LES CONCEPTIONS DE L'AUTONOMIE

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LE CONCEZIONI DI AUTONOMIA

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Abstract
Autonomy has been broadly discussed in the face of the transformations in work processes, from the alleged overcoming of the Fordist model at the end of the twentieth century to the changes induced by information technology in the 2000s. Nevertheless, the widespread definitions of autonomy have generally been distant from the term's etymological meaning, which indicates autonomy as the subject's capability to produce her own rules and, therefore, to manage her own processes of action. This contribution discusses the various conceptions of autonomy, also in relation to the different interpretations of cooperation and the different ways of conceiving and planning the structuring of work processes. It is a discussion that clarifies and explains the extensive literature on the subject while maintaining its topicality.

Keywords
Autonomy, Cooperation, Formalization, Regulation, Organizational action.

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The conceptions of autonomy[•]

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Introduction

Autonomy is a relevant component of work. It has been used to differentiate situations: it allowed distinguishing the organizational choices with reference to action spaces not subject to prescription or to the possibility of influencing work rules. It also represents a privileged dimension by workers. And it is an organizational variable, of which the job enlargement and enrichment experiences are already ancient examples.

Autonomy, however, seems to concern very different situations involving the notion of freedom and independence for some scholars and the notion of interdependence and control for others. The rationalization choices attempt to formalize the expression of autonomy in different ways, which correspond to different interpretations of autonomy: we will discuss this in the second part. But, first of all, what is autonomy about? It is about working situations that range from the possibility of impacting work rules up to the production of their own organization by the subjects involved. How is autonomy treated in work-related studies? We propose discussing this in the first part to clarify the concepts used.

Autonomy and interactive forms of cooperation: changes in reality

The question of autonomy at work, as in work studies, is undoubtedly ancient, although it is currently the subject of particular attention. It is the question of the division of labor, treated by Friedmann (1950/1963) in terms of separation and opposition between decision and planning on the one hand and

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[•] This text is the translation of a chapter published in Terssac G. de, Friedberg E. (Eds.), 1996, *Coopération et Conception*, Toulouse: Octarès Editions.

execution on the other. The separation inherent in the division of labor and produced by it, detaches what comes from the outside and what is produced by the subjects at work: on the one hand, what structures action by those who govern its execution, and on the other hand an execution limited to just following the prescriptions. Autonomy becomes an attempt to break this situation of division by regaining initiative and independence.

However, the notion of autonomy is used to designate very different situations: freedom, influence, space of action, independence, influence avoidance, departure from the existing rules, reaching one's goals, etc. These expressions are not equivalent because sometimes they indicate the possibility or the ability to regain responsibility and initiative, but other times they indicate what is put in place to achieve a result within a context of dependence. In both cases, there is a relationship with the division of labor, which separates activities, situates subjects, and defines their place and role in the work systems. Regarding the first interpretation, with Dubois, Chave, and Le Maître (1976), autonomy can be considered as "influence" and as "independence": with respect to the technical division, autonomy indicates the influence of the worker on the rules and the methods of work, and with respect to the division of labor, it indicates independence from the hierarchy and freedom in the work unit. According to the second interpretation, autonomy could be considered an adaptive response of people to work contexts characterized by the possibility "of producing without external control, of self-correction by learning, of adaptation to external changes" (Liu, 1983).

The literature on autonomy at work is extensive: we identify some topics that are at the origin of these studies, depending on whether the notion of autonomy is used to: a) evaluate the possibilities of intervention of operators in work situations, b) measure the influence on the rules of work and the methods of work, c) detect the independence of the operators in the construction of their own rules.

Autonomy as the possibility of intervention and criterion for evaluating work situations

According to Rouvery and Tripier (1973), autonomy indicates the possibility for operators to intervene in a division of labor that can be assessed on the basis of the "actual or potential discretionary content of the jobs". For these authors, autonomy expresses discretion, which can be classified into four levels: it is "null" when machines direct the work, "reactive" when it is necessary to evaluate the situation, "adaptive" when it is necessary to choose following an interpretation, "active" when the operator, in the face of unexpected problems, must not only diagnose the situation but also intervene in the production process. Dubois *et al.* (1976) distinguish workplaces on the basis of the degree of influence of operators on the rules of work, specifying this influence with different criteria: quantity, quality, operating methods, cycle times, assignment of places, freedom of movement, freedom of speech, with respect to working hours and prescriptions. At a low level of autonomy, "the job has no influence in the definition of the rule", at a medium level, there are "margins of action", and at a high level, "the rule is dissolved or produced by the workgroup". Similarly, Susman (1972) proposes to evaluate the autonomy of workgroups according to the interdependence of the functions to be performed, the specialization, and the planning, depending on the variability of the context.

All these contributions characterize work situations, both on the basis of observable facts and on the basis of judgments expressed by the interested parties: different evaluation scales of work situations integrate the notion of autonomy as a criterion for distinguishing work contexts. These contributions have also been implemented to evaluate the "new forms of work organization", specifically the experiences of job enrichment and semi-autonomous workgroups, as illustrated by Chave (1976) or Ruffier (1977). Ruffier shows that in 72 factories in the Rhône-Alpes region, the phenomenon appears marginal as the experiences of work reorganization concern only 18 companies, and that autonomy is expressed in three ways: experimental, participatory, negotiable. Through a comparison between his results with the evidence summarized by

the International Labor Office, he points out the characteristics of the "semi-autonomous workgroups": stable team, defined product, own equipment, established space, common production objective of the group with exemption from sanctions, independence concerning the pace of work, small group size. In these practices, autonomy corresponds to some freedom but it is structured by the work organization.

