Time, processes and cycles

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ABSTRACT

We introduce a proposal for a theoretical, systemic definition of the concept of *process*, based on the constructivistic role of the observer and the level of description. We mention in this regard the concept of *reductionism* and some misunderstandings still present in the systemic movement about humanism and the scientific approach.
By considering the active role of the observer we then consider *Time as a Social Construction*. In this framework we consider the difference between cyclic and non-cyclic time as defined by cyclic and non-cyclic processes. This difference has very important consequences when dealing with social systems. Assumption of behaving in cycles or not affect tremendously life of human beings by inducing systemic *closeness* or *openness*. Making people to assume living cyclic time has important role in social control and manipulation. We introduced two short examples referred to Architecture and designing social systems.

Keywords: cyclic, non-cyclic, openness, process

1. THE CONCEPT OF *PROCESS* AND THE ROLE OF THE *OBSERVER*

1.1. The concept of process

The concept of process, as *noun*, is widely used in different disciplines, metaphorically and in the daily language. By the way definitions available in literature are often based on *usages* rather than on a *theoretical content*.
It is possible, for instance, to define, as from some English dictionaries, the concept of process as

- *series of actions* needed to achieve a result, such as accumulating in order to produce savings, improving single writing/reading ability to produce culture and trial and errors processes;
- *methodology* to produce, i.e. to transform, goods such as industrial processes and computing processes;
- *series of events* collectively establishing specific changes, such as development process (versus single events of growing), learning process (versus acquiring single, specific information or ability);
- *transformations* taking place in an organized or self-organized way (e.g. phase transitions, between liquid, gas and solid states in physics and chemistry; changes between legal entities, such as Sole Proprietorship, Limited Partnership, Limited Liability Company, and Corporation in economics).

Some time definitions introduced in this way overlap. We would like to propose a more theoretical definition based on the systemic view and the role of the observer. We introduce the concept of *process* as *sequence* of *correlated* states (at *any* level of complexity), eventually ordered, by the observer, depending on the *level of description adopted*. This approach is based on considering the need and the effectiveness to be *not* objectivistic *or* constructivistic, but to *mutually represent* and dynamically use the two opposite approaches. This approach has been introduced in literature as *Dynamical Usage of Models* [1,2] related to the ability to dynamically and simultaneously use different levels of descriptions and not just to select the one supposed to be the best. For instance, sometimes a problem may be better dealt with by considering it biological, sometime chemical, sometime psychological: in this case we have in mind different kinds of human illness and disabilities. In the *inter-disciplinary* (i.e. usable in different, specific disciplinary fields, as for systemic properties such as *openness* suitable in physics, biology, economics and psychology) and *trans-disciplinary* (i.e. related to interdisciplinary properties not used in different disciplinary fields, but considered *per se*, in general) systemic view the researcher must be able to represent a level of description into another one (this related to the cognitive ability to *translate*) and it is done, for instance, by modelling and simulating.

1.2. The level of description

The concept of *level of description*, as introduced in literature, relates both to

- the disciplinary knowledge assumed by the observer when dealing with a phenomenon. It may be done by considering one discipline ***or*** another one. In a systemic view different disciplinary knowledge are not considered as *alternative*, but *simultaneous* for modelling and simulating by using, for instance, agents based models, neural networks, cellular automata, genetic algorithms,

and generalising by using, for instance, mathematical representations [2];

- the *cognitive model* (i.e., in short, schemas and computer programs to represent and process input, then transformed into *information*) assumed by the observer in the framework of its *cognitive system*, considered as system of cognitive models interacting (we have interaction when the one's behavior affects the other's behavior) within a *cognitive architecture* [3,4,5].

We just mentioned how the term *reductionism*, considered opposite to the systemic view, relates, in short, to reducing one level of description to another one (a simpler one). *In the reductionistic view the microscopic level is considered sufficient to explain the macroscopic level.* It is assumed that the macroscopic level can be disassembled, without losing properties, into the simpler microscopic level.

