

THE DESIGN OF ORGANIZATION

Dr. LALITA

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HUMAN FACTORS IN ORGANIZATIONAL DESIGN AND MANAGEMENT – IV

**Development, Introduction and Use of New Technology –
Challenges for Human Organization and Human Resource
Development in a Changing World**

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The design of organization: contribution of the anthropotechnological approach

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1. Introduction

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In this perspective, research was carried out in two lubricant mixing plants of a multinational group which operate respectively in Zaïre and France. The aim was to highlight how the organization really worked, the elements on which this operation was based and, finally, to see what possible contributions the anthropotechnological approach could make to the design of organization.

In this communication, we present the situations studied and the methodology followed before proposing a discussion of the results obtained and the lessons which could be learned from this work in the field of the operation of organizations.

2. The work situations analyzed

The two plants studied use the same technology which leads to the mixing of basic oils, heavy residues from oil refining. Depending on the lubricant to be produced, various qualities of these oils are mixed in proportions determined by the appropriate formulas. The production process is a continuous process in which the centrifugal mixing force and the systems which monitor the condition of the product and evacuation of gases are essential.

The two technical systems mainly differ in terms of size: for a theoretical production capacity two and a half times that of Kinshasa, the Nanterre plant not only has technical facilities which can produce more but also has greater flexibility of use. The differences are mainly found in the raw material and finished product storage facilities and the production systems. Differences vary from 1 to 16. Although the technology is identical, the different sizes of the technical systems have an effect on the work. The plant manager (PM) and the workers are not faced with the same problems and, due to this, do not produce the same reasonings or the same operating methods in the two installations.

Formal organization in the two situations is based on a bureaucratic model. In Nanterre, as in Kinshasa, the plant is run by an engineer whose direct superior is on the company's management board.

In Nanterre, the plant has six departments, each of which is run by a manager. Executives are given professional training and are former workers who have reached management level through internal promotion after a long period of experience (from 9 to 29 years) - except for two of them who have university degrees. Twenty-five operators are employed directly in production. The plant has a total of 52 staff, including managers.

In Kinshasa, the *maintenance and shipments* department does not come under the PM's authority. There is no quality department. The plant has only three departments, each of which is run by a manager. All of them have a higher education level (three years at university). Fifteen operators work regularly in production. Two fork-lift truck drivers handle the transportation of products and equipment. The plant employs a total of 20 persons. But this number doubles when journeymen are taken into account. Journeymen work in the plant but do not belong to the plant's regular workforce. In fact these journeymen, most of whom are employed in the plant every day, are hired on a daily basis.

The Nanterre plant operates in an industrially developed country while that of Kinshasa is in an industrially developing country. The problems posed by these different environments are not the same. The Kinshasa environment may be defined as very uncertain while that of Nanterre is relatively stable. Raw materials and spare parts are increasingly difficult to acquire in Kinshasa due to the remoteness of suppliers. The sale of finished products raises major problems due to the inconsistency of demand and communication systems. The various infrastructures and skills and the technical and financial possibilities which the plant can use to ensure that it runs properly differ due to the industrial and social fabric. The industrial and social fabrics, which are very dense in France and relatively light in Zaïre, contribute to the constitution of concrete problems which individuals have to face.

3. Methodology: analysis of the PM's activity

In order to tackle the real organization of work through ergonomic analysis, we thought that the most pertinent observation level was that of a rather senior manager who is close enough to the performance of tasks. Due to his position of responsibility and his relative independence, the plant manager represents the point of convergence for all problems concerning persons under his authority and the instructions from the departments he answers to. The choice of studying the PM's activities was mainly based on a criterion of pertinence and in no way postulates that the PM's activity is representative of all the activities performed in the plant. The analysis of the PM's activities constitutes a starting point from which it is possible to study the entire operation of the system and its organization.

