

The Birth Triangle: a New Approach to Study the Birth of Systems

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Abstract

This paper focus on the birth of systems. It starts with a physical model which provides some necessary conditions to the birth of a specific system: the fire. Next, a more general model: the birth triangle is presented. Similarly to the fire triangle, in the birth triangle two objects interact together when there is an activator. The notion of environment, in which the two objects are included, is also introduced. Different examples of application of this model from physics to human organizations are examined: conglomerates of matters, molecules, cells and markets. The first main interest of the birth triangle is to propose ways to induce the birth of systems and also to stop their development. The second main interest of this model is to propose a new framework for a triggering condition and thus a way to revise the question of causality of different factors. Indeed, with this model, it is the triangle which is causal (the set of the necessary factors and their conjunction). This new vision permits to avoid some quarrels to know which factor is the most responsible for something and some debates on which is the first inducer of an effect.

Keywords Fire triangle, Birth, system, Field

1 Introduction

A lot of studies deal with the behavior of systems, the occurrence of some specific properties like for example emergences (properties of systems which cannot be observed in the elements [1]) or the collapse of systems [2]. Considering the systemic methods, the same remarks can be done: a lot of methods aim to represent the behavior and/or the collapse of systems. The System dynamics, for example, belongs to this kind of methods [3]. But there are few studies about the birth of systems. Then, this article will be focused on this topic.

Moreover, a lot of studies deal with causes [4-6]. Some methods try in particular to find variables that most influence the others [7-9]: the control variables. Indeed, the question is often: what are the variables which induce variations of the other ones? Then, this article will propose a specific answer to this question related to the factors which cause the birth of systems.

Finally, this work starts with a physical model which provides some necessary conditions to the birth of fire (which is considered as a system). This model is the fire triangle. It was adapted to get a more general one: the birth triangle.

Then, the birth triangle will be firstly described. Next, examples of application of this model from physics to human organizations will be provided. Finally, a

discussion will be presented.

2 The Birth Triangle

The fire triangle

It is proposed to study the question of the birth of systems with a metaphor: the birth of fire. The common representation used to explain this birth is called the fire triangle. In a few words, this representation indicates that the birth of a fire depends on the conjunction and the amount of three factors which have to be in the same place at the same time:

- something to burn: a fuel,
- another factor which is necessary for the chemical reaction with the fuel: an oxidizing agent (usually oxygen),
- an activating energy which is necessary to induce the reaction between the two previous factors.

The different components of the birth triangle

Similarly to the fire triangle, in the birth triangle two objects interact together when there is an activator. The notion of environment, in which the two objects are included, is also introduced here.

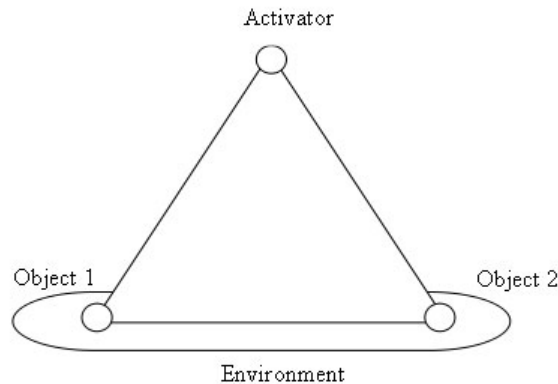


Fig.1 The birth triangle

In this model, objects are generally “physical” and may have different sizes: t- molecules (of fuel and oxygen), two people, two towns, two countries... There may be also virtual objects like the cells of Conway’s game of life [10]. But objects are not qualities or emotions like gladness, sadness... .

The activator induces a movement of one object closer to the other one in such a way that a system (i.e. two objects grouped and interacting together) may exist after (this movement). The activator is a field which may be a:

- pushing field. Object 2 moves closer to object 1 due to an internal energy (in object 2) or the two objects are pushed toward each other due to an external energy. This field is related to:

- intrinsic pushing energies: if the objects are living beings, it means that only object 2 moves closer to object 1 (a prey tries to run away when the predator attacks). Then, when a predator attacks a prey, a system of pursuit may be created;

and/or

- extrinsic pushing energies: heat (for example the birth of fire), mechanical energy (for example to make a mayonnaise)

or

- pulling field (in the meaning of attraction). The two objects are pulled toward each other due to an internal energy (in the two objects) or due to an external energy. This field is related to:

- intrinsic pulling energies of the two objects (leading to a mutual attraction). For example, two boxers move closer to constitute a pair after the ringing of bell;

and or

- extrinsic pulling energies: introduction of new entities in the environment like a catalyst.

