

THE SUBJECTIVE INSTRUMENT AND DEVELOPMENT OF THE POWER TO ACT

English translation of : Rabardel, P. (2005). Instrument subjectif et développement du pouvoir d'agir. *Modèles du sujet pour la conception. Dialectiques activités développement*, 11-29. Octares.

Introduction

In an important article written in 1999, Engeström asks himself and asks us collectively: Do we have a sufficiently shared understanding of the idea of activity for it to be a starting point for an evolutionary and polyphonic activity theory? This chapter aims to contribute to this investigation and to the necessary debates it raises by working from the angle of “instrument mediated activity”.

The contribution at hand is organized into seven connected parts. The first part is devoted to a discussion of human models and the presentation of a model of the capable subject that brings together epistemic and pragmatic dimensions. The second presents the concept of the subjective instrument and explores mediations in the subject's productive activity. This same exploration of mediations is tackled in the third part, from the perspective of constructive dimensions of activity and instrumental geneses of artifacts. The fourth and fifth parts of the chapter put forward distinctions between the subject's doing and acting as well as his abilities and powers in the fields of action and activity. We then return to productive and constructive activities to examine their dialectic interplay. The seven part discusses the question of the capable subject as a subject of development. Finally, we conclude with themes that are crucial to evolutionary and polyphonic activity theories: the units of analysis needed, the expansive cycle and the conceptualization of mediation.

The capable subject as a subject of development.

1. A capable subject

The point of view explored here is that of a pragmatic and capable subject, reinforced by an epistemic and knowing subject. These two points of view are not contradictory. The **capable subject** considers

himself in terms of “I can”, meaning both “I have the means” and “I have the ability”, I can effectively do it. Not that the capable subject is or wants to be ignorant, but the capable subject’s “I can” concerns the orientation of his activity. This activity is primarily about intervening in the world in the broad sense, whereas the epistemic subject’s activity primarily concerns producing knowledge.

This is a differentiation concerning relations of dependency and reciprocal subordination between knowledge and action. For the capable subject (the subject of capacity), cognitive activity is subordinated to, and in a way, governed by acting, whereas for the knowing subject, relations of subordination are the opposite: acting is subordinated to cognitive finalities.

These differentiations correspond to two of the many possible approaches for psychology as a scientific discipline and a means of intervention. Every living subject, every person is intrinsically and simultaneously knowing subject, capable subject as well as flesh and blood subject, subject in law or society, etc. In short, every subject is obviously a non-divisible person, engaged in activities participating in systems of activities, inscribed in cultures and social relations of life and work, i.e. in human worlds. In daily life, every person is an intentional, motivated and finalized subject, whose activities and actions respond to the norms that structure them, to motives that drive them and goals that draw them in a more or less contradictory manner. Motives and goals, actions and operations are components of all activities and the subject’s acts as a whole. Motives and goals express and manifest the general orientation of the subject’s personality on the level of activities and engender specific motives and goals on the level of different actions in relation with tasks and circumstances. Correspondence or non-correspondence between these different instances, positive or negative matchings between the subject’s needs and the results of his interventions in the world are a source of meaning, signification and emotions that effect, color and model his activities (Rubinstein, 1958).

The capable subject disposes of a range of both internal and external resources. These constitute his ability to act, that he mobilizes within his activities and which mediate and give form to his different relations to the world: relating to objects of activities, to other subjects and to himself (Léontiev, 1972, 1975, Rubinstein, 1958) and more broadly, to rules, community and division of labor (Engeström 1987). His activities are instrumented and mediated in the full, psychological sense of the word. The subject is at one with his instruments. He constitutes all of their internal and external components. These functional organs are specifically human (Léontiev, 1975, Kaptelinin, 1996, Rabardel, 1995).

Beyond daily life, the capable subject is an emerging subject. This is not only because, like all living creatures, he undergoes the dynamic evolutions of ontogenesis throughout the ages of his life. It is also, and above all, because the subject is an actor of his own movement and his own evolutionary dynamics. The capable subject is both subject of productive activities in daily life and subject of the constructive activities by which he models his systems of resources and values, his domains, situations and conditions of activity for the future. He is a developing subject and subject of his development in all the pertinent and valid dimensions for his activities. The capable subject is an acting and evolving subject, whose development occurs constantly via constructive activities, in the forms and according

to the modalities that connect his own history with that of the communities, collectivities and social groups he belongs to and in which he lives, in a three-way movement of appropriation, renewal and culture sharing.

2. Subjective instruments¹ and mediations in productive activity

Let us go over a few basic definitions of the different relations humans have with technical devices².

There are two main types of relations between humans considered as subjects and technologies:

– in the first type of relation, technologies are in the position of objects of the activity. This is the main relation in tasks of surveillance and control of devices, production systems, industrial processes, etc. It is also the predominant relation in preventative or corrective maintenance, and repair activities.

– the second type of relation to technologies and technical devices is the instrumental relation in which the device is not in the position of object of the activity, but rather in the position of a means, of a mobilized or mobilizable resource for the subject's productive activity.

However, in the instrumental relation, what constitutes the instrument for the subject, **the subjective instrument³**, that we name thus to distinguish it from the technical instrument, is not restricted to the technical device. Research undertaken in recent decades has confirmed the twofold nature of the instrumental entity that the subject mobilizes as a means of his activity.

The instrumental entity, the subjective instrument in the theoretical sense, would seem to be structurally composed:

- of an artifact component that may be technical and material in the traditional sense, as well as more immaterial in nature, such as software programs or even more distantly, concepts, signs and rules;
- a schematic component that has been called “utilization schemes” and which is made up of the organizing invariants of the subject's activity in their usual classes of situations and domains and systems of activities.