Autonomy as the ability to influence the order of production

In this case, autonomy concerns the capability to modify the work rules and the prescribed methods; the object of the analysis is no longer the evaluation of the work position or situation, but the operators' reactions to the structured context observed in the work practices. Contributions on variations in production standards and variations in the pace of work allowed to assess the influence of operators on the prescribed order. However, can we state that all deviations from the rule imply autonomy? If this interpretation is adopted, all human errors in work situations would have to be considered an expression of autonomy. This interpretation cannot be accepted unless the errors are considered intentional, but this is rare. The practices that refer to the universe of autonomy concern actions of intentional regulation.

Durand (1959) shows that the practice of slowing down the pace of work causes a limitation of production, which varies according to the technical level of the rolling mills, but it becomes absent with the continuous flow, which is organized with such constraints to make it impossible to slow down the pace. Bernoux (Bernoux *et al.*, 1973) observes a similar phenomenon on the metal processing line; however, a 15% reduction compared to the production rule does not concern all operators since workers of peasant origin do not slow down the pace of work. Chabaud and Terssac (1987) observe, in the newspaper printing sector, that the operators assigned to the acquisition of texts (the typists) modify the prescribed rhythm of production, which is equal to 65,000 characters for six hours and six minutes: this production rhythm is never

reached, and the actual production is approximately 21% lower than the prescription.

Is the slowing down of the pace of work only imputable to the inability to respect a production rule, or may it represent the operators' attempt to oppose imposed rules? Is it a reaction, aimed at protecting oneself from work paces that are difficult to follow, or is it an affirmation of rules specific to the group of operators? Is it simply an avoidance of management-induced constraints or an affirmation of the capacity of self-organization? Numerous interpretations of these behaviors have been proposed, focusing on the ability to influence the work rules.

First of all, it is a matter of defining the acceptable working rule by reaching a compromise: it is necessary to safeguard an acceptable norm based on the necessary effort to put it into practice. Durand (1959) notes that if a particular effort is required to attain the norm, overcoming it would risk disavowing it and transforming it into an even more onerous norm. This is what Bernoux states (Bernoux *et al.*, 1973): to occupy a job for the whole working life, it is necessary to manage the efforts. In other cases, such as in the press, it is a matter of changing the rule to allow the newspaper's publication. Indeed, micro accidents due to breakdowns or the irregular arrival of texts do not allow respecting the negotiated cadence, but the typists increase the pace in the second part of their work in order to ensure the newspaper's publication on time.

It is, therefore, a matter of expressing autonomy. As Bernoux says (Bernoux *et al.*, 1973), not respecting the prescribed production rule means refusing an imposed work organization; the behavior is therefore directed against the management and aims to escape the rules it imposes. At the same time, the affirmation of autonomy is an opportunity for the creation of a collective actor and the development of solidarity in the group: it is the establishment of a group culture, of a climate of solidarity that arises from the "opposition to the world of executives "(Sainsaulieu, 1977).

Work practices are analyzed as practices aimed at challenging the order of production: in most cases, production is achieved through activities that are different from those prescribed. However, this challenge is not only instrumental; it can have a political dimension when the workers try to define themselves the relevant framework for their action.

Autonomy as a process of self-organization

Autonomy may not concern the challenge to the order of production, but the construction of an order by the subjects according to strategies developed to face issues or faults of the formal structure, or to combine multiple rules. In both cases, it is a question of production of rules according to a process of joint construction of a legitimate order, not a challenge.

Our previous works (Terssac, 1992) have highlighted the importance of autonomy and mutual exchanges in situations of cooperation in production systems. In the two research cases (in the chemical and nuclear sector), the operators create a new distribution of tasks: shift workers and external operators participate in the work activities in the control room; although they usually are excluded from such room, as formal rules are forbidding their participation, they nevertheless carry out multiple activities together with the control room operators. The analysis of the reasons for the interactions in the control room between the two groups of operators, internal and external, reveals the legitimacy of the practices; indeed, such practices express new arrangements in the distribution of tasks, and four reasons are evoked in support of their legitimacy:

- to ensure consistency, through discussion, of the orders issued by the control room on the basis of the knowledge about the workplace possessed by the shift workers;

- to manage the cognitive interdependence and elaborate a common operational standard based on shared knowledge;

- to learn leading a higher-level position, but also to understand what has been done on the job by analyzing the results in the control room with its managers;

- to help each other when the workload of the control room operators is very high.

The work activity appears as an activity of joint production of pertinent rules, expressed in terms of choices of work distribution among the operators. These actual rules are oriented, on the one hand, towards the achievement of the result; in this sense, they are elaborated and implemented to manage a triple limitation of the prescriptions: the latter are incomplete because all possible cases cannot be foreseen, they are inconsistent with the context, and they are implicit since not everything is specified. These actual rules are oriented, on the other hand, to the common definition of relevant actions; in this sense, they are developed and implemented to manage the interdependencies between the members of the collective. By producing pertinent and finalized rules, the collective constitutes itself as an autonomous actor capable of regulating the work process.

Similar results can be found in other studies concerning the interactions between the work group members in which their independence from external rules is observed. Mariné and Navarro (1980) show how mutual aid is activated in a paper pulp factory in case of accidents: the operators not assigned to the task help those formally responsible for taking on the solution of the accident. Likewise, in a study limited to forty people, Mercure, Regimbald, and Tanguay (1987) found that the operators accept night shifts to preserve their autonomy: the free choice of night work can be considered as a light form of challenge to the modalities of control and surveillance deemed to be too strict in day-work teams. Bernoux (1981) has well illustrated the strategies of appropriation developed by workers facing new work situations.

