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SOME SYSTEM ASPECTS CONCERNING ORGANIZATION OF INSTITUTIONS
AND ENTERPRISES

Institution and Enterprise as a Flow System of Different
Qualitative Elements

For a quarter of the century social activity systems have been interpreted after G. Friedmann¹ as "man-machine" configurations, with the later addition of information element perceived in them. However, every social activity system, apart from the achieved goals or the performed functions, apart from its structure and scale, is built from different elements which, in great simplifications, can be grouped always into the same 5 qualitative classes - fig. 1:

- 1) men (managers, employees and users - as autonomous working subsystems),
- 2) groups of organisms and their physical environment (ecosystems are also the autonomous subsystems),
- 3) inanimate objects (of environment as well as materials and equipment),
- 4) energy (different kinds of energy carriers and forms of energy),
- 5) information (information carriers).

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¹ G. Friedmann, Machine et humanisme, Paris 1954.

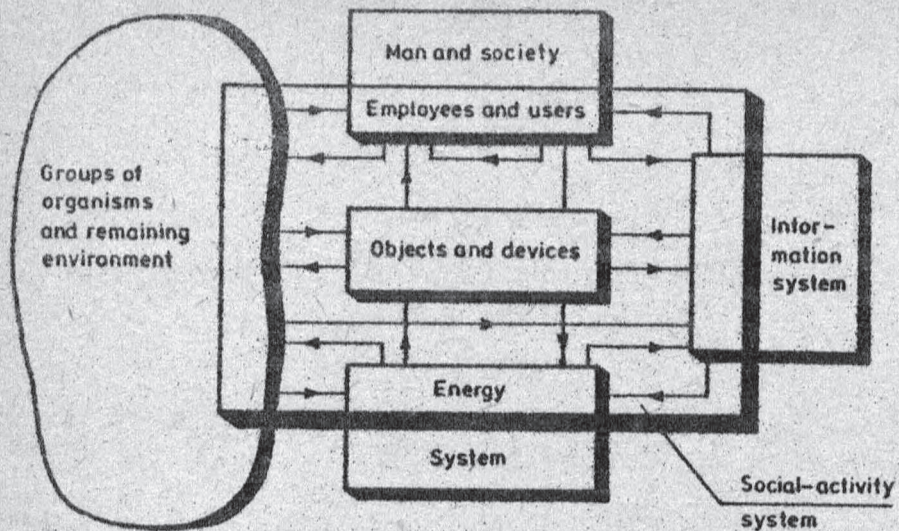


Fig. 1. Structure of Social Activity System, after W. Bojarski, Praxiological Model of Technical System Design, "Methods and Theories" 1976, vol. 10, nr 20.

The above classification is not clear because the first three classes are also often the carriers of the factors listed in the other two classes. Moreover, all the elements and factors are in the process of movement in the system and they undergo changes. They are only temporarily present in the system and that is why their flows through the system are willingly considered.

As a rule, all the listed kinds of the elements enter, to some extent, into the composition of the working stands creating a processing system called processor. It is at these stands that the transformation of the object of action is performed in which it is possible to distinguish some or even all the kinds of the above mentioned elements. Thus, every larger social activity system should be considered as a complex system: man - environment - device - energy - information. It is shown in fig. 1 that such a system is always strictly connected with the larger systems existing in its surroundings such as social system, information system, energy system and environment.

Figure 2 presents the flow interpretation of the social activity system. Each of the main flows indicated in the figure is