The reductionistic approach considers that problems have their specific level of description to be dealt with by an appropriated mono-disciplinary knowledge. In this framework, for instance, managerial problems are intended as organizational problems and illness as biological problems. This view has been the basis for the *behavioristic* approach to explain behavior [6]. As we introduced above, inter-disciplinarity is based on *simultaneously* considering different disciplinary knowledge, different levels of description. In this systemic view it is possible to *move* from one level to another by considering systemic properties, modelling and simulating.

It is very important to underline as in modern science the observer has an *active* role, being integrant part of the processes, as for the well-known *Uncertainty Principle*, introduced in the 1927 by W. Heisenberg and the concept of *emergence* [2,7,8,9]. The role is *active* because it is at the observer to select suitable models to detect, model, and represent a phenomenon.

On one side this has been a deep improvement with reference to considering the role of the observer just as generator of relativity, of points of view.

On the other side, phenomena and the environment may be considered as source of inputs that are to be processed by the observer in a deductive, inductive or abductive way [2]. We mentioned that as observer we mean an agent equipped with a cognitive system able to use cognitive models to behave: it may be a living system having cognitive system at different level of complexity and it may also be *simulated*.

In this regard we would like to introduce some comments about a misunderstanding still very diffused in the systems community and even in some universities claiming to use the systemic view for their activities.

1.3 The misunderstanding about humanistic as non-reductionistic knowledge

The misunderstanding is based on a couple of very wrong assumptions, such as:

a) The so-called *humanistic approach* means or, at least, implies non-reductionism;
b) The so-called *scientific approach* means, or implies, reductionism.

Rather, they are often equivalent.

Both assumptions are based on the idea is that to *explain* is a reductionistic approach *per se*. Probably the concepts of repeatability, falsification and generalization by using mathematics and validation of models is considered as request for standardizing, ignoring peculiar properties of human beings.

In particular, such a misunderstanding takes place when dealing with social systems because in this case repeatability and isolating are experimentally very difficult. This difficulty is often taken as an *excuse* not to be scientific when instead it would be effective to be such.

These misunderstandings open the way to generalizing specific cases and analogies without validating theories. "*General* System Theory" is a science of *generalizing* (not making *generic*) by using consistent approaches and robust knowledge.

In the systemic view we are very aware of the different levels of descriptions and of the different disciplinary knowledge involved.

Knowledge in general may be used in a reductionistic way, that is, trying to deal with everything by using what we know.

Any kind of knowledge may be used in a reductionistic way. The reductionistic aspects is not related nor dependent on the kind of knowledge considered.

2. CYCLIC AND NON-CYCLIC PROCESSES, TIME AND OPENNESS

In the framework of what has been introduced in chapter 1 we may first of all distinguish between Physical Time and *Time as a Social Construction*, see, for instance, the issue of *Chronotypes* [10]. As it is well known physical time has been well explored in physics, as in the past century with *Relativity*. The concept of *Time as a Social Construction* relates to assuming another level of description, different, but compatible, with the one of physics (we just mention that the compatibility is not assured by dealing with different levels of descriptions in Quantum Field Theory). With the expression *Time as a Social Construction* we consider the role of the observer not only for measuring and comparing Physical Time as in

science when we refer to it with the expression *(t)* in equations, but also for modelling it by considering time as a general process into which other micro processes take place. For instance in the general daily time there is the working, leisure, travel, breakfast, lunch, dinner, slipping and waiting time. *Social Construction of Time may be intended as a process giving social properties to physical time*. It happens by using cognitive models dealing with time as resource for designing and performing processes.

This view, of course, is based on the constructivistic approach [11] , the active role of the observer.

Time as a Social Construction is time of a general (considered as such by the observer) process, such as daily time and life time. It means that events and other processes take place in the framework of a fundamental, environmental, general, defining process. Other processes use time, i.e. steps, of the general one. General time is not composed by micro-times. At the contrary, micro-times use steps of the general one.

This usage is done by the observer, behaving at levels of description different from, even if based on, the one of physics. We do not consider in this paper other possible approaches as Chronobiology [12].