All these practices attest, on the one hand, that the social system of the work situation is never predefined but built, and that in this construction an important role is played by the affirmations of autonomy and the mutual exchanges in the processes of action. On the other hand, they indicate that production systems require such behaviors: autonomy and interactive forms of cooperation are not a residue of the functioning and effectiveness of the

production systems but the primary condition of the organizational result (Terssac, Dubois, 1992). In this framework of necessary autonomy, it should be pointed out that autonomy is declined in different ways, according to the contexts and the situations previously experienced. Therefore, it is useless to investigate the starting point of autonomy; instead, it is useful to try to understand the dynamics of its construction and the learnings that its activation requires. This is what results from the important research on the "social worlds of business" by Francfort, Osty, Sainsaulieu, and Uhalde (1995). These authors shed light on the relevance of what they call "learning of controlled autonomy", aimed at overcoming the hierarchical-functional model: for the manager, learning a new relationship with subordinates, concerning authority and control of his own universe; for the subordinate, often coming from a formal dependency system, learning new references; and, overall, a new social game between the actors who desire stabilized rules, which allow organized autonomy. Organizing the autonomy means for these authors "to incorporate guidelines and some limitations".

The position of autonomy and control and their relationships in actual work situations remain to be understood, since these are two dimensions that appear contradictory.

Usefulness and need for a conceptual clarification

The aforementioned changes lead to wonder whether we are dealing with a new model of organization, but the diversity of the realities designated by the term "autonomy" requires to clarify in advance the notions adopted.

First of all, we observe that autonomy can be considered according to different orientations, among which the main ones seem to concern the satisfaction of the subjects at work, the organizational performance, the process of action.

According to the long tradition of satisfaction studies, autonomy, as perceived by the subjects, is considered as a condition for the possibility of any decision and any influence on the performance of the task. In their synthesis of

contributions regarding this field of study, Breaugh and Becker (1987) write that what determines most job satisfaction is "autonomy in work" or the freedom with which operators believe they can make their own decisions and influence what happens at work. A synthesis of the contributions that relate management styles to perceived autonomy, satisfaction, and performance has been proposed by Thill (1991) in the context of the theories on motivation. The contributions in the management field concerning the organizational effectiveness, synthesized by Srivastva and Salipante (1976), consider autonomy as a subjective state of perception and an objective intervention on the workplace structure.

According to a different point of view, autonomy is a component of the action process: reflection is centered on action, its order, and its development. This point of view addresses the way in which work actions organize and are organized, and in this framework, the examples evoked allow departing from a vision in which subjects are devoid of initiative and responsibility: subjects are not passive, limited by constraints, nor by the pressures that weigh on them. Real world examples show the existence of spaces of action, degrees of freedom at work. Are these spaces of action granted or conquered? Are the observed practices expected by managers or affirmed by the groups of operators? Do they aim to make work systems function differently or to make influence and independence recognized?

The notion of autonomy

While discussing the results of research activities conducted according to this point of view, we proposed to define autonomy as *the ability to produce and choose one's own rules* (referring to its etymological meaning), therefore as the ability to manage one's own processes of action (Maggi, 1993/2016). Autonomy indicates the elaboration of one's own rules of action and the management of rules that have been defined previously. Autonomy implies an individual and a collective aspect. In the first case, it is about the actions of a single subject; in the

second case, it is about the actions of a collective that affirms its own rules and its ability, as a collective actor, to elaborate and implement them.

If we analyze the examples of behaviors defined as autonomous in the previous paragraphs, confusion emerges between autonomy (as defined here) and the obligation to choose between a set of solutions, which has been described as "granted or available autonomy", i.e., in some ways prescribed or guided.

In the perspective of the granted autonomy, prescribed or guided, specific behaviors, situated within a previously structured action space, are required to achieve a certain result: there are rules that require adaptation. These are behaviors that the group develops by deviating from a defined path, or behaviors that, without constituting illegitimate deviations, allow the achievement of the expected result: the informal organization illustrates these behaviors, only possible and meaningful within the pertinent framework of control rules. These behaviors, aimed at managing what we have called "implicit obligations" (Terssac, 1992), concern the execution of open jobs or, more generally, everything that management expects from the executors; even if these expectations are not completely explicit, the management actually expects the executors to adapt to the context. Therefore, this is false autonomy since it is "locked up" in areas allowed by the control rules: it is defined from the outside and limited within a predefined space. Furthermore, it is false autonomy because it is "required" to the executors, therefore prescribed. We propose to distinguish the notion of *autonomy* and the notion of *discretion* (Maggi, 1993/2016) and to indicate as a "discretionary space" the space of action in which "the subject can choose between alternatives, but in a context of dependence". Behaviors, therefore, refer to the existence of alternatives that are integrated into a predetermined and externally regulated system.

This perspective is suitable for defining and evaluating organizational strategies. An illustration is proposed by the contributions of Srivastva and Salipante (1976): in their article entitled "Autonomy at work", they define the

relationships between subordinates and managers according to degrees of autonomy-discretion:

- the degree of autonomy of a manager and a subordinate should be determined by a mutual agreement between them;

- the contract is established on a discretionary basis: an essential part of the contract is the amount of discretion that the subordinate may utilize to regulate his activities;

- the extent of the discretionary space depends on the level of competence of each one: the competence concerning the job of the subordinate and the manager can be considered a tool to determine the amount of discretion to be granted to them for a specific activity.