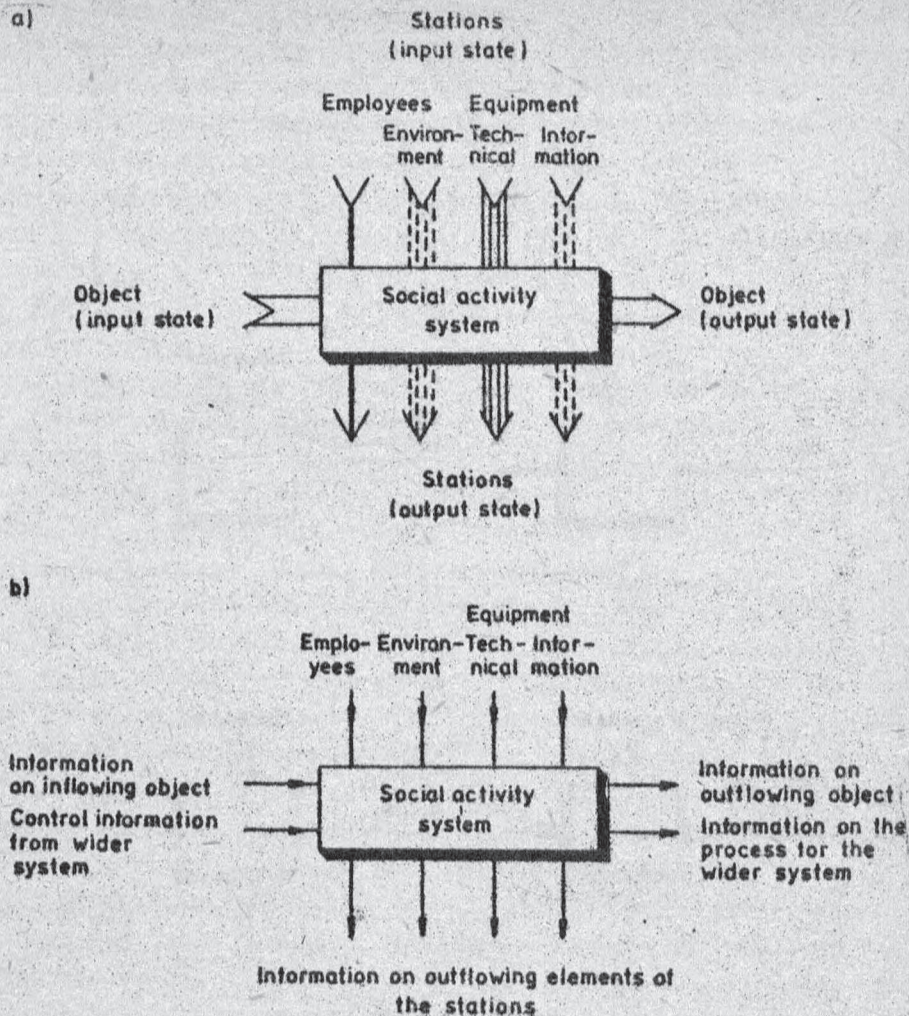


Fig. 2. Social Activity System as a Transformer of Flows: a) Flows of Action Object and Elements of Action Stations, b) Flows of Information (Energy)

accompanied by some associate information flow, which is presented in fig. 2b. In simple cases a carrier of information of a given flow may be the flow itself, e.g. the properly marked material. In more complex cases the main flow is accompanied by a related, but partially separated, information flow (e.g. opinions, certificates, descriptions etc.)

Moreover, some or even all the main flows are accompanied by

certain energy flows, specific kinds-of energy are brought into the system by employees and other people, environment and materials as well as information inflowing. Predominantly energy is received separately from the system neighbourhood and given back in there as well as partly diffused. Thus, it would be possible to present fig. 2 c similar to fig. 2 b, which would indicate energy flows.

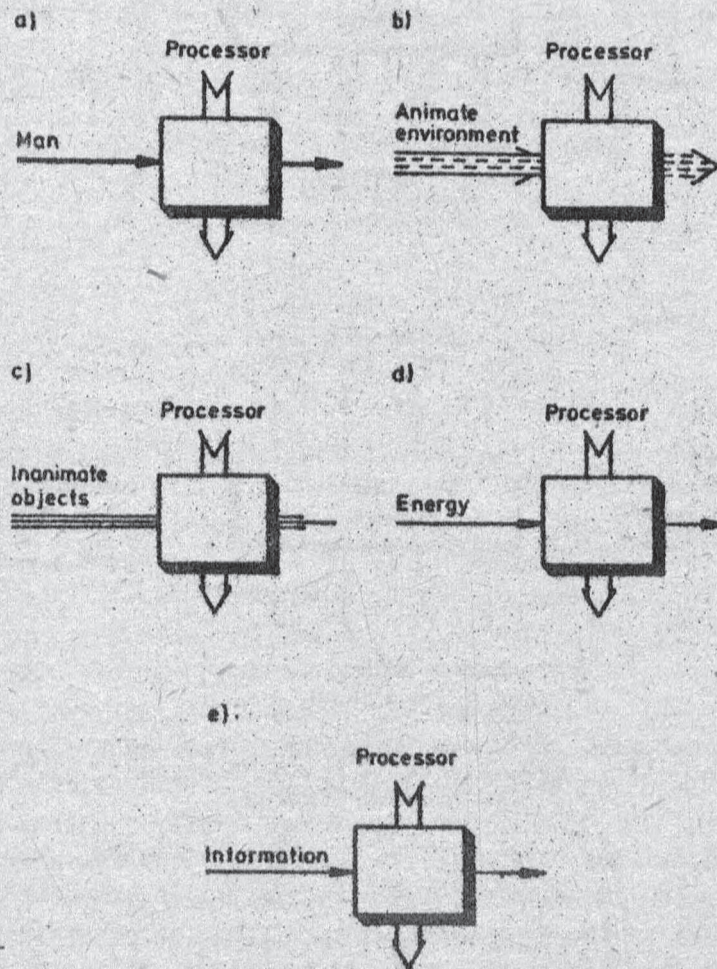


Fig. 3. Typical Systems of Social Activity: a) Institutions and Service Posts, b) Farms, Forestries and Stud-Farms, c) Industrial and Craft Plants, d) Energy Plants, e) Information Plants

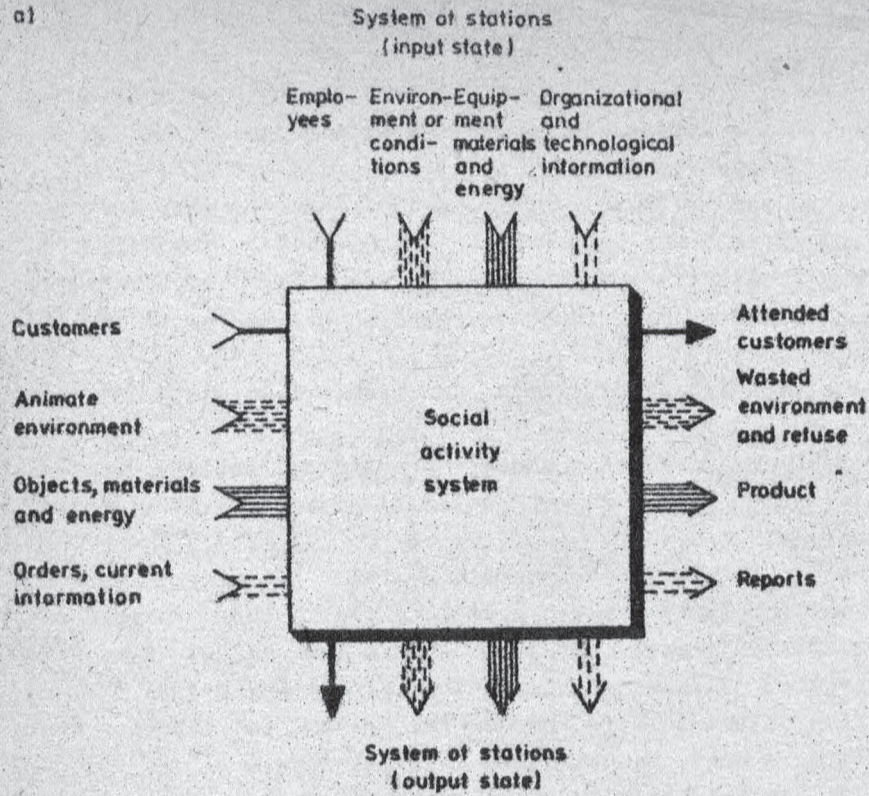
According to the kinds of the elements dominating in processed objects in the system one can distinguish main kinds of the social activity systems - as in fig. 3:

- a) Institution and service centers in which the processed and attended object is a man,
- b) Farms, forestries and stud farms in which the processed and attended objects are groups of organism biocenoses or all the ecosystems,
- c) Industrial and craft plants in which inanimate objects are processed,
- d) Energy plants which produce, process and deliver energy,
- e) Information plants which collect, process, storage and delivery energy.

Obviously, only relatively small social activity systems, which are called plants above, appear in their pure forms. Any large enterprise is more complex and so in the object flow one can distinguish classes of elements as presented in fig. 4 a and b. An action object is here the complex system in itself, even if one considers only the processed material flow.

Thus, the social activity system must be regarded as a multichannel processor of the different kinds of flows. Every separate class of elements brings its characteristic features to the system and is subject to other processes according to separate laws. Moreover, the synergic interaction of different elements is proceeded together with some more complex processes of the associated transformation. If one considers the smallest but the complete social activity system having two elements of each of the kinds in the processor and two - in the processed object plus the manager, one will easily observe that in such a system there are more than 100 qualitatively different connections (taking into consideration the kind and place - role - of the elements and the kind of connection). Thus, this rough model indicates all the complex and difficult problems connected with the appropriate design, organization, realization and management of a social activity system. To solve the above problems a research group of at least 10 persons has to be engaged (minimum 1 expert for every flow marked in fig. 1), due to the limits existing in the traditional specialistic education. While considering successively every significant separate kind of connection

a)



b)

Energy and information
inflowing to the system
with the flows as above
as well as received
separately

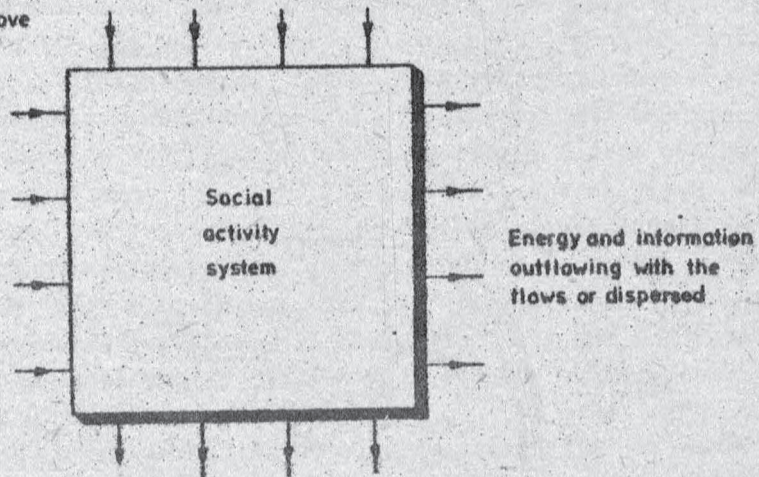


Fig. 4. Large - Scale Social Activity System Enterprise or Institution as a Multichannel Transformer of Flows.

inside the system as well as outside connections, it would be possible then to assign them more adequately to different experts, and to determine an integrity role and the tasks of organization and system experts.

A general evaluation criterion indicating the quality and level of the social activity system organization is an adequate realization of the system task or its main goal with the possible entire inside and outside harmonization of the system and the minimal overall social costs. Cost minimization includes here the design, construction, exploitation and eventual retirement of the system as well as all the costs of the users and the processed object. It means e.g. that the institution or service center should be organized in a way which would minimize not only its own costs, but also the generalized costs of the served customers.

Institution and Enterprise Environment

The flow model presented in fig. 2 or 4 has also an additional advantage i.e. it is relatively easy to separate and identify in the environment of the system some other systems of specific kinds and functions, which for a long run are of essential significance for the proper operation of the system. Figure 5 is a rough presentation of the basic generic-functional structure of the environment referring to fig. 4a and b would need too much space, nevertheless it should be done with the function analysis of a definite system.

A large block in the middle of fig. 5 presenting the considered system S (institution or enterprise), is interpreted here as an organized group of people, materials and equipment in the process of operation or ready to operate, provided with adequate documentation, supplied with energy and "plunged" in a part of the environment. The adopted graphical convention here is that for the purpose of maintenance and repairs the equipment is transferred from this block to the maintenance system shown below, regardless of the fact whether the inspection or repairs are performed in the workshop or in the place where a given piece of equipment operates.