Data collection methods

The great variability of the tasks which the PM has to face and the diversity of the actions he undertakes led to a continuous observation of his activity over a period of several days. Due to the behaviour of the PM, which is essentially verbal, a sound recording had to be made of all his communications and a "paper-pencil" note had to be taken of his observable activities. Thanks to the integration of data recorded with these two techniques, it was possible to reconstitute several working days in each of the two situations. These working day reconstitutions constitute the material which was processed.

Significance of the action: the use of verbalizations

Since explanations were necessary in order to understand the various activities observed, three levels of verbalization were selected:

- *interruptive verbalizations*, which consisted of asking questions as work was done in order to enable the PM to explain the actions he was performing. These questions concerned the action itself, the gesture made or, more generally, an element of the work or the context in which it took place.

- *written self-confrontation*. The predominance of communication actions in the PM's activity, the density of the actions and situations whose understanding was desirable, and the length of time represented by a working day led to a form of confrontation other than that generally used

in ergonomics. Written self-confrontation consists of showing the person whose activity is analyzed *his working day reconstituted in writing* and asking him to *write down* his reactions. This gets round the difficulty of commenting an oral exchange.

This method of confrontation did not raise any particular problems, since the persons whose activity was analyzed had a high education level. Through their activities, they were used to dealing with written documents. Therefore, reading and understanding their reconstituted activities did not pose any particular problem. As such, it was possible to have the reconstituted activities criticized by the PM.

- *Interviews guided by facts* (IGF). Interviews guided by facts constitute the third level of explanation used to grasp the significance of actions and reconstruct the interpretation. The aim of IGFs is two-fold. First of all, it is a matter of explaining the facts at a level which enables the attainments of verbalizations in situation and written self-confrontation to be extended and consolidated. IGFs thus endeavour to bridge the gaps in previous methods: difficulty of verbalizing during work or incomplete verbalizations, difficult interpretation of explanations obtained in written self-confrontation, etc. In this sense, they reinforce the perspective of the "what" and "how" aimed at by self-confrontation.

It is also a matter of highlighting the rules which govern the behaviour observed. It is not simply a matter of considering the "What" and "How" of the action to the limit of their most remote causes, but also that of including the perspective of "Why". The generalization of the possible interpretation and highlighting of close or remote explanatory elements helps to understand the organization of the activities.

The particularity of this approach is that it starts from the activity and endeavours to understand the operation of the organization on the basis of the activities of men at work.

The data collected as such are processed at several levels. An initial descriptive approach of the manager's work helps to understand the various characteristics using a comparison of behaviours observed over several days. Secondly, the reconstitution of "histories" on the basis of objects highlighted enables an analysis of the content which depends on analysis of the activities.

This double perspective leads to a synthesis of the activity in terms of relations, thanks to which it is possible to find out the various work relations maintained by the manager and, with them, the various constraints of the situation, the way in which problems are actually posed and the means which are effectively used.

In the two situations in Zaïre and France, this approach leads to the production of a collection of data that are comparable both in terms of the descriptive viewpoint and the work content.

4. The manager's activity and operation of the plant: the dynamics of real organization

The tasks which the manager faces in Nanterre, as in Kinshasa, are multiple. We shall not describe them all in this text. However, thanks to the descriptive approach to the activity, they have been defined in a rather exhaustive way (Langa, 1994). In order to understand the operation of the PM and his relation with the real organization of the plant, we shall start with the reconstitution of his activity around a single example: the production schedule. In both situations, the plant has to respect a production schedule established outside. In Nanterre, the various customer orders which arrive in the specific departments of the lubricants division and the requirements of the different depots and points of sale are entered in the computer system. The production manager can thus follow them up on his terminal and produce the necessary amounts. In the same way, a monthly schedule is transmitted to the Kinshasa PM.

However, an analysis of the different production documents shows that, in reality, production in Kinshasa is different from that planned in the schedule, while that of Nanterre is similar to it.

The main causes of the considerable difference noted in Kinshasa and the tendency towards compliance observed in Nanterre are numerous. Achieving production which complies with forecasts implies, among other things: knowledge of the schedule in good time, stability of the programme concerned, availability of the raw materials necessary and control of the supply system, availability of the technical equipment and skills necessary to perform production, availability of sufficient storage premises, no incidents in production or in the finished product delivery process, etc.