As defined in this contribution, autonomy is not a suitable response to what is required and predetermined, nor is it a set of actions developed in a social vacuum. Autonomy designates the ability to regulate one's actions and implies independence. Autonomy concerns the space of decision freedom that the collective subject tries to construct and affirm. Autonomy tries to escape the strategic direction of the control rules which are aimed, as Reynaud (1989) underlines, at affecting the margins of maneuver of the operators: the social system tries to assert its autonomy against the control exercised by the organizers. For Reynaud (1989), the regulation elaborated by the subordinates is not different from the regulation elaborated by the executives because it has a different object, but because it seeks to affirm its autonomy. Autonomy is opposed to heteronomy, which indicates "receiving rules of government from the outside", but also the will to "draw" from the outside, from stimuli or social rules, the principle of one's action. We also note with Reynaud (1989) that autonomous regulation is rational and "can accept organizational goals: in the case of a firm, this means accepting the criteria of cost-prices, quality, market".

The notion of cooperation

The studies described above show that autonomy and discretion are connected in the reality of work through mutual exchanges, mutual relations of

cooperation, cooperative interaction. Then, it becomes necessary to clarify the notion of cooperation to complete the reflection on autonomy. What is the relationship between autonomy and cooperation? Is there a difference between cooperation connected with autonomy and cooperation connected with discretion? Does cooperation always concern the same situation, or are there different forms of cooperation?

Various clarifications are needed. First and more generally, cooperation is *action towards the same goal*. Therefore, we define cooperation as the collective action through which various subjects contribute to the same result (Maggi, 1996/2016). As Barnard (1938) stated, cooperation characterizes every action process aimed at an end that a single subject cannot achieve: it is a means to "overcome the limitations of individual action".

In this framework, cooperation cannot be reduced to mutual exchange situations or direct relationships between subjects. On the one hand, because it is possible to contribute to the achievement of the result with actions developed in different times and places, without direct communication. On the other hand, because it is possible to share means (tools to work, food to survive) without a common purpose: therefore, a sharing of means cannot be indicated as cooperation. Furthermore, the finalization can be chosen by the acting subjects or it can be prescribed to them: collective action does not cease to be cooperative when the common goal is given.

If we define cooperation as a process of actions aimed at the same result, we can add other clarifications concerning the two terms of the definition: the actions and the goal. The *actions* can be *joint or separate*, and the *finalization* can be *spontaneous* (the purpose is chosen by the subjects) or *imposed* (Maggi, 1996/2016). Joint actions imply mutual exchanges, reciprocal relationships, and direct communication between the subjects. The two dimensions of cooperation, action and finalization, define four cooperation situations and different subjects' strategies, according to whether the action is joint or separate and whether the finalization is chosen or imposed. These situations are not

equivalent, and the nature of collective action that develops in each type of situation deserves to be defined according to the form of cooperation.

Can we conceive a collective work action process that is not cooperative? Many and different actions can be oriented towards a goal, and the acting subjects can have different expectations and strategies: would this lead to rejecting to define as cooperative the collective action aimed at the same end? Do joint actions exist and are they possible only when the finalization is spontaneous, when the subjects themselves choose the end? According to our point of view, the action process of work can only be cooperative. Indeed, in work, there are not only joint actions and mutual exchanges. The classical model has tried to exclude any form of interaction in cooperation, to impose separate cooperative actions and precise ways of carrying them out; at the same time, it has attempted to impose ends at every level. The above-mentioned studies illustrate the existence of mutual exchange and communication in work, thus demonstrating the inadequacy of the classical model: cooperation through separate actions turns out to be insufficient and unsuitable, particularly when the result to be achieved is complex. In work, the finalization is always imposed, and there is always the coexistence of separate and joint actions.

The contributions to achieving a common result can be very different: for example, in a research group, where joint actions between researchers and separate actions coexist, and each researcher has her own strategy. In any reality, it is difficult to clearly separate means and ends: nothing is only an end or only a means, the means are not without value, and the ends are often means oriented to other ends. Simon (1947) proposes defining the process of action as a means-ends chain, or rather as a series of means-ends chains, mostly not integrated, to fully consider the multiplicity of levels of goals and levels of decision. Furthermore, every process of cooperative collective action cannot be understood only in its "instrumental" dimension; it is necessary to add the "political" dimension, as Friedberg (1993) notes: each actor plays a power game, understood as an "unbalanced exchange of possibility of action". This is not less

important than the instrumental dimension of action, and the two dimensions are inseparable in reality.

The actors' different strategies, contributions, and separate actions do not contradict cooperation. Furthermore, mutual exchanges and reciprocal communications do not imply freedom of decision: in fact, joint actions and reciprocal exchanges can be prescribed in work. If we consider the different ways of action (joint or separate) and finalization (spontaneous or imposed) that cooperation can involve, it is clear that imposed finalization (as well as spontaneous finalization) can concern both joint and separate actions. All possibilities are present in collective action. In the action process of work, the overall finalization is predominantly imposed, as well as the intermediate ends and the actions (separate or joint). However, this does not prevent the collective action process from generating spaces of spontaneous finalization concerning both joint and separate actions.

Finally, it is worth noting that when we talk about the action process of work, the reality is always simplified: in fact, this process is a set of numerous intertwined processes, each developed in means-end chains and on numerous levels of actions and decisions. Therefore, it is on this basis that the relations between autonomy and cooperation can be considered.