A few important points that result from this structural definition should be stressed.

Due to its twofold nature, the subjective instrument ontologically transgresses borders usually recognized in living organisms. The subjective instrument belongs both to the externality of the physical body due to its artifact components (even though some artifacts, in particular symbolic artifacts, may be partially or totally interiorized) and to the subject's physical body due to its schematic dimensions. It is a mixture of interiority and exteriority, a functional organ (as understood by Léontiev, 1975, or Kaptelinin, 1996) elaborated by the subject via constructive activity and

¹ Subjective instruments are not isolated. They are organized into systems of instruments and resources. This dimension, which is explored specifically in Rabardel Bourmaud XXXX)

² These are brief summaries of elements already published on different occasions (Rabardel 1995, Rabardel 2001, 2002, Folcher & Rabardel 2004).

³ Henceforth, the term instrument will be used to mean subjective instrument.

mobilized in productive activity. In terms of the subject's models, this leads to considering the boundary of the acting subject. The skin of the capable subject, if we dare use the term, only coincides locally with that of the physical body. Subjective instruments are, most often, incorporated in the strong sense of the term, not to the physical body but to the acting body (in the broad sense) that constitutes them. Recent research results (Iriki *et al.*, 1996, Berti & Frassinetti, 2000) corroborate this hypothesis and its incorporation of subjective instruments in the corporal scheme of the acting subject on neurophysiological and neuropsychological levels.

On the functional level, the subjective instrument, functional organ of the capable subject, participates in various mediations within the productive activity.

The **mediations** concern primarily the **object of the activity**. They include **epistemic** dimensions oriented toward knowledge of the object, both in terms of its intrinsic properties and the evolutions that result from the subject's actions or the dynamic of situations. They include **pragmatic** dimensions oriented toward the subject's action: orientation, control, regulation, etc. Epistemic and pragmatic dimensions of mediated relations with the object are in constant interaction in activity, even if one or other may be temporarily or lastingly dominant.

Reflexive mediations concern mediated relations between the subject and himself: he knows himself, manages himself and transforms himself in a usage of himself by himself (Schwartz, 1990). Games of Scrabble among process conducting operators or crossword puzzles done by drivers while operating a train concern the subject's management of his own functional states in that they determine his ability to act. The same is true when the productive activity is carried out over longer periods (like those of long term assignments). Béguin (1994), for example, demonstrated how CAD draftsmen use the structure and organization of computer files as a means of managing their future activity several months in advance.

Finally, in all activity, the subject also relates to other subjects. **Interpersonal mediations** clearly occur in collective activities but they concern all socially inscribed dimensions of activities in a more general sense. Several studies (Folcher, 1999, Cerratto, 2000) have demonstrated the fact that interpersonal mediations are inscribed both in inter-functional relations among agents and in inter-subjective relations among people and more broadly speaking again, in the various dimensions that determine inter-human relations on the level of communities and culture.

Vygotsky (1930) conceptualized in terms of the psychological instrument the idea that an instrument allows the subject to manage himself (with the particularly eloquent example of the knot in a handkerchief to remind oneself... to remember) as well as mediating relations with others. It has been shown elsewhere that the distinction between psychological and technical instruments put forward by Vygotsky is only partly relevant (Rabardel, 1999). Mediations with oneself and others are not the specific properties of a class of instruments. Any instrument is potentially a mediator for three types of relations: with objects, with oneself and with others.

Concepts of the subjective instrument and the psychological instruments are not interchangeable. For Vygotsky, the psychological instrument is specifically devoted to mediations with oneself and others. The subjective instrument, in the definition that has been sketched out above, is inscribed in all the relations in which the subject's activity takes place. It participates in the criteria and values that activity responds to and incorporates them via the process of constitution and development of the subject's instruments and resources, i.e. instrumental geneses and more broadly, constructive activity.

3. Instrumental geneses and mediations in constructive activity

The subjective instrument is thus the instrument of activity as a whole.

It is enriched by its mobilizations in the specific situations that the subject constantly deals with in his productive activities. In this way the instrument's **functional field** is constituted for the subject: all the artifact's utilization schemes in which it can be inserted to form an instrument, all the objects on which it allows the subject to act, all the operations, actions and activities that it allows to be carried out and in which its functional value for the subject is grounded.

The artifact's utilization schemes are enriched and diversified in relation to the evolution of the instrument's functional field. They evolve in relation to the range of artifacts with which they are associated to form a locally or temporarily operational instrument, and the diversity of statuses they can take on in this association. Constructive activity concerns transformation, development and formatting of schemes, which are activity organizers. This movement, directed toward the subject himself, is what is known as **instrumentation**.

The second movement, that of **instrumentalization**, is that by which a subject formats, in a way that fits with his person, that which is given externally in order to make his own instrument. Adapting it to oneself supposes inserting the subject in the forms of artifacts as they are given or offered to him. It also supposes subverting these forms or their meanings. This second aspect can be manifested by changes in function, the development of new functions or on the contrary, forsaking planned functions. This can also occur through the transformation of the structure or even the behavior of the tool, technical system, etc.

Instrumentalization and instrumentation are correlative. They bounce off each other, although they are not necessarily simultaneous or of the same scope in each case. These two processes are the two sides of one of the dimensions of carrying out constructive activity: **instrumental geneses** and more broadly, operative geneses. Instrumental geneses concern both artifacts - structurally and functionally - as well as the subject himself (objects of activity, forms of activity and their organizers, i.e. representations, concepts and schemes). They occur within long periods of development, often months or years.