In the Nanterre situation, orders recorded by computer are effective. Urgent situations rarely arise in production since the great finished product storage capacities enable the *shipment* department to satisfy urgent customer orders without asking the production department to change its schedule. The raw material storage system is largely sufficient. The wealth of the industrial fabric facilitates relations with suppliers, customers, service companies, manufacturers of the machines used, etc. The hazards arising from technical incidents are solved by a skilled maintenance department which has the necessary equipment, or by calling in one of the many companies in the surrounding area; the intervention of these companies is fast enough to avoid operation of the company being excessively penalized.

An analysis of the PM's activity in Nanterre showed that he does not intervene much in the scheduling of production. The problems posed by this activity generally arise in a such a way that they can be solved by direct managers. Situations which require the intervention of the PM are rare. However, we noted various cases of the PM's intervention: the fact that a product did not respect standards when it had to be delivered immediately, use of one ingredient instead of another because the former was not available in stock, a production incident leading to a mixture of products, etc. These situations, which are exceptional in Nanterre, do not disturb production to the point where the production schedule cannot be respected.

On the other hand, in Kinshasa, the parameters which have to be considered to respect the production schedule are affected by several problems that are practically permanent: the production schedule is never sent early enough to enable production managers to take the necessary steps. Quite often this schedule arrives well into the month when it should have started. Requests made are never stable. Frequently, requests are sent to the plant in the form of an order from a senior manager, requests from the *shipment* department, telephone calls from various managers, etc. Some of these requests are imperative and urgent due to the importance of the customer. Quite often, some requests made at the outset are cancelled because there are unsold products, because the depots are saturated or because the customers have changed their orders.

Raw material supply difficulties make forecasts uncertain. The long import procedure depends on departments which are beyond the plant's control. The low capacity of the storage system and its lack of flexibility - due to the small number of tanks - makes the difficulty of managing basic oils even worse. The acquisition of various supplies is always exposed to certain hazards which are beyond control: production problems at the manufacturer's, routing difficulties, etc. Similar problems are found with the management of finished product stocks and the oil production system whose capacity is limited. Technical incidents are particularly serious when the spare parts required have to be imported. The same applies to management of staff whose absences, due to various problems like family constraints, happen without warning, due to the poor telephone network.

In reality, these problems are practically permanent. Stock shortages, delivery surpluses, non-compliance of products delivered and staff turning up late or remaining absent for an unforeseen time are daily problems. The high frequency of these problems, the difficulty of

foreseeing them and solving them in good time and in the right way makes it hard to respect a schedule which, moreover, fluctuates.

Unlike what happens in Nanterre, the activity of the PM in Kinshasa consists of constantly redefining the production which should and can be made. He cannot refer to information which is sent in a bureaucratic way. In order to determine production, he follows up the lubricants situation at customer's through information from the truck drivers who deliver them so that he can find out the real tendency of requirements. He follows up service companies and suppliers by questioning their drivers, their employees and their various managers in order to find out, in good time, the hazards which could alter the plant's operation. In this way, his behaviour is close to that of visual navigation: the different decisions are made directly at his level and according to existing circumstances. Beyond the formal relations planned by the organization, his relations cover all the persons liable to provide him with the elements he needs to plan the desired production level.