Relations between autonomy and cooperation

The definition of autonomy that we have proposed concerns the rules of the action process, rules expressed by the acting subjects, and not rules imposed from outside. When the literature that supports the overcoming of the classical model proposes autonomy and mutual exchanges of cooperation as two mutually associated aspects, is it confusing different dimensions of the process of action?

On the one hand, we have pointed out that it is necessary to distinguish mutual exchanges in joint actions from the finalization of the action, otherwise it could be concluded that there is autonomy in a framework of imposed finalization, while in this case there is discretion and not autonomy, or not even

discretion. On the other hand, it is appropriate to distinguish the exchanges of joint actions in a framework of spontaneous or imposed finalization from the negotiations aimed at creating rules that govern the process of action.

We propose to distinguish these two dimensions, even in situations in which they are not actually separable, for example in the case of joint actions within a collective that affirms a space of autonomy. Here, the collective action of cooperation is expressed through exchanges and comparisons. They are developed:

- to articulate complementary individual competencies and compensate for the limitations of the subjects,

- to improve the consistency through the comparisons required by the existence of a plurality of points of view,

- to improve the collective management of competences by making the best use of individual competences,

- to establish a system of mutual help and to manage learning processes.

At the same time, collective action develops from the negotiation aimed at producing mutually accepted rules: it is a contract that each party accepts and commits to comply (Terssac, 1992). This shows that the two dimensions can be distinguished: the first concerns the actions and aims of the cooperation process, and the second concerns the regulation of the process.

Regulation is necessary for any cooperative action, as actions without order can be ineffective. This dimension concerning regulation can be defined in different ways, but since the notions of "coordination" and "organization" are affected by the legacy of the classical model, we prefer to refer to the *order* and *structuration* of the process (Maggi, 1984/1990) or to *regulation,* according to Reynaud (1989). For Reynaud, regulation designates the activity of confrontation and negotiation that leads the parties to find compromises; these solutions are never taken for granted; instead, there are variable arrangements, which are continuously modified and renegotiated during the process itself.

The regulation of the action process of work, combining a plurality of rules, is always composed of heteronomy and autonomy. Mutual exchanges

and their purposes can therefore be arranged autonomously or heteronomously. In cooperative actions, exchanges and finalization can be imposed: if finalization is imposed and the modalities of exchange are not imposed, the action process has discretion. Nevertheless, discretion may concern the finalization of joint actions, while an imposed regulation may require exchanges. There is autonomy only where the regulation is autonomous.

Because the action process of work is always composed of autonomy and heteronomy, another critical consequence emerges. On the one hand, no action process can be completely autonomous since it is related to other processes. On the other hand, no process can be completely heteronomous since its regulation is the continually changing outcome of negotiations between all acting subjects at different levels of decision. In the relationships between processes, as in any process, power (Crozier, Friedberg, 1977) and authority (Barnard, 1938; Simon, 1947) are not attributes but relational dimensions. The affirmation of autonomy by the individual or collective subject does not challenge the global order of the process. This overall order implies the contribution of all the actors.

The different interpretations of reality

Based on our conceptual clarifications, it is now possible to reinterpret the changes in the reality of work and the expressions of autonomy and cooperation that the literature proposes. The crucial question concerns the meaning of the changes with respect to the classical model of organization and the consequences on design methods. Is it a new organization model that tends to become generalized, or is it a new reality of which different possible interpretations can be discovered?

We propose first to consider the possibility of different interpretations of what is generally referred to as "action spaces" in work situations, which we have tried to specify. Later, we can consider the consequences of these different views on design modalities.

The denial of the spaces of action

A first interpretation considers behaviors that depart from the established plan as illegitimate changes: any deviation from the work rule is interpreted as a deviance deriving from a deficit of prescriptions that must be corrected through new rules or as a lack of compliance to the given rule. The recurrence of such behaviors indicates the limits of the classic model of organization, which fails to both confine the executors to a passive role, and to force them to a logic of obedience, despite the attempts aimed at isolating the subjects and obliging them to follow the prescriptions.

Nothing in this interpretation allows stating that the exercise of work requires either autonomy or discretion or direct relations between operators, because every initiative and every exchange in the execution is excluded: autonomy is considered counterproductive. This is the interpretation proposed by the classic model. But this model denies the reality, arguing, on the one hand, the exclusion of any initiative in human action and the absence of decision in the execution of the work and, on the other hand, affirming that interactions are not necessary but counterproductive. The reality of autonomy and cooperation is not considered. This point of view affirms a representation that is continually contradicted by reality. The origin of the crisis of the classical model lies in this contradiction, although such crisis manifests itself only when the transformation of work no longer allows denying autonomy, discretion, and mutual exchanges in the cooperation process. The model is rejected by this denial of reality, while it is designed to understand it and arrange it.

Tolerance of spaces of action: a conditional recognition

A second interpretation is aimed at tracing autonomy to practices aimed at achieving a goal: such work practices are recognized as deviating from the established plans, but the deviance is accepted, provided that it allows the achievement of the production goal. If the infringement is intended as a condition of the goal, the deviance is considered functional. According to this interpretation, the goal is unchanged, but the ways and means to achieve it are

many: the excessive rigidity of the prescriptions harms the effectiveness, and the observed partial loss of control turns out to be a condition of control.