In the professional field, instruments and instrument and resource systems allow the worker to be the subject of his work. They are means available for productive activity and as such, must be able to fit with all the relations the subject forms in the workplace to carry out his productive activity. Not only

must they not interfere with the nature of these relations, but on the contrary, they must support, accompany and encourage their development and incarnate their values. This is why, within constructive activity, subjects aim, via the processes of instrumental genesis, to incorporate into their budding instruments (both as schemes and artifacts) the meanings that these different relations have for them in the present as well as in the future for the person they will be one day. Instrumental geneses carry out several mediations:

- mediation between the extrinsic rationality of the system's objectives for and within which they work, and the intrinsic rationality of their objectives and their identity as subjects at work;
- mediation between oneself and oneself, mediation between the self of their current identity as subjects at work and the identity of the budding self that their constructive activity contributes to producing;
- and mediation between themselves and society, its history and culture, because in operative and instrumental geneses, subjects appropriate artifacts and tools from society while simultaneously contributing to their evolution and renewal through their own creations.

All instrumental geneses tend to carry out each of these mediations in an instrument that constitutes a concrete and specific form. Instrumental geneses can be considered as subjects' interventions in several ongoing undertakings, in the meaning given by Ricœur (1986):

- the ongoing dialectic of planned work and real work;
- the subject's ongoing evolving dynamic;
- ongoing relations to others;
- the ongoing transmission dialectic (appropriation), renewal of society and culture's experience.

For each subject, the instrument takes on a range of meanings. An instrument's meaning is made up of all the functional and subjective values that are sedimented in it during its genesis and the history of its inscription in subjects' activity. These values confront and interact with those inherited from the social history of artifacts and schemes. The instrument's meaning is also made up of functional and subjective values that it may potentially take from within a subject's activity. In transposing Vygotsky's expression, it is no exaggeration to say that all instruments contain, in a specific form, all the relations a subject may uphold with reality on and in which it allows him to act with himself and with others.

The development of the power to act born of instrumental geneses is thus not limited to the sphere of the subject's relation to the objects of his activity. The instrument incorporates, in its specific forms, functional and subjective relations to work objects, to oneself, now and in the future, to others, to collectivities and to the culture of the society in which the subject exists. It functions in these same relations that leave their mark on it and support the specificity they have for it. They are in a sense crystallized, as understood by Léontiev (1972). Subjective instruments thus appear at the heart of the subject's deeds and acts.

4. Doing within acting

The distinctions between doing and acting presented below do not correspond to the vocabulary used by Ricœur (1990, 2004), in which doing is a component of acting that also includes speaking about it and describing it. Our differentiations between doing and acting do not concern what Ricœur calls doing. However, different distinctions will be introduced that do not contradict those he puts forward. The first is that acting goes beyond doing. **Doing** can be defined as a subject's intentional intervention that aims to produce transformations in the world. Doing is thus functionally defined on the level of transformations that the subject introduces or provokes in the world: intentional transformation concerning the object of the activity and situations, as well as the transformations that result, deliberately or otherwise. However, it is clear that the capable subject's action is not limited to doing thus defined by transformations relative the objects of the activity.

Acting includes doing but is not restricted to it. Beyond the object's relation to activity, it concerns other relations that are constitutive of action: relation to oneself, to others and to society via the diverse institutions in which it is incarnated. Acting encompasses doing in a second way, by an enlargement of criteria to which action and activities respond, obey or by which they are guided: efficacy, efficiency, appropriateness, beauty, authenticity, etc. Acting is thus extended to all dimensions of the normed and sensible action and activity.

5. Capacity and power

The second difference from Ricœur's theoretical proposals is that the conceptualization of relations between capacity and power are founded on the differentiation between what the subject who defines his sphere of capacity can mobilize and what is effectively possible, or in other words what the subject has the power to do in the specificity of situations and conditions of activity.

The **capacity** to act is linked to competencies, instruments and the overall resources developed as potentially operational means in the world where subjects can mobilize and apply them. The capacity to act is not a general capacity, but rather a capacity to do something, or make something happen in the space of situations and classes of situations corresponding to a significant whole for the subject, for example, a domain of professional or everyday activity. It depends on the specific regularities of the activity domain it corresponds to. It is potential at the subject's disposal. The capacity to act can be defined functionally by the results it allows to be produced as well as the transformations of the world and the events that the subject is capable of bringing about. It can also be defined by that of which it is constituted: instruments, competencies, functional capacities of one's own body, etc. It is inscribed in the capable subject's generic relation to the world.

The **power** to act depends on conditions that are external and internal to the subject, that are brought together at a given moment, like the subject's functional state, available artifacts and resources, intervention opportunities, etc. It is always situated in a specific relation to the real world. The ability to act updates and manifests this relation by transforming potential into power.

Capacity is inscribed in the medium and long term typical of the elaboration of the world's (or worlds') invariances. This is in the sense of its own domains and systems of activities and that of others, that the subject frequents or with whom he must deal; classes of situations, families of activities, etc. that are the object for the subject of structured constructions of invariants and resources for activity and action. Capacities to act are inscribed in the long term and in the space of territories of the capable subject's activity, i.e. in what can be considered a generality in its subjectively centered times and spaces. Not immobile, because the many variants that make up the subject's resources are constantly being transformed, remodeled, diversified, and generalized (even losing in generality in some cases as it gains in specificity) to better match different evolutions, of worlds and of himself and others. He is confronted with, incites, or aspires to these evolutions. The essence of capacity is in the dynamic invariance connected to the evolving subject and his corollary, the dynamic of invariance in the genericity of his times, his spaces, his territories and his adherences.