Our purpose is to introduce some comments about the relationship between the general time and micro time as designed by the observer.

2.1. Distinguishing time of cyclic and non-cyclic processes

We propose to consider the difference, for the purpose of modelling by the observer, between the cases when the general time of the general process is cyclic or non-cyclic. This distinction qualifies the *nature* of the events taking place into it:

- *Time of cyclic processes* is time of cycles, per $(\text{cycles})_i$ with $i \geq 1$. They may be considered time of *closed* processes, because starting and arrival points coincide. This is the case, for instance, of machine time cycles, seasonal lives, and calendars. This also refers to *repeatability* of single processes. Single, limited processes may be considered as single, unique, *uncompleted* cycles, such as short term business and travel time, because they are repeatable. Events in this case are *steps* of a *virtual* cycle, given by repeatability. They are *closed* processes.
- *Time of non-cyclic processes* takes place when, at a specific level of description, non-cyclic processes happen into it. This is the case when evolutionary, adaptive, growing, degenerative, developing and learning processes take place. There is no repeatability. There are *open* processes, when only the starting point is known. Events in this case are assumed steps of an open line.

For comments about systemic openness and closeness, see the end of the point 2.2

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2.2. *Living* in cyclic or non-cyclic time

There is a big difference between considering cyclic and non-cyclic time in an objectivistic (i.e. observer-independent) or cognitive (as introduced above) way.

We consider this difference for our species that has become to study itself, living in natural cycles, but able to design different usage of time as resource. Because of that we do not move and live in cycles only, but steps are part of imaginary, open, evolutionary lines. The end of this line may be intended as ideals, God, knowledge, the final truth, the beauty, and so on depending on cultures, ages and religions. We just assume they are *open*.

Let us comment the difference between considering living in cyclic time or in non-cyclic time.

This consideration has a tremendous effect on considering human life: as steps of a cycle, first step of new cycles and steps of an open line, an open journey.

This has an enormous impact on approaches, tools, methodologies, representations and culture to be properly used to manage in such a kind of times.

The culture, tools, technology, and social designing for maintaining and establishing cycles are very different from the ones for supporting non-cyclic time:

- The assumption of living cyclic time makes easier the acceptance of local, temporarily purposes. With reference to political issues it makes easier the keeping of the *status quo*. In the past it was suitable to avoid revolutions, maintaining *unbalanced* situations (the escaping from the prison of cycles was considered delayed to another life after death). Cyclic time as the time of the general cyclic process was assumed as the natural, i.e. objective, status of the world. Human life should reproduce the same cyclical process. In modern societies cyclic time is used for configuring human lives, by forcing people to consider they needs as sets of single, specific needs to be satisfied with consumerism and standardized life styles (see point 3.2). *In this view freedom is freedom to select between predefined possibilities and not to design new possibilities*.
- The assumption of living non-cyclic time makes it possible to abandon cyclic and repeatable frameworks, allowing the *design of future* and not only live cycles or anticipate and control in a deterministic view. *In this view life is usage, even design, of cyclic time* (see the difference between First and Second Cybernetics mentioned at the end

of this Chapter). Agents are not forced to *only* perform steps of the cyclic general process. Culture and science need this conceptual framework, otherwise they only reproduce, optimise, sophisticate the previous cycle. We take this opportunity to underline how the very powerful technology today available may establish a *scientific status quo*, where revolutions are not necessary. We may ask ourselves, what if *Simplicio* (we refer to the famous "Dialogue Concerning the Two Chief World Systems" by Galileo Galilei, 1632) and *Ptolemy* (we refer to the "Geocentric Theory", ca. 85 – ca. 165) had the computers as we have ? (We give credit to professor Salvatore Di Gregorio for this comment).

With reference to the concepts of cyclic and non-cyclic processes and time we used the property of closeness and openness to refer to open and closed loops. We just mention their systemic aspects. Let consider the difference between *thermodynamic* and *logical systemic openness* [13].