The recurrence of autonomous behaviors and exchanges in a cooperative context has led to review the interpretation towards a conditional recognition of these practices. Recognition depends on the recognized effectiveness of those behaviors to goal achievement: the literature on the usefulness of know-how, on the effectiveness of the local initiative, on the interest of the participatory movement, attests to the legitimacy of these practices. However, this legitimacy is conditional since the recognition is subject to a condition: that these practices serve by default to the realization of the given purposes. The practices of some serve to legitimize the decisions of others, by managing the limits of these decisions.

Autonomy and reciprocal relations in cooperation processes are confined to a restrictive interpretation. By managing the gaps or the imperfections of the prescription, autonomy is limited to a response to what is required or expected by management, which we have defined as management of "implicit obligations" (Terssac, 1992), or management of the "discretionary job"(Maggi, 1993/2016). Autonomy appears to be "locked up" and "harnessed": one can think that the organization is divided into two modalities, formal and informal, where the latter is a practical degradation of the former into the practices. Then, autonomy corresponds to the management of a discretionary space, i.e., degrees of freedom granted by those who defined this space: the decision-making capacity is recognized but on the condition that it allows the achievement of goals in a more functional way, and at the same time the exercise of the power is solicited, indeed prescribed, in a context of dependence.

This functional vision also emerges from the interpretations of mutual exchanges of cooperation. It is a way of seeing reality aimed at translating all autonomy into discretion and transforming mutual exchanges activated by autonomous choices into relationships controlled by heteronomous coordination. The joint and spontaneous actions of cooperation are then forced within the framework of spaces provided to identify solutions that cannot be

achieved with separate actions and through exclusively hierarchical and procedural communications. Overall, what changes is the recognition of the variability of the means with respect to the ends that are given at every level, within a discretionary framework aimed at finalizing the behaviors in a process established *a priori*.

The exaltation of action spaces

While the two previous interpretations share a vision of the work process that remains completely heteronomous - autonomy is denied in the first case and transformed into discretion in the second - a still different interpretation leads to consider autonomy as an affirmation of the freedom of the operators in the work process. The subjects oppose the heteronomous process to affirm their spaces of freedom: through their exchanges and interactions, the actual process is built, in a comparison between the rules set by the management and the rules affirmed by the operators. According to this interpretation, autonomy is not only a circumvention of the norm or its substitution; it is to be considered a reaction to prescriptions, based on the decision to develop a different framework of action and to impose it. Therefore, it is not a question of a comparison between two complementary modes of organization, prescribed and effective, formal and informal. In the process that actually develops, there is not a cancellation of the rules set by the management and their role, but at least a reduction of their value and role. This weakening of the rules set by the hierarchy is the condition for affirming the rules produced by the operators. This does not mean that autonomy is the absence of rules, but it attests the dissolution of the rules imposed by the hierarchy; autonomy is the production of rules, but these rules are decided by the operators, through their interactions and in opposition to the structured context. The definition and appropriation of spaces of independence against the hierarchy, which usually decides the rules of work, is fundamental in this case.

According to this interpretation, mutual exchanges of cooperation express a competitive and contrasting attitude about the hierarchy's decisions.

The work activity develops in a structured context, which is the product of both conflictual and cooperative interactions of all the actors involved; therefore, the result of these interactions is neither predictable nor programmable since it derives from mutual conflicts, transactions, and adjustments.

The regulation of the spaces of action

A different interpretation considers autonomy as the stimulus of a regulatory activity that leads to the joint production of adequate rules. The work practices discussed are not infractions, functional deviations, or affirmation of opposition to the order of the process but the production of original solutions that combine different types of (control and autonomous) rules.

This interpretation recognizes the legitimacy of the joint production of rules, even when the context is previously regulated: according to this point of view, autonomy and mutual exchanges of cooperation are ineluctable and necessary for the survival of the collective and for its goal achievement. Autonomy is not conceived in opposition to the predetermined order of the work process, while cooperation through joint actions requiring mutual exchanges is not seen in opposition to cooperation through separate actions. The reality of work is considered according to a point of view that recognizes greater complexity, that admits in the order of the process both different forms of cooperation and spaces of control, which may accept or reject discretion, and spaces of autonomy.

This view is strongly supported by Reynaud (1989), and it is consistent with the interpretation of organizational action as social action guided by intentional and bounded rationality (Simon, 1947). According to this interpretation, the work process develops and changes by arranging actions and decisions of the subjects, and their carrying out of activities: the process develops its order, its organizational action (Maggi, 1984/1990). Therefore, there is no tendency to oppose the formal and the informal, control and autonomy, but regulation is seen as a joint dynamic of production of mutually

accepted rules. From this point of view three principles, essential for the topic we are discussing, are derived.

Collective action is developed on a plurality of rules and points of view, not on a univocal intent; the structured and structuring character of the context of action is an element of this plurality, every development of the process is also structuration.

The combination of these pluralities results from comparisons and compromises that lead to agreements and contracts that each party commits to comply to, as the rules are mutually acknowledged.

These agreements do not derive from a general and overall regulation but from a local and transitory regulation produced by the social actors.

Formalization: from ways of seeing to ways of designing.