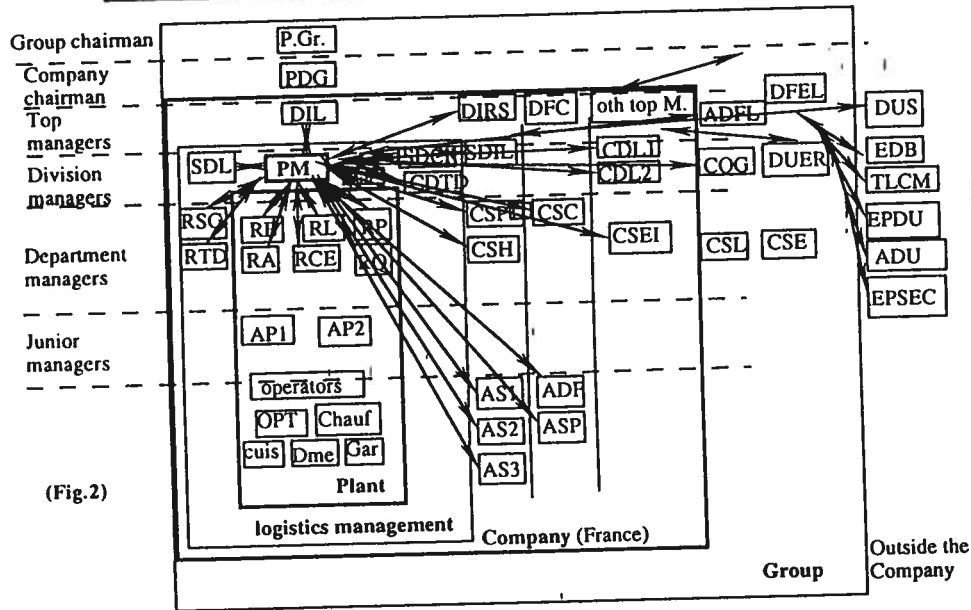
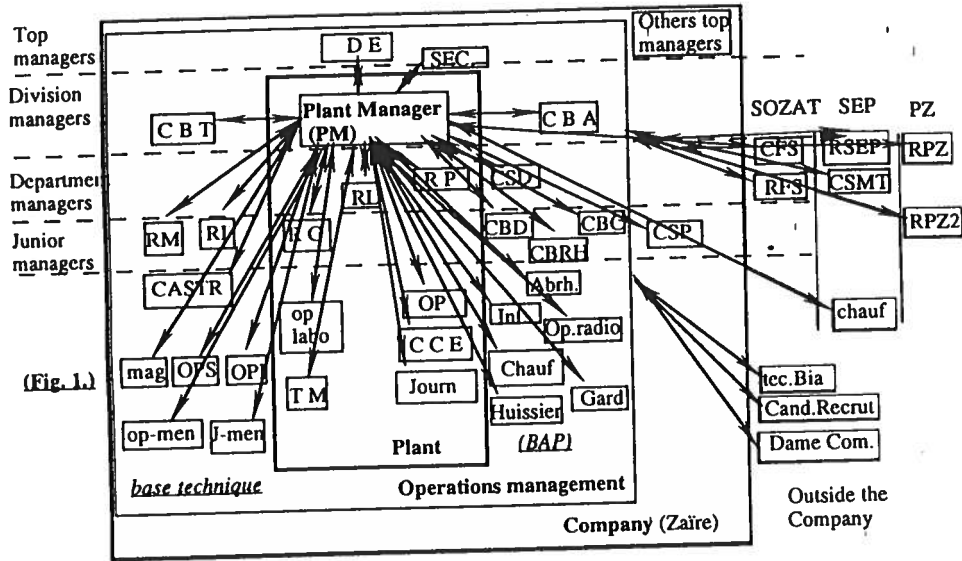
The reconstitution of the PM's behaviour in regard to various other objects indicated the same tendency. New works, maintenance, servicing and repair of certain elements of the technical system, for example, constitute difficult problems due to the lack of means available for treating them in Kinshasa, while in Nanterre these problems are less frequent and are handled by existing departments.

As such, the organization turns out to be very dynamic in reality. The behaviour of individuals tends to be in line with the recommended rules and procedures when no problems are posed and when the use of these rules and the implementation of these procedures and work methods respect the requirements of the situation. On the other hand, they deviate considerably in the event of defective operation which transforms the situation in such a way that the problems have to be posed otherwise and means other than those planned by the organization have to be implemented, or sometimes even invented.

The work relations of the manager, shown in the figures relative to Nanterre and Kinshasa, enable a synthesis which indicates the dynamics in question: the lack of defective operation corresponds to a situation where the organization tends towards the expected operation. The real relations of the manager are then reduced to hierarchical and functional links. In the defective operation situations which are permanent in Kinshasa other links show up. In these links there is a predominance of oblique relations: relations with the plant's operators, the drivers, staff and managers from other departments, divisions, managements and companies with whom the PM is not supposed to be in contact in a normal situation.