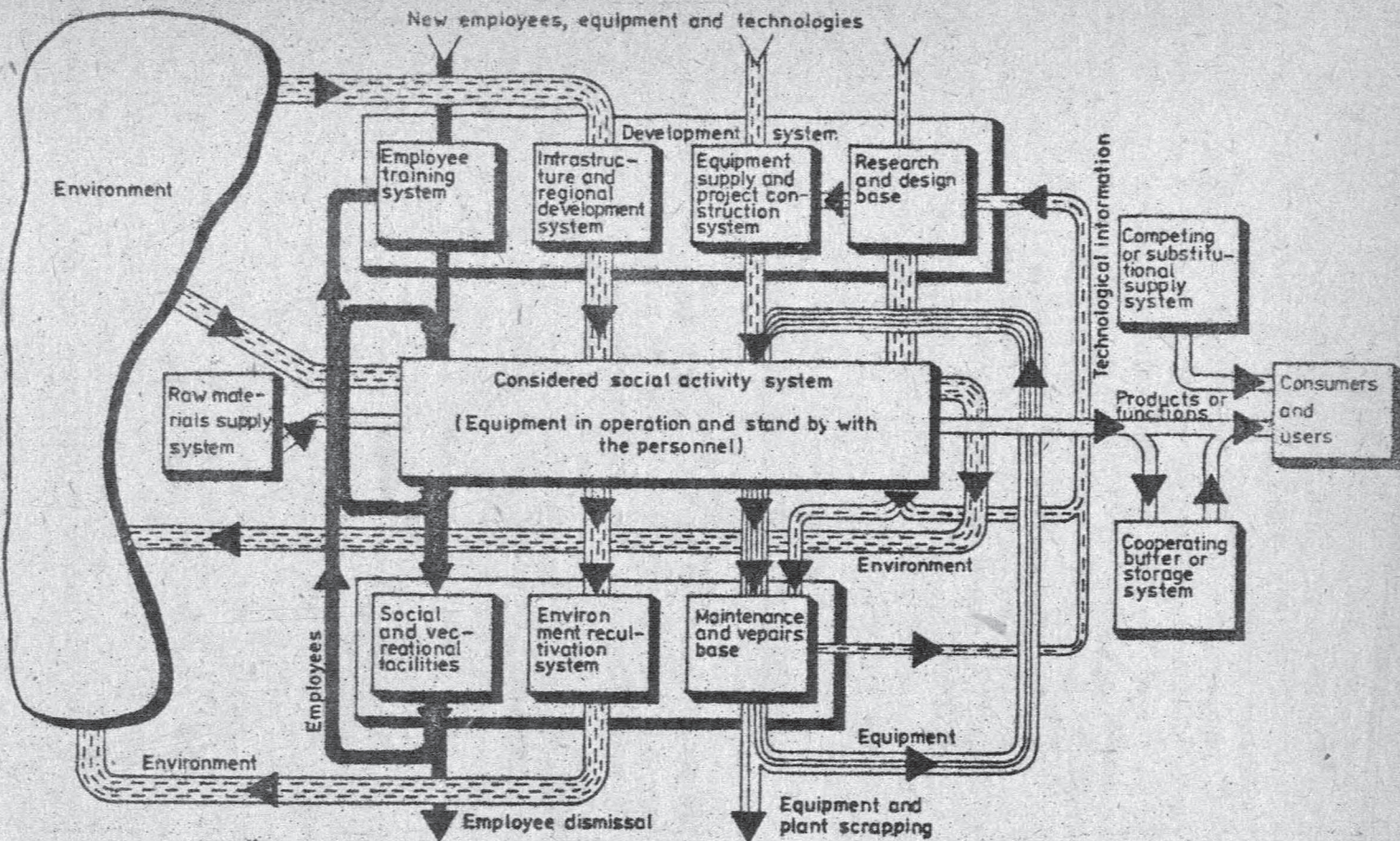


Fig. 5. Exploitation and development of Environment of a Social Activity System (Indicated, Lines Denote the Flows of Employees, Environment, Equipment, Information, Materials and Energy)

Vertically in the above diagram there are the input and output systems concerning employees, environment (and infrastructure), equipment and documentation. The social activity system is discussed here in the long term horizon and therefore in the upper part of the diagram the development system is shown, which builds and develops the system considered.

In the horizontal position in fig. 5 the basic flow of action object is presented together with the usually associated flow of a part of environment currently used in the technological process (e.g. the air used for conditioning and burning). At the output of the system, beside consumers and users of the products or function, the cooperative buffer or storage system is shown as well as the system of competing or substituting supplies (functions). In such an environment the optimal construction, exploitation, reconstruction and development, of, in fact, every social activity system should be discussed.

The flows of employees, environment, equipment and information form partly closed loops of flows and feedbacks in the system surroundings which is also presented in the figure. The awareness is not always satisfactory, one can also doubt if the present flows are closed sufficiently. There are only the most intensive information flows shown in this diagram; all the other information connections which also exist between all the presented systems have been omitted here to make the presentation more clear.

While beginning research on the definite system of enterprise or institution it is necessary to treat it as system S in the middle of fig. 5 and to study successively all its connections with the real systems existing in its environment, which perform the same functions as the environment systems marked in the figure. Every input and output of the system S can be, to some degree, limited and cause the limitation of its action possibilities and solutions.

The proper solution of the system needs the appropriate evaluation and the adequate qualitative and quantitative composition of all the above connections performed in the optimal and harmonious way and that depends also on the adequate cooperation of the environment systems. In a more difficult situation there is such a system, which lacks some significant cooperating systems in its environment and partly has to take over their functions.

