How To Operate with Strong Emergence Concept: from psycho-cognitive system to social system

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Social events are emerging from individual action. What's emerging exactly and how? What may be learned about an organization studied through a systemic model based on the emergence concept? From fundamental works about the emergence concept, realized in the field of Artificial Intelligence, this article shows how to operate with weak and strong emergences. A systemic model of emergence will be built and the relativist nature of emergence will be laid down. The method benefits from pilots' reflexivity upon their systems and several cases show how strong emergence concept may give some information about some social dynamics. This model is consistent with main structural and systemic theories. We'll develop it to differentiate and hierarchize the intervention modes upon organization dynamics.

Keywords: strong emergence, social facts, organization

In the context of a working team in a business company, one or more pilots (managers) have to act on the dynamics of this organized group. Outcomes and goals are known by pilots and their role is mainly consisting to reach those ones.

When observing such a working team as a system, we may notice products, services, processes, functions and other properties which may not be assigned to a single system component (men, machines, etc.). Most of these phenomena may be qualified of an emergence arising from the working of the system.

The existence of a social entity, like a team or a company, may be an emergence from a collective work. Early in social sciences, Max Weber proposed that social events emerge from individual action. What would a systemic model including the emergence concept give us, in studies about organized and piloted social groups? A first contribution will be to distinguish between emergent properties and non-emergent properties. An other contribution will be to determine if actors are conscious of the emergence concerning their group. Thus we'll link the perception of emerging phenomena and how are actions adjusted according to individual strategy. From this, a systemic model of social dynamics linked to emergences and to intervention modes upon these dynamics, will emerge.

1. Emergence

In order to build our systemic model, we'll use fundamental works about the emergence concept done by "SMA&Collectif" AFCET/AFIA workgroup [SMA&Collectif (1997)].

1.1. Forms and Characteristics of Emergence

For a group of social actors, if the part or each actor is identifiable in global properties and if none of these properties belongs to the system, it's only a composition, it's a **null emergence** (e.g. the cumulative sales results obtained by independent salesmen).

An emergence appears when a global property of the system may not be assigned to one single component of the system. We'll have a **weak emergence** for an actor when he is not conscious about what's emerging, so that he won't directly adjust his action according to the emergence. The effects of weak emergence are perceived by actors as "enchanted" modifications of the environment.

We'll have a **strong emergence** when the actor is conscious of emergent phenomena. He is adjusting his actions with the aim of modifying the emergence. His perception of the emergence, his cognitive processes about these perceptions, and his expected outcomes, all become constraints for decisions about actions to engage , or not.

Emergence is a **dynamic process,** which the system's components, structure and properties, produces feedback effects on this system. These effects may be observed from appearance or modification of a component, a relation or a property. If observer assigns these effects to an emergence, this is a strong emergence. It does not mean this inference is pertinent. When qualifying a weak or a strong emergence, effects and composition of these emergences depend on observer. These characteristics are relative to observers located either inside the system or outside. Structure and working of this process are mostly unknown; this is why it will be modelled as a **black box**.

1.2. Systemic Model of Emergence in Piloted and Organized Groups

1.2.1. To distinguish what is emergent and what is not

These definitions allow us to split the system with emergent properties into two subsystems: the first one is composed of directly observable components, their structural relations and non-emergent properties; the second one is a black box named "emergence", its input is the first system and its output is the modified system.
Actors may take an observation "position", dissociated from the system they are "belonging to". If this reflexivity includes both subsystems, we have a strong emergence. If this reflexivity only includes the first subsystem, we have a weak emergence, at most.
This reflexivity is often difficult to operate in social sciences but becomes very useful here. Through questioning the actors of the system, we may determine what they are observing about their system and, besides, what they are linking system properties to. If these properties are shown as global and not assignable to a single component then they are emergent.