What are the consequences of the ways of seeing on the ways of designing? Can relationships be defined between the different ways of seeing the work process and the spaces of action on the one hand, and the ways of designing technical devices on the other? This reflection, which is not new, deserves to be revived to understand the possible articulations between the ways of seeing the spaces of action in the work process and the ways of structuring a space of action, of defining the order of actions. This reflection should clarify the possible articulations between the interpretations of the organization and the practices of systems engineering: on the one hand, to understand how the formalizations proposed by the systems engineers are based more or less explicitly on a conception of the organization and, on the other hand, to identify the possible contributions of the organization's interpretations to the design of technical devices. The first perspective concerns a reflection on systems engineering practices, and the second perspective concerns a reflection aimed at systems engineers so that their practices are better articulated with the organizational design they imply. This reflection is connected to our experience of collaboration between social and engineering disciplines, concerning the design of decision-making tools in production

management. It is not aimed at an evaluation, but at highlighting how, in the field of the design of technical devices, there are several possible ways, which allow more or fewer spaces of action to the subjects, and to show that these ways of designing the space or order of actions are related to the ways of seeing the work process and the place occupied by the subject. Finally, it aims to show that the different ways of designing technical devices are more legitimate when they are more consistent with the organizational designs which accompany them.

This reflection on the ways of designing technical devices will adopt the notion of *formalization*, understood in a broad sense as the process of designing formal rules, which have three general characteristics:

- they are elaborated from the outside to guide the action: they are therefore heteronomous rules;

- they are aimed at determining the course of action, orienting it towards a result, and channeling the action in ways that are established *a priori*: they, therefore, structure a more or less extended space of action, and impose an order to the actions;

- they use a representation of reality based on a more or less precise and validated knowledge of the real world.

We believe that the planning methods can be connected to the different interpretations proposed. For this reflection, we will refer to the automation practices of production systems. There are different ways of automating production systems, the validity of which is the responsibility of the automation field. Manufacturing, management, and design are three fields, each subject to specific automation; moreover, different disciplines are connected within each field; for example, in systems engineering, there are connections between knowledge, models, and tools concerning mechanics, information technology, electronics, and automation. Finally, in the context of production management, on which our reflection will focus, we can distinguish four ways of intervention depending on the way of conceiving the result:

a) the envisaged solution of the technical device is unique, optimal, and activated by the technical devices,

b) the proposed solution is unique, but it is the human operator who activates it,

c) there are several solutions,

d) there is no *a priori* solution, but the possibility of using the technical device to know the consequences of a solution defined by the human operator.

The articulation of fields, disciplines, and procedures leads to an extreme variety of situations, which we call "different design modalities". To approach this variety of ways of designing, we hypothesize that they are articulated according to the different ways of seeing the work process and the spaces of action. The methods of automation and the ways of seeing the organization and decision-making spaces are intertwined in the formalization process. Formalization can be induced by real-world studies or be deducted from a representation made by the designer; it will then be translated into a model that will allow the more or less automated processing of the information. The four types of formalization that we present (totalizing, attenuated, denied, limited) correspond to the different ways of seeing the organization.

The totalizing formalization

The formalization of the classical model aims to prescribe everything, ends and means. Nothing should be left to the initiative, and interactions should be avoided. It is an idealized representation of reality, supposedly known, stable, and predictable. It is a simplified image that gives an illusion of legitimacy due to its simplicity. Two main aspects characterize this way of formalizing: first, the states of the system to be driven are known and formalizable, and second, the formalization of the states allows them to be translated into a model that facilitates the calculations necessary for driving the system and the achievement of a performance. This procedure is based on the hypothesis of complete correspondence between the formalized states of the

system and its pertinent states. Pertinent states are significant for the system's operation and are suitable for the system's operation.

When the relevant states of the system correspond to the formalized states, the system operates automatically. When a system's state differs from the formalized states, the system's functioning goes beyond the foreseen conditions and boundaries: micro-accidents, malfunctions, failures, system shutdowns may happen and produce accidents. This formalization modality is based on the trust devoted to the knowledge of the formalized states: when this trust is high, the estimated risks of moving away from the known states are low; equally, when the estimation of the consequences of a non-nominal operation is weak, the relevance of the system's exit from the expected conditions and boundaries is weak. The fundamental weakness of this modality depends on the fact that only a tiny part of the events is considered, and therefore the formalized states correspond only to a part of the pertinent states of the system.

The attenuated formalization

The tolerance of the necessary variability of the means leads to accepting the formalization's attenuation. It takes the form of what has been called "light rationalization": it is expressed in the coexistence of formal rules for controlling the process and the established possibility of choosing between several solutions.

It is recognized that it is impossible to prescribe everything because of unpredictable events. Therefore, the space of action is structured, on the one hand, with the delimitation of a field of admissible solutions and, on the other hand, with a control device. This design method does not exclude autonomy or mutual exchanges but aims to manage them, according to a functionalist logic. It uses a codification based on the delimitation of discretionary action spaces and is aimed at controlling the management of these spaces.

One way to allow managing non-formalized states is to soften formalization. This way of proceeding has two essential characteristics: it

postulates, on the one hand, that not all the states of the system can be formalized and, on the other hand, that the operator is capable of adapting to a great variety of situations. The system's reactivity is thus improved since its human components allow adaptation to fluctuations in the environment.

This formalization method is based on the hypothesis of a coherent articulation between the automation of information processing and human intervention in managing non-formalized states. Human activity is not formalized. Instead, it is a black box; however, it is framed. The framing delimits the space of decision so that the set of behaviors of the decision-maker conforms to the system's objectives. There is decision-making freedom but within a framework of coherence aimed at conforming decisions to objectives.

This method allows the system to behave outside nominal operations and human intervention to deal with unusual situations. However, human intervention is limited to an instrumental and functional role. This way of designing is consistent with the conditional recognition of action spaces, defined according to a functionalist perspective as the only legitimate and pertinent framework for the decisions that must be made.