Organization and Disorganization

The term "organization" has several meanings. Here we shall understand (in an adjective sense) the mutual settlement of elements in the system to perform a definite function or to achieve some definite goal of the system. Hence, the system organization is a certain directed and relative feature. A highly organized system with regard to some of its aspects can be low organized with regard to others.

Referring to the definition of activity system one can say that a system organized to perform a definite function or to achieve a given goal is built with the elements cooperating in performance of this function or goal as well as with the forms of interactions occurring between the elements. This statement can be treated as a definition of organization in a material sense.

The system organization consists in composition and settlement of static elements in space, with respect to their material, form, function etc. It introduces also an additional double time order connected with the action:

- genealogic order resulting from the reason - result succession in the past,
- goal order (technologic) resulting from directing the system towards the functions performed and realization of the system goals in the past and in the future.

In animate systems, perfectly organized, in the static conditions both of the above rules of settlement give the same result of settlement which is, additionally, in accordance with the actual static settlement.

Some sufficiently high level of static settlement is needed for the proper and effective function of the system. However, an excessive, too stiff settlement leads to determinism, is threatens with fossilization, and it is an obstacle for an elastic, effective action in emergency as well as for the adaptation of the system to the changing environment. K. Bogdański² tried to

² K. B o g d a ń s k i, Próba definicji żywej materii ze stanowiska biofizyki, "Kosmos" 1971, ser. A, 20. nr 1.

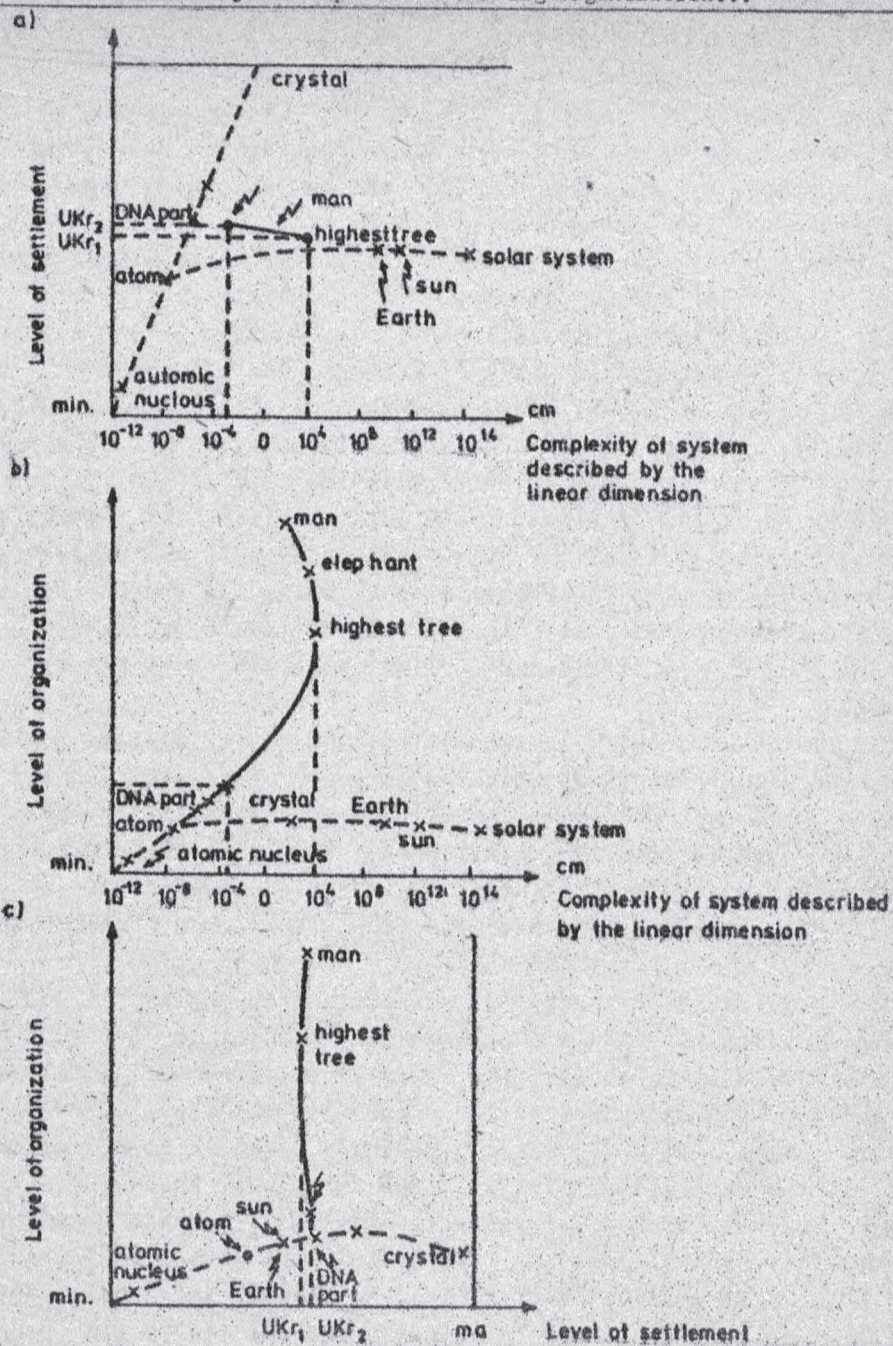


Fig. 6. Orientation Diagram of Dependence Between Level of Organization and Settlement Contrary Complexity of System, after K. Bogdański, Próba definicji żywej materii ze stanowiska biofizyki, "Kosmos" 1971, ser. A, 20, nr 1

illustrate this problem comparing the natural systems of a significantly different scale - see fig. 6. It was indicated that the ideal forms of the animate matter organization were developed in a very narrow partition of the system settlement degree, independently of the system scale. There are some optimal scales of systems and settlements, which induced the highest degree of settlement - a human organism.