Powers to act do not belong to the order of generic invariance, even if they are founded in it and are nourished by the systemic constructions and elaborations they carry out. The essence of powers to act resides in the field of the temporally and locally situated. They are always inscribed in singular relations to the world and worlds (shared or otherwise). Within these relations, capacities are updated and manifested as effective powers in the concrete conditions of the real here and now, and in the entanglement of motives, goals and conditions that engender, model and govern activities and singular actions.

Capacities and powers are thus both subject-centered, but in different temporal dynamics. Capacities interact with long periods of experience and development (including aging), of the evolving subject. They are intrinsically linked to the capable subject's history. Powers interact with the temporal dynamics of the action or activity underway, in line with its finalities and circumstances, i.e. of the subject inscribed in daily life in the ups and downs of the world. Capacities and powers are also differently situated spatially: capacities are generated and inscribed in places, territories and domains of action where the subject's activities and activity systems are engaged, whereas powers occur in the dynamic singularities of situations that form the circumstantial substratum of actions and activities.

6. Dialectic of the productive and the constructive

Constructive activity, by which the subject's capacities to do and act are elaborated, is inscribed in productive activity in which capacities of power via effective usage of resources are manifested. The paradox is that this grounding of the constructive activity is also a necessary detachment. Beyond the variability of singularity, and in a sense in opposition to this variability, constructive activity must elaborate invariances necessary to the renewal and development of the emerging subject's capacity to act. It must grow out of productive activity, in a sense be intrinsically part of it and oppose it by constructing, beyond and even in opposition to the singularity of experienced situations, inter-situational invariances (that organize situations into classes) and which then allow the subject to come

back and deal with singularity more effectively. Metaphorically, constructive activity has its hands and feet in productive activity and its versatile singularities, but its head is elsewhere, i.e. in the spheres of the world's dynamic regularities and invariances as well as the personal history of the capable subject. The productive side of the productive-constructive dialectic is dealing with the situated and the permanent singular by mobilizing the regular invariant elaborated by the constructive in terms of thought, concepts, representations, instruments, criteria and values, etc. (Vergnaud 1996, Pastré 1994 and 1997).

The constructive side is building invariant regularity in an epistemic, pragmatic, affective, identity-based and societal form among others, that is dependant on truth, pertinence, appropriateness, authenticity, beauty or operationality in the reality of productive activity. In this sense, the products of constructive activity must seek equivalence in the reality of past and future productive activity. They must also serve the subject of tomorrow, this other self that I will be and that I construct in an ongoing process. In a way, it could be said that constructive activity ideally comes out of a sort of perpetual adolescence of the power to act, in that capacities to act constantly contest the more established of their current components and seek to establish a renewed strength (not only restored) that is grounded in systems of reconfigured, or even recreated resources at the service of the subject of tomorrow. Yet this movement of constructive development must, of course, deal with situations and circumstances that may, due to the necessities they impose, lead to a reduction in the power to act.

7. Capable subject, subject of development

The construction of capacities and powers to act occurs in spaces, worlds, situations and activities systems that are sought and/or imposed on the subject, but all of them have specific characteristics that can be favorable or unfavorable. From this point of view, unfavorable developments of situations the subject faces leading to a reduction of his power to act may also, paradoxically, constitute opportunities to develop. The capable subject is not a weather vane whose behavior changes depending on the variable wind of external events. Nor is it totally dependant on his internal movements or the accomplishment of a pre-formatted development program. Constructive activity undertaken by the capable subject constructs him as a subject in a constantly renewed relation with the world, his body and his existence. Real or metaphoric losses of tools thus not only generate negative occurrences, which may be major. They can also be opportunities, nourishment, or even sources for constructive activity. By stressing the contradictory nature of evolutions imposed on the subject, the position stated above is not weakened in the slightest. Even when losses and suffering have rendered the subject particularly vulnerable, he can, by his constructive activity, inscribe himself in a movement of development, as demonstrated by studies on resilience undertaken in clinics.

Development, management, maintenance and evolution of the capacity and power to act are a finality and result of the capable subject's constructive activity. Based on what he has, the subject engenders capacities to act, particularly by appropriating social pre-constructs (artifacts, schemes, methods,

norms, etc.) that are accessible to him in the society and collectivities he belongs to and the collectives to which he contributes. Instrumental and operative geneses contribute to the development of capacities to act, as do the process of pragmatic conceptualization

(conceptual geneses), the construction of model representations (representative geneses), the appropriation of methods⁴, etc.

Constructive activity occurs in geneses that produce resources (instruments, systems of instruments, competences, systems of values, criteria), which develop the capable subject's capacities to act and the modalities and ways of acting, thus expanding the field of possibilities. These constructions by the subject occur in the social and public arenas of the workplace as well as in other domains of activity. Thus, they have a twofold social dimension: one comes from appropriating the already constituted external; the other comes from the fact that operative creations and geneses influence social pre-constructs in return. These geneses and creations are not simple copies of what exists in society. They are marked by the subjects that produce them. They reflect and are constitutive of their own style(s). Operative geneses thus contribute to the evolving dynamic of social pre-constructs by incorporating some of their components in later generations of artifacts and social schemes,⁵ which are added to common culture within systems of ensembles that are themselves socially organized.

8. Reducing the power to act

Relations between the evolutions of the subject's capacities and powers to act and the way he is affected will now be explored⁶, beginning with a passage from Robert Linhart's book *L'Établi* (The Workbench) (1978). In it, the author describes the suffering of a worker in a large automobile construction company. Demarcy was responsible for fixing doors damaged on the production line: "The cracks, bumps, parts that were badly nailed or cast, embossments and holes were all his department... The most amazing thing was his workbench, an indefinable machine made of rods and pieces of metal, a variety of props and improvised vices to hold pieces together, with holes everywhere and a frighteningly instable appearance... Yet appearances are deceptive. When you watch him work for a fairly long while, you understand that all the apparent imperfections in the workbench serve a purpose. Through this slot, he can slide an instrument that will hold a hidden part. Through that hole,

⁴ See, for example, Samurçay & Rogalski (1991).