In the first case openness refers, in short, to the possibility for matter and energy to cross the borders of the system in thermodynamic processes.

In the second case openness refers to the ability of interacting agents to mutually model themselves during the interactions (this interest the constructivistic role of the observer). Many levels of openness are possible, such as:

1. two systems utilize in the communication process a language assumed to be common;
2. the systems model each other;
3. systems influence the other's context to induce the attribution of meaning to the sent message, by influencing the rules of the game;
4. systems design new rules, even deciding to act as a closed system.

Logical closeness takes place when systems just follow predefined rules.

We may also metaphorically say that:

- *Time of cyclic processes* is the time of *applications of rules* as described by First-Order Cybernetics, when a game is played and *new things are seen in old light.*
- *Time of non-cyclic processes* is the time of *invention of new rules* as described by Second-Order Cybernetics, when games are invented and *old things are seen in new light* [14,15].

3. DISCIPLINARY VIEWS

With reference to the concepts introduced above, we mention, as example, a couple of disciplinary views.

3.1. Architecture

The distinctions introduced enables to identify in Architecture

- cyclic times are intended as the *iterated* and *recursive* production of shapes, urban and living solutions. The conceptual meaning and the social influence are kept constant by process of repetition (in mathematics we say *isomorphic* process, i.e. having the same information). Civilizations in different ages distinguish in their architectures. It is possible to detect evolutionary social processes by considering changes in architecture. The cyclic usage of the same architecture corresponds to conservative and cyclic time where the constancy of cycles takes place in different cultural and social aspects. For instance, *in nature species build nests always in the same cyclic ways without changing any rule.*
- non-cyclic times take place when solutions are not iterated and recursively used *only*, but also *invented*. In order to be not just the start of a new cycle, they should be used as *language* for *social system designing*. Awareness of this usage allows for being not anymore in cycles. Architecture relates to the design of structures where social systems emerge: structures have very important role on making interactions possible. That's by supporting and *inducing* new views and new approaches having different, general and social impacts through induction of usage, styles and ways of thinking [16,17].

3.2 Social systems

Modern, consumerist societies are based on some reductionistic assumptions, such as considering life *desegregated* into a very large set of details to deal with products and services. This is a very reductionistic view, adopted for local, private, short-term interests [18,19].

Cyclic time is the *clock* for lives having *consuming* as meaning.

This is not only for products and services, but for time itself too. Time is *regulated* by cycles (i.e. work shifts and regular daily activities), and *consumed* by non-creative activities (i.e. not for *designing future* in general, just following steps), such as watching TV (not specific programs, but *selecting* between the available ones: the keypad gives the illusion of freedom) and shopping in general (not specific goods, but *selecting* between the available ones: people visit market centres for such a *leisure*).

This is very *reassuring* because it removes any responsibility from people about usage of time: there is

the, *welcomed*, assumption that there is no choice, by confusing *acceptance of standard* and *willing*.
By accepting to live in cycles induces to consider everything as cycles. Projects that are not made of cycles are considered *unrealistic*. We particularly refer to young people designing their future as sets of standardized cycles *only* (having a job, buying a car, moving to a non-parental home, establishing a family, and so on) instead of having higher level idealistic goals (such as discovering scientific results, having social, economical and political roles, producing artistic results, visiting new worlds and so on).
Young people should eventually regret to have took lower risks rather than too higher ones (I give credit to my son for this comment).

4. CONCLUSION

In the framework of a constructivistic, systemic approach we introduced a proposal about a definition of the concept of *process*. In this framework we considered *Time as a Social Construction*. We distinguished between time of cyclic and non-cyclic processes, as time of the general framework influencing any micro time in social systems. Living cycles is the standard in nature. We underlined how the ability to *design usages* of cycles is a peculiar creative possibility available to our species. *Status quo* of social systems is based on reducing life to cycles.
Life should be not reduced to a set of cycles, but, rather, be a continuous usage and design of cycles. This is a very important message for young generations.
Non-cyclic time has *strategic nature*. *Cyclic time does not make history, just events.*

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