In every modern organization it is necessary to maintain continually an appropriate balance between the two opposite but equally important groups of features: order (of a static nature) and creation, adaptativity and innovatory action (of a dynamic nature). Formalization and centralization lead to order, but on the other hand, to stagnation and inadaptability of the system. The real improvement of organization consists in the optimal and harmonious joining of these groups of features. It should mean the creation of the sufficient degree of order and coordination with the maximum degree of freedom and the general possibility of action.

In fact, a level of organization is such a system feature which can be gradated but which we are not able to measure. It is also difficult to compare the level of organization between the large systems and the small ones, which perform different functions. The level of organization is a dynamic feature of the system, which occurs in the very action, not in a static situation.

The organization functional connections in the system and the control actions having a protective and stabilizing effect on the state of individual elements greatly increase the probability of the proper performance of the elements, but they are not able to lead to the full determinism. Moreover, the control subsystems and the connections between the elements become lax and disarranged. In effect, every action system is subject to the ruthless law of decomposition, following the second law of thermodynamics. It means that if only the system is sufficiently isolated and left alone or does not undertake itself the necessary compensation actions consuming its internal energy (as animate organisms do), the disorganization and chaos increase in it. In effect, the system operates worse and worse.

One can observe then that the process of wear and tear growing old, degeneration of the system takes place.

If the increasing defectiveness of the system functioning of an enterprise or an institution causes the growing dissatisfaction of users and it increases the number and intenseness of their complaints, the energy thus flowing in from the outside can temporarily stop the further decay of the system, and it may even result in improving its level of organization and function. The pressure of authorities, competition etc. may act in the same direction. Generally and roughly speaking, every industrial and institutional system after a sufficiently long period of time operates as badly as possible, that is - in the very way it is allowed to operate. If after some time the energy of the system environment is exhausted in the "struggle" with the decaying system and the intervention becomes weaker, the further decay of the system will proceed more rapidly.

This natural, inertial destruction refers to a higher degree and more intensively occurs in the system of a higher level of organization than in the systems of a simpler and more primitive organization. (The higher the degree of organization the less probable it is, comparing the total chaos, as the high sand whip in the desert is significantly less probable than a low hill).

A partial suppression of the destructive process affecting the quality of the system functioning is achieved by means of the reserve elements (excessive and by passing), which are usually located in the large scale systems. They are possessed by the animate organisms (e.g. double organs of kidneys, lungs, partly sight and hearing) as well as the large scale technological systems. However, the possibilities of reservation are limited because of their different features and functions.

It is only possible in the mathematical theory of reliability that large and highly reliable systems are constructed from unreliable elements; in fact, these possibilities are highly limited. Hence, even the most ideal organisms are the systems which grow old and live a relatively short period of time. It appears that the nature has decided that it is more proper for development and biological expansion to create continually new generations and in this way to preserve the species and ecosystems than to prolong life of individual organisms.

Undoubtedly, the processes of ageing take place also in all the enterprises and institutions. If no energy generated or inflowing from the outside stimulates or rejuvenesces them, they operate less and less productively and effectively. Thus, one of the crucial problems of the organization theory is searching for the answer to the question - how to incite and rejuvenesce these systems and also when and how to liquidate them (after reaching the limitary degree of necrosis and destruction)? Nowadays one should also search in the scale larger than up till now the possible analogies between the large scale social activity systems and the ecosystems, not confining oneself only to the analogy with the organism of an individual being.

Direction and Management

As direction we shall understand the set of relations joining the person of the leader or the leading group with subordinate employees. In this sense only people are directed (exceptionally animals, but not equipment). To distinguish, as control we shall understand the influence of a man on equipment (it is equipment which is to be controlled only). Thus, management encompasses both of the above processes, i.e. direction and control.

The formalized and mathematized control theory in its basic part refers, first of all, to the machines and other working devices satisfying several quite rigorous formal assumptions (which are generally not explicitly formulated). In social activity systems, due to versatility and multifunctionality of every man, the strict formal description is not fully possible. In particular a one-sided (from the assumption) control relation in contacts with a man often changes into the two-sided control game, when the controlling object controls the controlled one and vice versa. If this different situation in direction is not taken into consideration which is typical for the technocratic way of thinking, it will lead to many failures and losses while applying the mathematical control theory in social activity systems. Thus, differentiation between the terms: direction and control refers to a significant difference in the contents of the above terms.

In social activity system one should see, at least, the three kinds of directional control interactions:

1) formal, relatively well coordinated and directed leading interactions of the directing staff as well as control actions of employees and regulators,

2) semiformal and informal interactions of different organization and social groups, weakly coordinated, but sometimes creating also the informal direction centres,

3) informal, in general not coordinated and dissipated interactions of individual employees.