⁵ Functions constituted via instrumental geneses are incorporated as constitutive functions, and utilization schemes as operative modes (or schemes) as constituents of the following generation. For a deeper analysis, see Rabardel, 1995.

⁶ This part of the text covers the main elements of a conference presented at the invitation of Christophe Dejours, in which the question of relations between subjective instruments and suffering was explored from the perspective of the notion of the loss of the power to act (Rabardel, 1998).

he will pass the pin for a difficult weld. Through this empty space below – which makes it look so fragile –, he can do some more panel beating without turning the door over.

This do-it-yourself workbench was constructed, transformed and completed by him. Now he is at one with it. He knows its resources off by heart: two turns of a screw here, three turns of a nut there, a wedge cranked up two notches, an angle adjusted by a few degrees, and the door is in the perfect position to be welded, polished, filed or hammered in the exact spot needing attention, however inaccessible...

Then suddenly one July morning, his workbench is replaced by another: “a huge cube... of solid metal... The production line is back in action... Demarcy has to try to keep up. With the awkward movements of a beginner, he gets to work. He attaches a door, instinctively seeks the access that is now blocked, resigns himself to decomposing the operations he did simultaneously with both hands, above and below... Clearly, it is a disaster. Demarcy’s rhythm is gone. His method has collapsed... He can no longer proceed, as he used to do, with combined movements above and below, which is the most convenient way of rapidly hammering out a smooth surface... Now this is impossible. He has to work on the recto and verso separately... For Demarcy, the worst is to come: he will be publicly humiliated by an executive leading a group that has come to inspect the workshop. Yet a few days later, his old workbench is returned, with no fanfare... The old worker goes back to his repairs, apparently like before. But now he has a look of terror in his eyes... He seems to feel he is being spied on. Living on a suspended sentence. As if he were waiting for the next blow... Always nervous when he is spoken to. Sometimes he makes a mess of a damaged door, which he almost never did previously. Soon after, he falls sick.”

Where does Demarcy’s suffering come from? From the reduction of his power to act, because “suffering is not only defined by physical pain, or even by mental pain, but by the reduction or even destruction of the capacity to act, the power to do something, which is experienced as an attack on one’s personal integrity.” Ricœur (1990): “The reduction of Demarcy’s power to act is reflected in several ways and on several levels in him as a capable subject.”

First, maintaining past performance requires costly regulations. His efficient movements are no longer efficient, or are less so. His schemes are no longer in tune with the world, which has suddenly changed. His well-practiced gestures are out of kilter. Managing, nonetheless, to repair the doors, to do his job, to not be overwhelmed by the flux that constantly renews his task implies an ongoing battle that he does not always win. Demarcy is affected here as a professional, an **agent** performing operations that constitute production that he can no longer deal with in terms of quantity or quality. He is affected in terms of the results of his productive activity and the conditions in which it is carried out. Suddenly his performance is infinitely more costly.

The activity required to reconstitute his performance as an operator is even more costly in that it takes place in real time, i.e. on and in production time. While the duration of his productive activity is already considerably reduced because each operation takes longer, he has to find extra time to adapt

his movements and maybe even invent new ones. These regulations and adaptations thus have a cost that generates suffering in itself. Further suffering comes from failure to reconstitute the performance when the combined efforts employed end up being insufficient to carry out the job.

Beyond this suffering linked to work efficacy and efficiency criteria (of “doing” as defined above), Demarcy suffers from no longer being able to assume the status linked to his competence in the eyes of others, both other workers and management. Demarcy is not less competent than before he lost his workbench. But he can no longer demonstrate this competence recognized by all because his acts in the workplace are no longer there to testify to it. The fast, confident work, the precise movements, the elegant solutions typical of his activity, everything by which his style was recognized (in both meanings of the term) is now mostly impossible. Not because he is no longer capable, but because the circumstances and situations he has to face make it impossible: he has retained the capacity but lost the power. The reduction of the power to act caused by the loss of the workbench leads to a discrepancy between his capacity and his real power to act. This discrepancy between the work act that he is capable of and those he can concretely carry out in the work situation make the attestation of his competence problematic⁷. Demarcy is affected here as **actor**, **working subject** and **worker**. The impossibility for Demarcy to prove his competence to others risks being progressively aggravated by a similar difficulty in proving it to himself if restoring his performance is slow and incomplete (as may be the case for a professional who is victim of an accident, sickness or simply advancing age). His suffering comes from the self-doubt that results, and which may spread well beyond the workplace: the muted suffering of the progressive loss of confidence in one’s capacity to act, which can no longer manifest itself in practice, leading to the loss of his workmates’ approval.

This particular workbench does not only represent the means of Demarcy’s productive activity, whose loss is translated by a reduction of the power to act. The workbench is more than a means of his productive activity. It is the product of his constructive activity, a creation, his creation. Beyond the loss of resources for activity, the replacement of the workbench signifies the negation of a creative dimension and the personal genius that allowed Demarcy to elaborate and accomplish himself in this creation⁸. From this point of view, the workbench is Demarcy’s expression as a **creative subject**, as the **author** of a creation. The negation of this creative dimension of his identity as a subject at work also generates suffering.