When the operation of the PM is compared in the two situations analyzed here, it turns out that the technical, socio-economic and cultural dimensions are important factors of differentiation. It is in downgraded situations, which are frequent in Kinshasa, that the unsuitability of the formal organization shows up more clearly. In particular, it is the individual skills in specific situations and the possibilities offered by society through its own rules which enable suitable operation of the organization or not. Therefore, it is possible to talk of the ethnological dimension, the reflection of various attainments which are due as much to society in terms of its history, its development and its present situation, as to the individual in his perception of this collective reality.

By highlighting the real operation of the organization, the analysis of the PM's activities may constitute a tool for evaluation of organizational operation. At least it provides an understanding of the difference which exists between reality and the supposed operation through structures as they are designed. Finally, we consider that the reflection on the design of organizations should include these anthropotechnological contingencies thanks to which the real behaviour of managers and operators can be taken into account.



The real relations of the Manager in Kinshasa (fig.1) and in Nanterre (Fig.2)
Hierarchical and functional representations

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foreseeing them and solving them in good time and in the right way makes it hard to respect a schedule which, moreover, fluctuates.

Unlike what happens in Nanterre, the activity of the PM in Kinshasa consists of constantly redefining the production which should and can be made. He cannot refer to information which is sent in a bureaucratic way. In order to determine production, he follows up the lubricants situation at customer's through information from the truck drivers who deliver them so that he can find out the real tendency of requirements. He follows up service companies and suppliers by questioning their drivers, their employees and their various managers in order to find out, in good time, the hazards which could alter the plant's operation. In this way, his behaviour is close to that of visual navigation: the different decisions are made directly at his level and according to existing circumstances. Beyond the formal relations planned by the organization, his relations cover all the persons liable to provide him with the elements he needs to plan the desired production level.