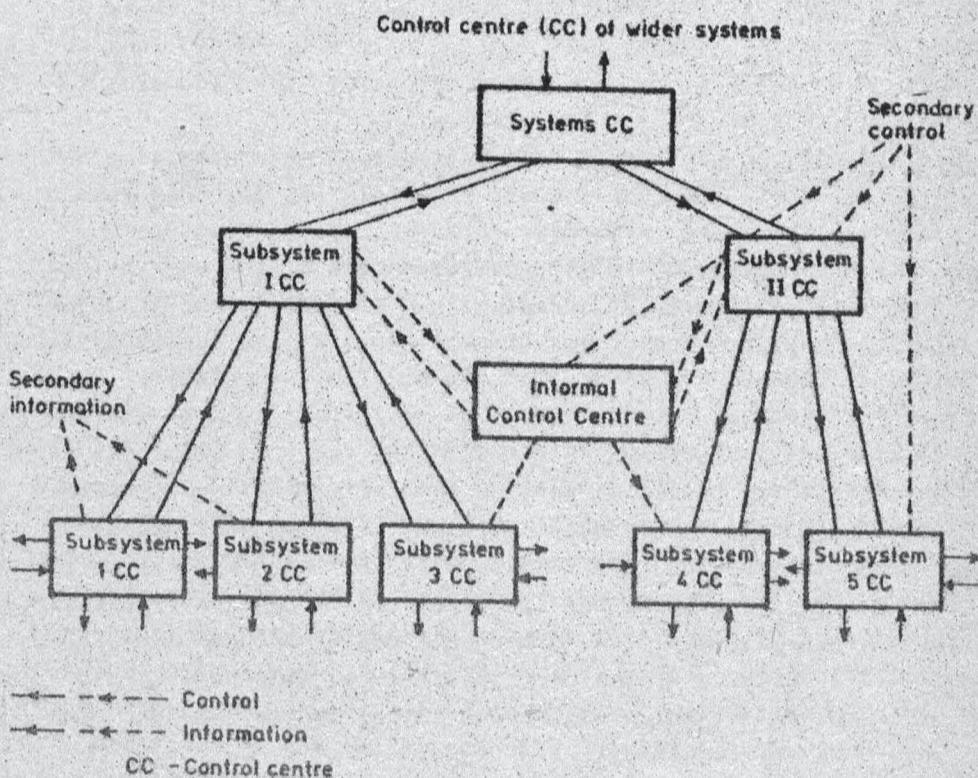


Fig. 7. An Example of Formal and Informal Control Structure of Social Activity System

It results from the subjective character of man that every employee, who has an influence on realization of a given process

in the system, directs this system in some way formally or informally, positively or negatively, actually or potentially. The case most discussed in literature concerning the centralized control or direction from one centre, is only a special case, adequate to the control of the equipment system. However, in almost every social activity system a simultaneous direction from many formal and informal centres is in fact performed which is presented in fig. 7. An example of such a system may be a city trade enterprise with numerous stores, controlled from above by the management of the enterprise and from below by shop assistants and customers as well as by the sanitary, financial and other authorities. It is a very serious problem of every direction to achieve the satisfactory coordination of all these direction and control actions (at least in order to avoid the contradiction) as well as to strengthen properly the formal interactions and to weaken the informal ones.

The skillful organization and direction needs knowledge and intelligence, not the capital and materials and for this reason it is one of the most effective forms of human activity.

As it was mentioned in the previous part of the work a continuous entropic process of self-acting slow decay and disorganization takes place in every dynamic system. In the social activity system the process manifests itself with a gradually less rigorous abidance by the fundamental rules and with an increasing number of deviations from the rules, in the looseness of the organizational bonds as well as autonomization and absolutization of separate cells actions, in the continual issuing of new uncoordinated and contradictory regulations etc. All these factors together result in the lower and lower effectiveness of the system activity and in other manifestations of ageing. Hence, preserving the system organization on the same constant level and improving this organization is the continuous and difficult task of an executive.

The proper solution of this problem is strictly connected with finding the optimal balance between order and elasticity in the system, i.e. it is connected with the optimal assignment of subject and object roles for the employees and users of the system. Man is one of the more active sources of the increasing

disorganization in the system, but it is also the only source of the possible rejuvenescence, adoption and development of such a class of the systems as institution or enterprise. It seems that the organization theory has not sufficiently considered this crucial problem so far.

Human nature is the most creative, innovatory, adaptable and elastic element of the system and it transfers these features into the whole modern social activity system, in which man's subject role is respected and used. However, the same positive features of man seem to be undersirable and detrimental in the primitively and despotically managed systems which assign only the object tasks of an ant or a robot to a man. In doing so such systems condemn themselves to become fossilized, aged and degenerated.

Coordination and Dissociation of Goals and Tasks in the System

In fig. 8 the interconnections between goals, roles and tasks in the social system of a typical hierarchic structure are presented. Both heads as well as employees on every level of the hierarchy perform the roles of double character; as subjects and objects (operational). As persons they introduce into the system their own goals partly modified with the motives, conditions and influence of some other organization factors. Among these factors the following are of great importance; the assigned role or the appointed function, the level of other people's subordination and the real organization responsibility. The organizational influence aims at neutralization of the dissociation between the employees' personal goals and the appointed roles or functions (it also aims at the entire coordination of employers' duties with the tasks actually assigned and performed by them which are called in fig. 8 personal tasks of an employee).