Finally, the injustice and arbitrary nature of this loss are also sources of suffering, not only because they are at the origin of the loss of the workbench, but because their sudden appearance without warning implies that it may happen again. They are the sign that somehow the “rules of the game,” the

⁷ The subject’s competence is thus the result of his capacity to act. Its efficient and attested application depends on the real power to act in situation, i.e. the subject’s inscription in the world.

⁸ In *Phénoménologie de l’esprit* (1807), Paris, Aubier-Montaigne (1947), Hegel gave a good analysis of the way a creation makes sense, its very existence as a creation and the signification that the other who is not its author accords it.

social norms that govern the work have changed or are changing. If his workbench (the instrument he developed and which allowed his performance as an operator, recognition of his competence as an actor and approval of his genius as an author) has become unacceptable and illegitimate for the company, then the change underway vitally affects his place in this community where he works. Demarcy is affected here by an event that puts him at odds with what the rules and division of labor previously expected of him. Beyond the immediate consequences, this event is the sign of an evolution of the prescribed and symbolic order with which his capacity to act was until recently in tune (which does not mean in harmony with). It signifies that other components of his professional life and his professionalism may henceforth be affected without him having deserved it. This could happen again at any time. Demarcy feels a new social threat weighing on him, which is yet another source of suffering. Demarcy, as a capable subject, is thus affected by the loss of the workbench in several ways, that the above analyses probably do not fully render. As an **agent** of production operations, as an **actor** who is a subject of his work, as an **author** of a creation and as a **socially inscribed professional**, his suffering originates in an instantaneous reduction in his power to act following the loss of the workbench. The consequences are felt on several levels: difficulties in accomplishing work operations and the burden of efforts to maintain performance; the burden of reconstituting the power and capacity to act in a period that is too short; the impossibility of providing proof of his competence; the negation through the rejection of his creation of his identity as an author subject at work; a new, unspecified threat that affects his professional identity and social status. The loss of the instrument is not only the loss of the power to act. It is also the loss of an intimacy with oneself because the schemes that are no longer operational require him to reinvent elementary conduct. His professionalism is affected, both in its efficacy and efficiency, in the self-esteem it allows, and in what could be called the ostentatious dimension. The loss is public. It is a loss of face that may lead to inner collapse.

This approach to the consequences of the reduction of the power to act leads us to stress the non-substitutable nature of the capable subject. Demarcy suffers personally, i.e. as a human, from the loss of power to act that is inflicted on him. It is himself and not another, even if others may be affected or afflicted by what happens and what happens to him. It is not an abstract entity reified as activity, action or acting. It is tempting to speak of the suffering of the activity or acting but it is the person who suffers and loses out.

Demarcy was only an isolated precursor in the corner of a workshop. At the time these lines are written, his successors' workbenches can be counted in the thousands and hundreds of thousands given the spread of the ideology of re-engineering that makes the destruction of what exists one of its cardinal principles. The all-powerful forms of organization incarnated in totalizing systems: information systems, integrated administration systems and other "Enterprise Resource Planning" (ERPs). These new forms of organization and governing, harbingers of efficacy and efficiency, often fail, as indicated by the over-abundant teratology of administrative and management instruments.

However, the omnipresence of piloting by result turns out to be crushing for people and collectives Moisdon (1997).

Here we join the questions of health and its interaction with the subject's development in quoting Schwartz (1987): "If health, as Georges Canguilhem has always claimed, is the capacity to create new norms of life in confrontation with the *milieu*, awareness of misuse (of oneself) and the demand for another usage in line with one's specific possibilities is the way the self testifies that we belong to the living." Yet this is the issue for Demarcy and all his contemporary successors, creative subjects developing their capacity to act by constantly generating instruments, resources and values in specific environments in the workplace and beyond. For these Demarcys, the disappearance of their modern workbenches often corresponds to a loss of many of the "singular possibilities" that constitute their capacities and powers to act. They are forced to misuse themselves in reduced, alienated spaces, which damage their health and their future.

Discussion conclusion

In conclusion, three essential questions in the field of activity theories will be discussed:

- Units of analysis
- The expansive cycle
- Mediation.

The focus on activity systems suggested by Engeström as a unit of analysis is fundamental. Yet the individual level is just as necessary as a unit of analysis. The above analysis of the loss of the instrument and its consequences in terms of suffering and reduced power to act highlights the irreducible nature of the subject as a person. It is the person, in the unit of his life, who develops, suffers and ultimately dies. The future of the activity system may be more or less affected, or sometimes not at all. On this point, we follow Rubinstein, an essential, yet little-known activity theorist: "From the perspective of goals and the future, the wellbeing of all must be the wellbeing of each person, of each human personality. Each person and his wellbeing becomes society's goal. This is what gives human life its sense of fulfillment." Throughout his life, the individual, the person, is inscribed in different activity systems simultaneously and successively. In the systemic approach to activity, different levels of analysis (and intervention) are not in conflict. Rather, they are in a relationship of dialectic complementarity. This is precisely why Engeström's complex model (1987) is so interesting: it allows this interaction between systems of activities and the systemic approaches of synchronic and diachronic activities on an individual and collective level.

Expansive cycle

The mixed nature, both internal and external, of mediating entities in productive activity leads to a questioning of the internalization/externalization pair in the “Expansive cycle”. The concepts themselves are not in doubt. We need them in activity theories. However, “expansive cycles” could also be conceptualized from other, complementary angles. In terms of what already exists in the society in which he develops the subject is given mixed entities in which internal and external interact from the outset, instruments already constituted socially of artifacts and schemes. The subject’s move to appropriate is not only internalization: it is played out both on internal and external levels. It is creative in itself. It is a reconstruction of the instrument for oneself that can go well beyond simple appropriation and lead to renewal and development. This constructive activity continues beyond the appropriation phase, over a long period, in relation with functional mobilizations of instruments in productive activity. Public sharing of innovations and inventions born of individual or collective subjects’ constructive activity is not automatic. We still need to distinguish, beyond movements of appropriation and creative development of the given, a third specific movement of knowledge sharing within social formations: collectives, communities, society. This knowledge sharing can take many paths, from inter-individual exchange to constructions formalized by the adoption of new rules, organization forms, the design of a new generation of artifacts, etc.