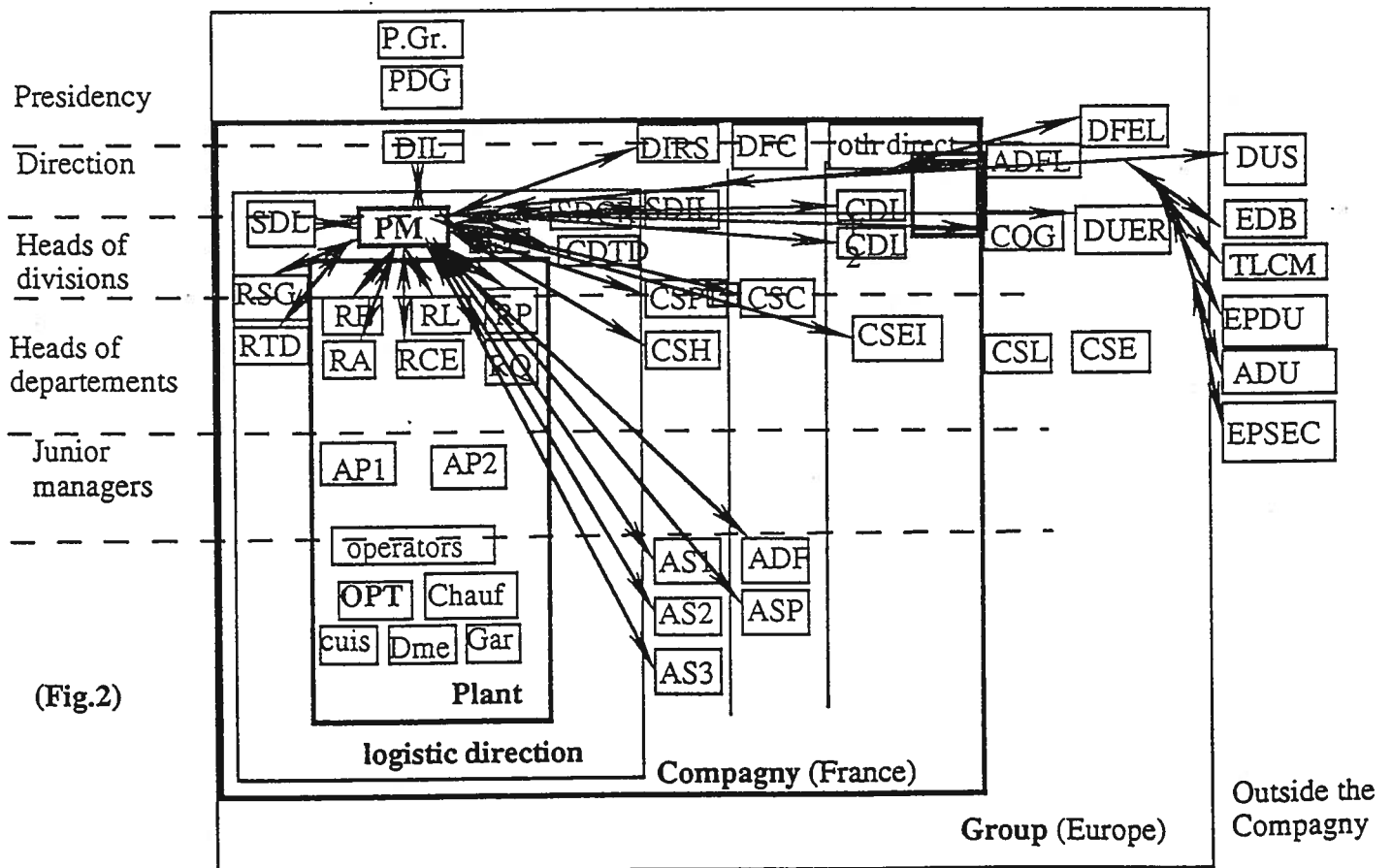
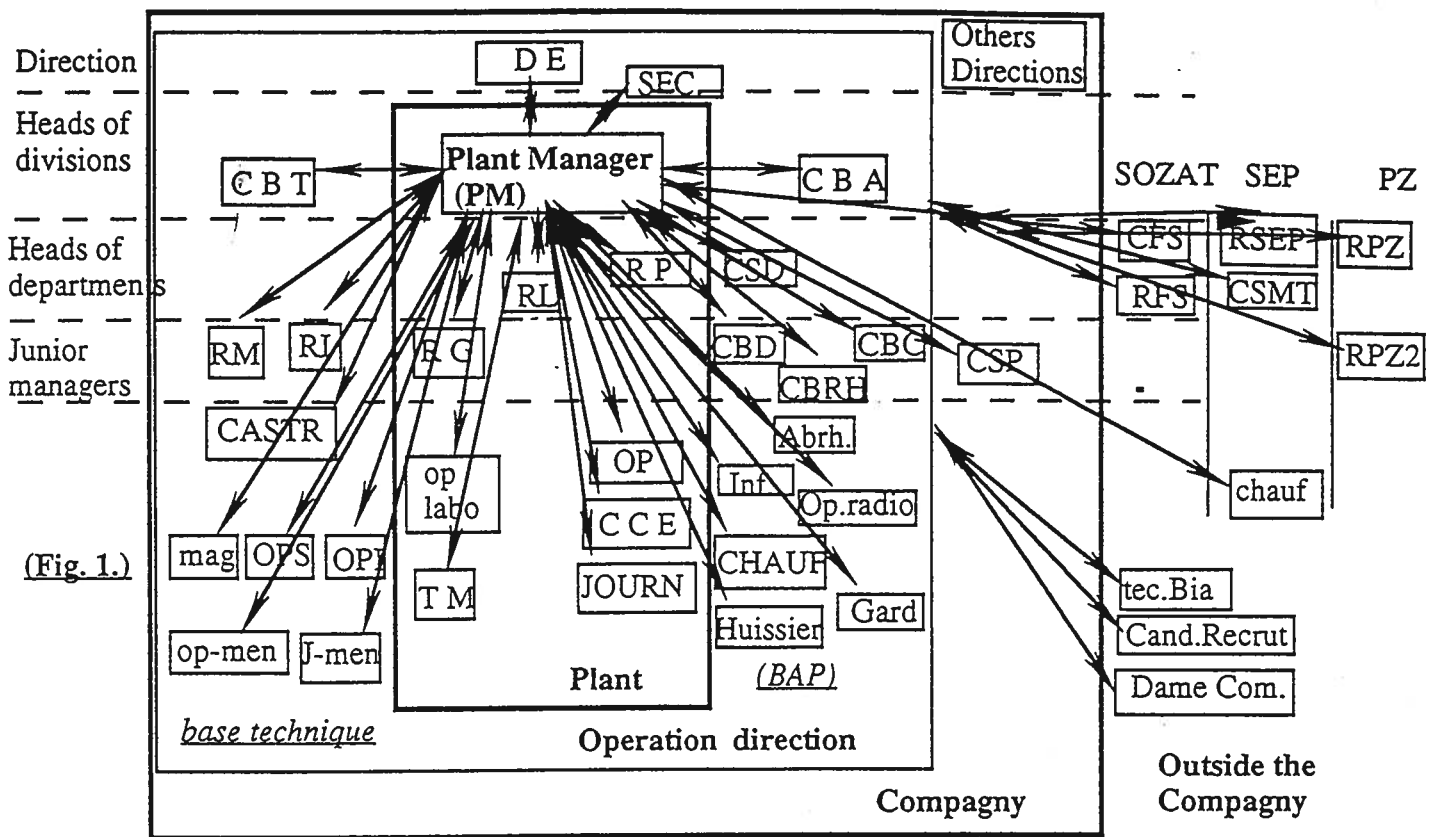
The reconstitution of the PM's behaviour in regard to various other objects indicated the same tendency. New works, maintenance, servicing and repair of certain elements of the technical system, for example, constitute difficult problems due to the lack of means available for treating them in Kinshasa, while in Nanterre these problems are less frequent and are handled by existing departments.