However, it is an ideal state, which is usually not achieved. One should be prepared for some dissociations of the heads' and employees' personal tasks and their duties. The dissociation of these tasks performed by heads falsifies the assignment of roles and tasks to the subordinate employees and to

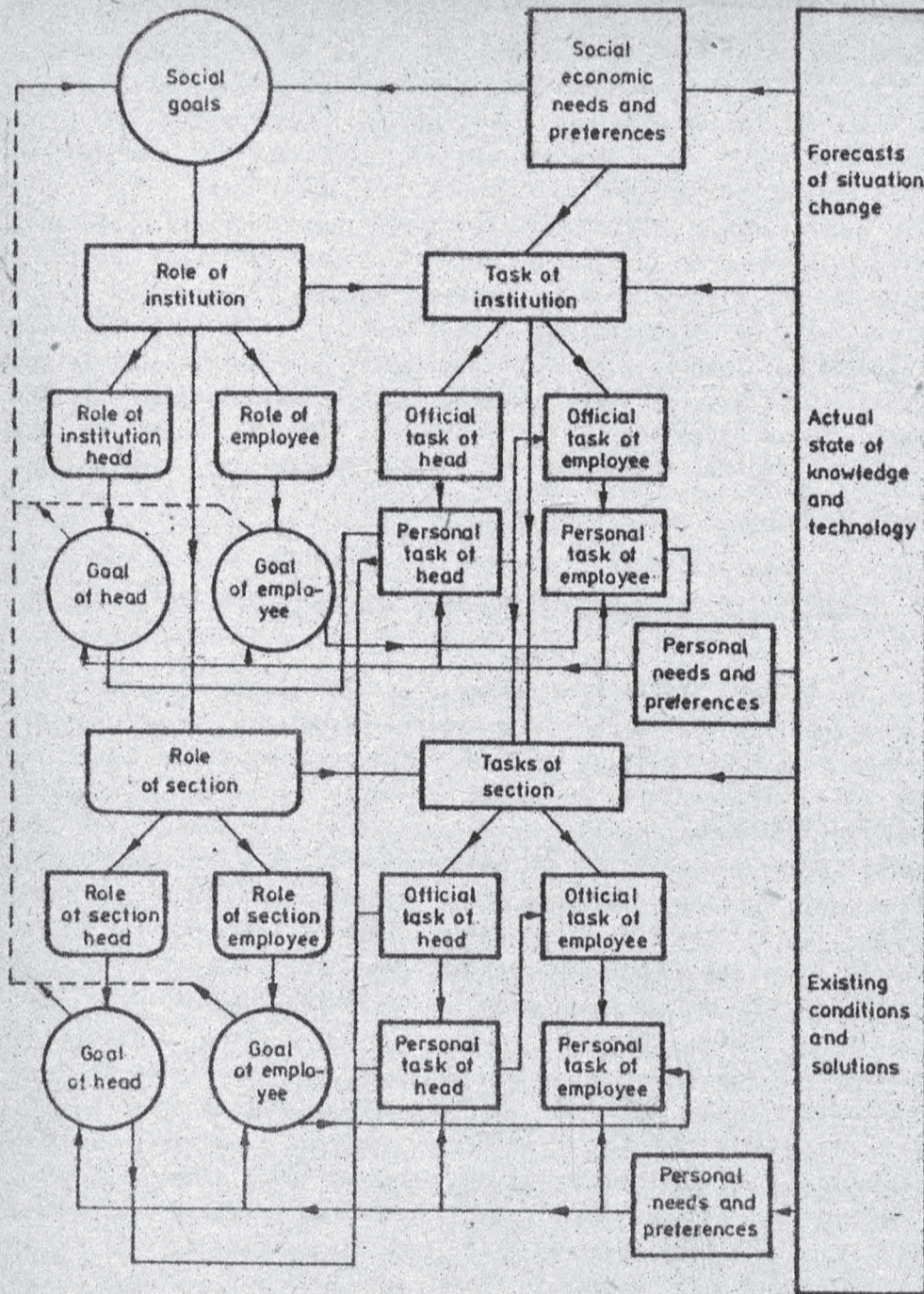


Fig. 8. Dissociation of Goals and Personal Tasks in System

the organization cells of a lower rank and their executives. In the multilevel hierarchical organization this falsification is multiplied on the way between the chief manager and the organization cells of a lower rank and their executives. Fortunately, many employees' common sense opposes this falsification.

Figure 8 presents also that the tasks of institution and employees are spread between the long term social goal and the institution goals and between the conditions and needs among which the short term factors are dominating.

It seems that for every organization and functional structure of an institution and enterprise the analogical studied to those presented in fig. 8 should be performed. More attention than today should be given to the problem of goals, roles and tasks coordination. The effective ways of real realization of the primary social goals should be still searched for in everyday activity of institutions and enterprises.

Włodzimierz Bojarski

PEWNE ASPEKTY SYSTEMOWE ORGANIZACJI INSTYTUCJI
I PRZEDSIĘBIORSTW

Artykuł jest poświęcony prawidłowej organizacji instytucji i przedsiębiorstw w ujęciu systemowym. Prawidłowa organizacja systemu polega na optymalnej równowadze pomiędzy statycznym prawem i porządkiem a dynamiczną działalnością, elastycznością i innowacjami. Jeśli ta równowaga zostanie zachwiana, każdy system osiągnie stan, w którym będzie działał zupełnie nieprawidłowo.

Kierowanie zasadniczo różni się od sterowania. Sterowanie jest jednokierunkową relacją, a kierowanie - relacją dwustronną. Stąd też teoria sterowania jest mało przydatna w zarządzaniu. W rzeczywistości odbywa się wielośrodkowe, autorytatywne i przechodzące jednocześnie od przełożonych do podwładnych kierowanie i zarządzanie systemem. Ważne jest rozszerzenie zakresu podmiotowej roli wszystkich ludzi związanych z systemem, ponieważ despotycznie kierowane systemy, które zakładają wyłącznie przedmiotową rolę wykonawców, są skazane na skamienienie, zestarzenie się i degenerację.