1.2.2. Model Description

The proposed model (Figure 1) has been inspired from J. Forrester, J-L. Le Moigne and J. Mélèse works. Relations and feedbacks are not shown.
Symbolized elements are those useful to detect emergences: system of persons, system of information and communication, data and documents flows, money flows, transports, production tools and flows, people networks (customers, suppliers, subcontractors), work places and spaces, some part of environment and subsystems (it's often useful to model the social entity as a subsystem to distinguish its aims, rules and its own system of values in order to be compared to actors' ones, to know if they are really emergent).
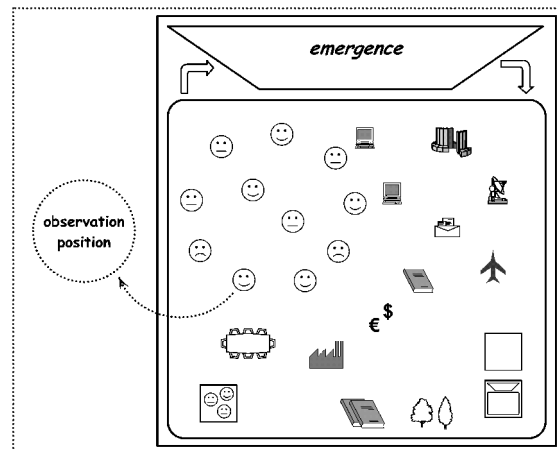

Figure 1: Model of the Emergence

The black box called *emergence* is drawn as a trapezium; *inputs* are symbolized by the left arrow and *outputs* by the right arrow. The rounded rectangle represents the *first subsystem*; the plain line rectangle represents the whole *observed system*. The *observation position* has a psychic nature and is an external reframing upon the system if the observer is also an actor.

2. Observed Situations

2.1. Psycho-Cognitives Structures Models

The cognitive psychology tools and models chosen to describe the system observed by the actor, the meaning he gives to his observations, his choices and decisions, the system of beliefs and values which drive these choices, come from R. Dilts works about *Systemic NLP* [Dilts (2000)].

2.2. Emergence Cases: presentation and decoding

2.2.1.   « Becoming better »

That was the main goal a supplies department manager links to her role. She was observing the department has a specific proficiency, an added value. She said department function has evolved, there was more work to do, and other departments are more often requesting services. These increased negotiation power with suppliers, decreased costs and allowed the application of buying policy. She was linking these effects to her action as this: better she will be, better will be the members of the department, better the given service will be.
We may observe the integration in her role's representation of the facilitation due to emergence (i.e. a global increase of proficiency). We may also observe several feedbacks. Some negative, as overwork; some positive, as decreasing of costs.
Her observation mainly focused on system of persons, on information and on objects, but not on places. Her time orientation was toward future. She was seeking for solutions and outcomes with optimization as evaluation type. Her inner sense of activities has the shape of a process (i.e. not static).

2.2.2.   « A day to day stress »

This situation concerned an administrative department manager who noticed an overwork. He linked this overwork to vacancy positions. This overwork let him no time to step backward enough to plan and organize. Here, we have a positive feedback reinforcing the problem: this overwork stimulating stress, this "day to day stress". However, this "enchanted" expression of a problem reveals an underlying process, unobserved by the actor.
The pilot told about his exigency level. He was looking for technically good employees, in order to build a coherent and cohesive team. He recognized this kind of employees is rare. So positions were still staying vacant. Thus, recruitment constraints forbade a "normal" working of the department: it's a negative feedback opposing to emergence.

2.2.3.   « The right solution »

In this case, I was the team's pilot. Team meetings were aimed to solve problem in common but were not productive. Team members brought some problems to solve but discussions were gabblers about present or anticipated consequences of these problems. No one has the feeling of a team working.
A coworker asked me why, although I was more paid than they were, I didn't give any solution or any response to their questions. I reframed this demand in explaining my role: I had to help them defining what we would want in place of problems and how we'll know how expected outcomes are achieved.
It was a belief like "a leader must have a solution to each problem" and was opposing to the appearance of a cooperative working. In the following weeks, this coworker made several proposals and encouraged other coworkers to make some. Problem solving was accelerated and work during meetings evolved into creating innovative services and constructing quality control system.