As such, the organization turns out to be very dynamic in reality. The behaviour of individuals tends to be in line with the recommended rules and procedures when no problems are posed and when the use of these rules and the implementation of these procedures and work methods respect the requirements of the situation. On the other hand, they deviate considerably in the event of defective operation which transforms the situation in such a way that the problems have to be posed otherwise and means other than those planned by the organization have to be implemented, or sometimes even invented.

The work relations of the manager, shown in the figures relative to Nanterre and Kinshasa, enable a synthesis which indicates the dynamics in question: the lack of defective operation corresponds to a situation where the organization tends towards the expected operation. The real relations of the manager are then reduced to hierarchical and functional links. In the defective operation situations which are permanent in Kinshasa other links show up. In these links there is a predominance of oblique relations: relations with the plant's operators, the drivers, staff and managers from other departments, divisions, managements and companies with whom the PM is not supposed to be in contact in a normal situation.

When the operation of the PM is compared in the two situations analyzed here, it turns out that the technical, socio-economic and cultural dimensions are important factors of differentiation. It is in downgraded situations, which are frequent in Kinshasa, that the unsuitability of the formal organization shows up more clearly. In particular, it is the individual skills in specific situations and the possibilities offered by society through its own rules which enable suitable operation of the organization or not. Therefore, it is possible to talk of the ethnological dimension, the reflection of various attainments which are due as much to society in terms of its history, its development and its present situation, as to the individual in his perception of this collective reality.

By highlighting the real operation of the organization, the analysis of the PM's activities may constitute a tool for evaluation of organizational operation. At least it provides an understanding of the difference which exists between reality and the supposed operation through structures as they are designed. Finally, we consider that the reflection on the design of organizations should include these anthropotechnological contingencies thanks to which the real behaviour of managers and operators can be taken into account.



The real relations of the Manager in Kinshasa (fig.1) and in Nanterre (Fig.2)
Hierarchical and functional representation