Engeström (1999) stresses that the idea of mediation is a key in activity theories. Mediations should be seen both on the level of productive activities and constructive activities in their dialectical, hence contradictory, relations. On the level of productive activities, the subject is in a contemporary relationship to the objects of the activity and himself: whereas on the level of productive activities, he is inscribed in the specificities of medium and long-term development periods. Productive and constructive activities are distinguished even more fundamentally by the nature of their respective objects and their mediations. Productive activity is oriented toward the transformation of the world in the broad sense. Mediations are supported by instruments and all the subject’s systematically organized resources, which constitute his power to act. Constructive activity is oriented toward the development of instruments and more generally, the subject’s resources. It aims to increase his ability to act and manage its evolutions. Constructive activity is thus in a mediating position in the general movement of the subject-person’s evolution and development (even if it is in decline). The person here and now is, due to his constructive activity, in a relationship with himself in other times and other places. He is in a relationship with the person he once was in the past and the one he brings about for the future, with the systems of life and activity in which he is inscribed and in those he could be inscribed or whose emergence he will contribute to bringing about. This twin relationship, mediated by constructive activity makes up the identity unit of personality in its evolutionary dynamic.

Bibliography

- Bannon L-J. & Bodker S. (1991). Beyond the Interface: Encountering Artifacts in Use (p. 227-253). In *Designing Interaction. Psychology at the Human-Computer Interface*. Carroll J. M. (ed.), Cambridge, Cambridge University Press.
- Berti A. & Frassinetti F. (2000). When Far Becomes Near: Remapping of Space by Tool Use, *Journal of Cognitive Neuroscience*, n° 12, p. 415-420.
- BÉGUIN, P., RABARDEL, P., 2000, Designing for instrument mediated activity, *Scandinavian Journal of Information Systems, special issue on Information technology in human activity*, 12, 173-190.
- BEDNY, G., KARWOWSKI, W., (2004) - Meaning and sense in activity theory and their role in study of human performance, *Ergonomia IJE&HF*, vol 26, N°2, 121-140.
- Bodker S. & Graves Petersen M. (2000). Design for Learning in Use. In O. Bertelsen & S. Bødker (Eds), *Information Technology in Human Activity. Designing for Instrument Mediated Activity. Scandinavian Journal of Information Systems*, vol. 12.
- Brushlinsky, A.V., Vladimir A. Barabanshikov, V.A., Nosulenko, V.N., Rabardel, P., (2005) - Man-Technology interaction : some of the Russian approaches, In *Theoretical Issues in Ergonomics Science* Vol. 6, No. 06, 2005.
- Cerratto Pargman, T. and Waern, Y. (2003). Appropriating the Use of a Moo for Collaborative Learning. *Interacting with Computers: the interdisciplinary journal of Human-Computer Interaction* Volume 15, p. 759 – 781. Elsevier Science.
- Daniellou F. Rabardel P. (2005). Activity-oriented approaches to ergonomics : some traditions and communities *Theoretical issues in ergonomics* ,vol. 6, no5, pp. 353-357
- CERRATTO, T., RODRIGUEZ, H. (2002) *Studies of Computer Supported Collaborative Writing mplications for System Design in Blay-Fornarino, M., Pinna-Dery, A., Schmidt, K. And Zarat, P. Cooperative Systems Design. 139-154 pp. IOS Press, Amsterdam.*
- Cole M. (1996). *Cultural Psychology: Once and Future Discipline?* Harvard, Harvard University Press.
- Engeström Y. (1990). *Learning, Working and Imagining, Twelve Studies in Activity Theory*. Helsinki, Orienta-Konsultit OY.
- Engeström, Y. (1999) "Activity Theory and Individual and Social Transformation." Engeström, Yrjö, et al., eds. *Perspectives on Activity Theory: Learning in Doing: Social, Cognitive & Computational Perspectives*. New York: Cambridge UP, 19-39.
- Engeström, Y. (2005). Development, movement and agency: breaking away into mycorrhizae activities. Paper presented at the International Symposium `Artefacts and the Collectives: Situated Action and Activity Theory, Lyon, July 4-6, 2005 <http://sites.univ-lyon2.fr/artco/home.html>.