2.2.4.   « A bad ratio »

The problem laid down was a management ratio between 8% and 12% since two quarters of a year although the goal was 22%. We did a whole team meeting and used a specific technique called *core problem* to choose what to do. After three hours and about fifteen sheets of paper hanged on the wall, whole team has the *intuition* to know what to do, that this ratio indeed was the problem and that the global working was henceforth "clearer". During the next quarter, the ratio was stabilized between 30% and 33%. A proposed interpretation might be an increase of the system variety by producing a strong emergence for all the team members.

3. Effects, Utility and Further Development of the Emergence Model

As shown, using the actors' reflexivity and this model allow describing links between cognitive processes and the appearance of an emergence. These links are validated with the sense given by actors themselves and by the relativist nature of the strong emergence.

Considering the emergence as a black box and differencing it from the observable subsystem, implicate modeling the social entity not as the system itself but as an emergent effect introducing a new component. This avoids us to describe social entity frontiers that may be blurred or imbricated, as for modern companies. This facilitates the comparison between actors' goals and entity goals.

This model expresses the P. Bourdieu's *habitus* double process and the A. Giddens' *Structuration Theory* first level. It's consistent with the M. Crozier's *Strategic Actor*, the C. Argyris and D. Schön's *Organizational Learning* double loop and, as the Palo Alto Systemic does, qualifies as a feedback what otherwise would have been qualified as the very problem.

A development of this model according to a role axis is shown on Figure 2. These roles concern those who have to do an intervention upon organization structure or dynamics.

Taking an *observation position* will produce a strong emergence.

A *pilot* must have skills to recognize what's emerging. His first aim: verifying the existence of an emergence and acting to produce emergence. His second possible aim: pacing other actors to recognize emergence in order to increasing the system's variety. The type of this produced emergence is *organization.*

An *advisor,* or some *consultants,* take the place or pace the pilot in its first aim.

Some forms of *professional coaching,* or the *action* side of the Action-Research, pace actors toward an observation position and facilitate the pilot's second aim.

Figure 2: Roles and Emergence of Emergence

The type of this produced emergence is *images of organization, paradigms, and schools of thought.*

A *researcher* may take each of the already described position.

His aim is to produce theoretical knowledge. This knowledge is feeding back all the embedded levels.

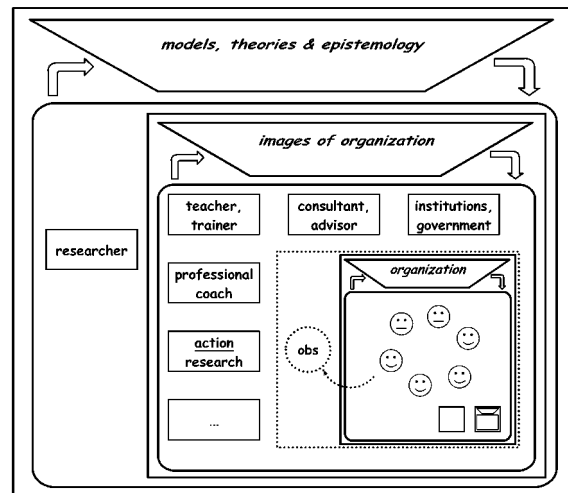The type of this produced emergence is *models, theories or epistemology.*

References

Dilts, R. and DeLozier, J. (2000). *Encyclopaedia of Systemic Neuro-Linguistic Programming*, NLP University Press, Scotts Valey : CA

SMA&Collectif, Groupe de travail (1997). *Émergence et SMA*, in *JFIADSMA'97 : Intelligence Artificielle et Systèmes Multi-Agents,* (AFCET/AFIA), Hermes, 323-341