'the court' because they allow the site foreman to gather round him a 'feudal' type court.

19. Their independence can perhaps be partially explained by the way the cost of the material was written off -often shuttering could in reality be written off in 1 or 2 years (just 1 site) whereas it was several years in company accounts.
20. Traditional link between building and the rural population (Nadaud, 1976-Germe, 1978).
21. The 'Reinforced-concrete operative' did not appear as such in the Parisian 'Convention collective' for Construction (a negotiated agreement on conditions which has the force of law) until 1970, 1972 for the national agreement. Until then the only category mentioned was 'wood formwork erectors' dating from the period when wooden frames were used in mines.
22. This shows up in the 'Enquête Formation-Qualification Professionnelle' (Survey on training and professional qualification). This official survey carried out by INSEE (cf. CSO) describes movements of labour between the sectors.
23. One should however, note that during the CEREQ survey on structural and load-bearing sites (1976) several sites using this type of organisation 10 years later, seemed to be efficient. These sites were all in a traditionally industrial region : the North. Several specialised in prefabrication. However surprisingly, the degree of fragmentation was far from being the highest.
24. After this date it is difficult to estimate the productivity for new work because repair and maintenance work, with lower productivity, increases from 33 % of all work done in 1975 to 45 % in 1978.
25. See 'Enquête sur la structure des emplois', Ministry of Labour; This is a survey on employment structure.
26. Historical studies of capitalism have demonstrated the transforming effect that reducing working hours has on the labour process (CEPREMAP 1978).
27. 'Only persuasion works. The site agent is a very important person. He doesn't bother about anything we plan in the work study department. As for the ganger he is going to show us he knows better. And the contracts managers cover for the site agents rather than admitting their incompetence or creating problems for themselves' (Campinos-Dubernet, 1979).
28. In the text : 'Service des prix (mètres)' which was not translated as quantity surveyors since their role is not exactly the same.



42. See above description of types of gangs.
43. After 1977, the situation of the work force was such that this was no longer necessary.

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