The negative formalization

According to another point of view, any formalization is considered negative for the social system since it limits the spaces of action of the subjects and tries to eliminate tensions and conflicts. From this perspective, automation is harmful for two reasons: on the one hand, it encodes reality, it imposes a form on it, it relies on a vision of human relationships based on transparency and harmony; on the other hand, this presentation of reality and this attempt at transparency contradict the opacity that characterizes the social game. Automation disrupts the rules of opacity by replacing them with transparency rules: this formalization must therefore be rejected as an attempt to make the behavior of the actors predictable, to manipulate them through the ordering and programming of their actions.

Automation hides uncertainty by declaring the operational rules of a system: these rules become coercive and destroy the ability of the actors to produce their own rules of action; with information technology, the opacity that constitutes the nourishment of collective action disappears, and therefore the social system fails, due to lack of power. This vision is not shared by systems engineering but has been proposed in the context of social disciplines.

This vision is consistent with the overestimation of autonomy, which is always presumed to be effective, while everything aimed at structuring the action is considered ineffective. It can be observed that this vision presupposes that the rules produced through formalization are totally constraining for the subjects, as they must comply to it without being able of any amendment. It also assumes that transparency is total for IT professionals and that opacity concerns only the users of technical devices: the division between transparency and opacity, as well as the attribution of these characteristics to particular actors, deserve to be discussed, both because there is opacity even among those who engineer, and because there is transparency also among operators, who produce rules, support them, try to make them legitimate and to impose them.

The limited formalization

The limited formalization constitutes a further modality of design; its essential characteristic is the belief that every organization uses a plurality of rules and that the action is the product of compromises and combinations between the numerous rules.

First of all, the limited formalization assumes that organizational effectiveness is not obtained exclusively from the formalized rules but through the contribution of the rules coming from the non-formalized domain. Effectiveness is therefore shared since it is produced both through formalized rules and through rules that are not formalized. This vision has two consequences. First, formalization is not the only source of effectiveness, and the adaptation of means to ends does not derive exclusively from compliance with formal rules. Second, the rules coming from the non-formalized domain

do not indicate a withdrawal of the social system towards the satisfaction of internal needs, they are not informal rules that indicate a degradation of the formal rules in practice, but they are rules developed to support the action and oriented towards the achievement of goals, therefore also directed towards the outside. Hence, formalization is limited in two ways: it concerns a part of the rules that contribute to organizational effectiveness and it is expressed with formal rules aimed at supporting action, constituting a means of action.

Furthermore, limited formalization is based on the need for a composition of formalized rules and non-formalized rules: this implies the possibility of finding compromises between the two sets through a regulatory activity. The compromises produced in the course of action form effective rules based on the ordering of formal rules and non-formal rules. Formalization is limited because it allows developing work regulations based on compromises. Two consequences can be noted: first, this formalization method differs from rigid control regulation, aimed at forcing the operator, for example, with prescribed solutions; in this case, the operator can only oppose any rule deemed to be a source of restriction of his autonomy. Second, limited formalization differs from autonomous regulation, which is aimed only at affirming autonomy against any external rule. According to this modality, the space granted to effective regulation limits the weight of formalized rules, which must be interpreted, discussed, and adapted to be useful for the action.

Finally, limited formalization does not exclude the opposition between the two sets of rules: the formalized heteronomous rules can be judged as too restrictive by their recipients, the operators can judge the framework of their action as too narrow. Subjects do have the possibility to review the framework of their action through negotiations. Limited formalization produces an obligation of result rather than procedural obligations, more a contractual obligation than an obligation to submit to the formal rules. And the contract can be denounced at any time, the commitments can be renegotiated. This vision considers the subject as an actor capable of managing negotiated regulations, with the possibility of leaving the space of action and blocking the system.

This vision is consistent with the vision of the regulation of spaces of action and is based on three main ideas:

- to bring formalization back to its place, as a means of collective action; in this sense, the usefulness of formalization is recognized, but within a plurality of rules in collective action;

- to facilitate the reversibility of decisions; in this sense, the possibility of renegotiating the framework of the predetermined order of action is recognized, even if this renegotiation involves different forms and levels;

- finally, regulation is placed at the center of collective action.

Conclusions

A first conclusion concerns the importance of autonomy and mutual exchanges of cooperation in work, as indicated by the relevance of the studies investigating this topic. However, these dimensions of work are treated with different meanings, which led us to clarify the concepts that allow to distinguish autonomy, understood as the ability to produce one's own rules, and discretion, as the possibility of choosing between alternatives within a framework of dependence; cooperation has been generally understood as action towards the same end, where both the finalization and the actions can be imposed or chosen during the course of the action. These definitions allow a better understanding of the regulation of the action process, always composed of heteronomy and autonomy.

A second conclusion concerns the extent of the changes observed. There is undoubtedly a challenge to the classic model of organization, but are we witnessing the affirmation of a new model? The answer must consider that the ways of seeing reality are also changeable, as we have tried to show by discussing the different ways of seeing autonomy at work (denied, tolerated, heralded, regulated): they correspond to different representations of the work process, always widespread in the discourse on work, which should be made explicit to clarify their characteristics and their incompatibilities.

A third conclusion concerns the conceptions of autonomy and forms of cooperation: through formalization practices, we have indicated the presence of different ways of conceiving autonomy, and we have distinguished totalizing, attenuated, negative, and limited formalization. The different formalization methods correspond to different design practices, particularly in systems engineering; they differ in their content and in the underlying representations of the action process. Therefore, we have indicated the close relationship between formalization modalities and modalities of representation of the action process.

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