- Folcher V. (2003). Appropriating Artifacts as Instruments: When Design-for-Use Meets Design-in-Use, *Interacting with Computers: The Interdisciplinary Journal of Human-Computer Interaction*, Vol. 15, (p. 647-663).
- Habermas J. (1981-1987). *Théorie de l'agir communicationnel*, t. I & II, Fayard, coll. L'Espace du politique.
- Iriki A., Tanaka M. & Iwamura Y. (1996). *Coding of Modified Body Schema During Tool Use by Macaque Postcentral Neurons*, *Neuroreport*, 7, (p. 2325-2330).
- Joas H. (1992-1999). *La créativité de l'agir*. Paris, Éditions du Cerf.
- Kaptelinin V. (1996). Computer Mediated Activity: Functional Organs in Social and Developmental Contexts. In Nardi B. A. (ed.), (1996 a) *Context and Consciousness, Activity Theory and Human Computer Interaction*. (p. 45-68). Cambridge, MIT Press.
- V. Kaptelinin, K. Kuutti, Cognitive Tools Reconsidered from Augmentation to Mediation, in: J. P. Marsh, B. Gorayska, J. L. Mey (eds.), *Human Interfaces, Questions of Method and Practice in Cognitive Technology*, Amsterdam, Elsevier Science B. V., 1999, pp.145-160.
- Léontiev A., N. (1981). *Problems of the Development of Mind*. Moscow, Progress.
- Letorsky, W.A. (1999). Activity Theory in a new area, in Engeström, Yrjö, et al., eds. *Perspectives on Activity Theory: Learning in Doing: Social, Cognitive & Computational Perspectives*. New York: Cambridge UP, 165-69.
- Lorino, P. (2005) *Target Costing Organizational Learning in New Product Development: The Theory of Activity Applied to Management Tools*. In : SANCHEZ R., HEENE A.. *A Focused Issue on Managing Knowledge Assets and Organizational Learning*. Oxford (Great-Britain) : Elsevier JAI.
- Miettinen, R., & Virkkunen, J. (2005). Epistemic Objects, Artefacts and Organizational Change. *Organization*, 12, 437-456. .
- Norman D. A. (1991). Cognitive Artifacts. In J. Carroll (ed.) *Designing Interaction: Psychology at the Human Computer Interface*, Cambridge, Cambridge University Press, 17-38.
- RABARDEL, P., ,1991, Activity with a training robot and formation of knowledge. *Journal of Artificial Intelligence in Education*, 2/4,, 3-14.
- Rabardel P. (1995). *Les hommes et les technologies, une approche cognitive des instruments contemporains*. Paris, Armand Colin (248 p.). Téléchargeable : <http://ergoserv.psy.univ-paris8.fr>
- RABARDEL, P., (1999), Ludi i tehnologii. Kognitivnyi podkod k analizu souremennykh instrumentov, (Moscow, IPRAN) 262 P..
- RABARDEL, P. 2001, Instrument mediated activity, in A. Blandford, J. Vanderdonck and P. Gray, (eds.), *Situations People and Computers XV -Interactions Without Frontiers*, (17-30), (Springer-Verlag).
- RABARDEL, P., 2002, *People and Technology* , <http://ergoserv.psy.univ-paris8.fr>.

- RABARDEL, P., SAMURÇAY, R., 2001, Artifact mediation in Learning, new challenges to research on learning, *International symposium organized by the Center for Activity Theory and Developmental Work Research, University of Helsinki, March 21-23, 2001*, <http://ergoserv.psy.univ-paris8.fr>.
- Rabardel, P., (2001) – *Instrument-Mediated Activity in Situations*, in Ann Blandford, Jean Vanderdonck & Phil Gray (eds.) *People and Computers XV - Interactions Without Frontiers*, p 17-30, Springer-Verlag.
- RABARDEL, P., WAERN, Y., (2003) - From Artefact to Instrument, in Special Issue “From Computer Artefact, *Interacting with computers* 15, 641-645.
- Rabardel, P., Béguin, P., (2005) - Instrument mediated activity: From subject development to anthropocentric design , in *Theoretical Issues in Ergonomics Science* Vol. 6, No. 5, September 2005, 429–461 .
- Rabardel, P., Bourmaud, G., (2003) - From computer to instrument system : a developpmental perspective, in Rabardel, P., Waern, Y., (eds.), Special Issue “From Computer Artefact to Mediated Activity”, Part 1 : Organisationnal Issues, *Interacting With Computers*, vol. 15, issue 5, p. 665-691.
- Rabardel, P., Pastré, P., (2005) - Modèles du sujet pour la conception : dialectiques activités développement, 260 p., Octares, Toulouse.
- Rasmussen J. (1997). Merging Paradigms: Decision Making, Management and Cognitive Control. In R. Flin, E. Salas, M. Strub and L. Martin, (Eds.), *Decision Making Under Stress, Emerging Themes and Applications*. Ashgate .
- Ricœur P. (1986). *Du texte à l'action, essais d'herméneutique II*. Paris, Éditions du Seuil.
- Ricœur P. (1990). *Soi-même comme un autre*. Paris, Éditions du Seuil.
- Ricœur P. (1995). *Le juste*. Éditions Esprit.
- Ricœur P. (2004). *Parcours de la reconnaissance : trois études*. Paris, Stock, Les Essais (387 p.)
- Rubinstein S. L. (1958a). *De la pensée et des voies de son étude*. Moscow, USSR Academy of Sciences
- Samurçay R. (1995). The Role of Causal Information Systems in the Internalization of a Continuous Process Knowledge . In L. NORROS (ed.), *5th European Conference on Cognitive Science Approaches to Process Control*, Finlande, VTT (p. 237-252).
- Samurçay R. & Rabardel P. (2004). Modèles pour l’analyse de l’activité et des compétences : propositions. In R. Samurçay & P. Pastré, *La didactique professionnelle*, Toulouse, Octares (p. 163-180).
- Vérillon, P. Rabardel, P. (1995). Artefact and Cognition: A Contribution to the Study of Thought in Relation to Instrumented Activity, *European Journal of Psychology in Education*, 9-(3).

- Virkkunen, J. (2006). Dilemmas in building shared transformative agency. *@ctivités*, 3 (1), 44-66, <http://www.activites.org/v3n1/virkkunen-en.pdf>
- Vygotsky L.S. (1930). La méthode instrumentale en psychologie. In *Vygotski aujourd'hui*, B. Schneuwly & J.-P. Bronckart, Delachaux & Niestlé.
- Vygotsky L.S. (1934). *Pensée et langage*. Paris, La Dispute, (1997).
- Wertsch J-V. (1998). *Mind as Action*. New York, Oxford University Press.