In a few words, energies are what permit the existence of the fields (which induce a movement of one object closer to another one). According to this general definition, energies are not only physical ones. They may correspond also for example to wishes of people. Moreover, for living beings or human organizations, this latest kind of energy may appear to create a movement after an event, an accident, an information, a chance meeting. For example, the murder of Archduke Franz Ferdinand of Austria in 1914 was an event which leads to the start of the First World War. The wishes of fighting appeared (even if they were “fed” by grievances existing previously). The European peoples constituted in 1914 a system of belligerents;

The environment supports the movement of moving one object closer to the other one. It means that there are also some characteristics of the environment that maintain together the two objects (to be able to interact to build a system afterwards): a small space inside a bottle or a bowl a place, a town which “maintain” people together. It means also that there are not obstacles in the environment between the objects. This may result from the removal of these obstacles, previously present in the environment, removal which may be caused by action of an entity (a human for example) or not (the natural removal of the link between a fruit and its tree).

In the birth triangle, only the interactions between object 1 and object 2 are considered. Object 1 is the entity on which the focus is. Object 2 may consist of

several other entities which interact with object 1. Moreover the question of the shape or the form of the set of these entities which interact in order to build the system is not considered in this article.

3 Examples of Birth of Systems: From the physics to the human organizations

Conglomerates of matter

In this case, the physical forces of gravitation are only taken into account. They attract the objects toward each other.

When an apple falls down on the ground, this phenomenon can be described with the birth triangle:

- object 1: the earth;
- object 2: an apple;
- environment: the space around these two objects;
- activator: a pulling field related to gravitational forces

In the same way, two magnets attract (pulling field) or repel (pushing field) each other according to their nature, orientation and distance from one to each other i.e. according to the field related to electromagnetic forces.

“Life bricks”

Let us consider now the chemical domain (the fire belongs to this domain). S. Miller succeeded to produce some molecules: the amino acids which are often considered as the “life bricks” [11].

- object 1: methane (CH₄);
- object 2: ammonia (NH₃) and hydrogen (H₂);
- environment: aqueous solution in a bowl;
- activator: a pushing field (electric shock).

Cells

Concerning the process of fecundation:

- object 1: an ovule;
- object 2: a spermatozoid;
- environment: liquid solution in a small space;
- activator: for in vitro fecundation, there is pushing field resulting from an electric stimulation or mechanical push (a sting with a pipette). For natural fecundation, there is a pulling field. Ovule and spermatozoids move closer toward each other.

Markets

Let us consider a market as a set of economic actors which sell and buy different kind of products:

- object 1: a company;

- object 2: its clients;
- environment: a place to support the interactions between these two objects i.e. the transfer of products between a selling company and a buying actor;
- activator: a pulling field due to, for example, the occurrence of new offers of products from the company and/or new demands from the clients.

4 Discussion

Several points are presented. First of all, this discussion deals with some ways to induce the birth of a system or to stop its development. Next, the focus is on one characteristic of the objects: the fertile soil. Finally, the notion of causality is questioned.

Ways to induce the birth of a system or to stop its development

According to the birth triangle, if there is a birth of a system then a pushing or a pulling field exists. It means that if these kinds of fields are identified somewhere, then a system may exist if there are an environment and sufficient fertile soil in the objects. It is a way to look for the existence of some potential new systems.

According to this model, what should be done, in practice, to induce the birth of systems?

The way is often to:

- change the environment, for example, by introducing new entities (catalysts), or energy (e.g. heat), or removing distances, obstacles... between the objects in the environment

and/or

- increase in object 1 and 2 the potentiality of interaction with the other one.

For example, let us consider:

- object 1: a baker who also sells some kinds of cakes;
- object 2: the clients for cakes;
- environment: the location of the bakery;
- activator: a pulling field.

Then to induce the purchase of the cakes, it could be important to work, respectively, on:

- the quality of the cakes, their colors, their shapes...;
- the needs of cakes from the clients (a way to increase them may be an advertising campaign for example);
- all information to locate the bakery... in order to increase the foot traffic to the storefront;
- if there are not enough clients, a special event may be organized with promotions and low costs or prepared like during the days of Christmas or Epiphany.

This example shows that this birth triangle is in fact already used in marketing... even if people did not know it. On the other hands, the birth triangle may be also

a way to observe a marketing mix strategy with a new framework of examination.

Moreover, a hypothesis is proposed: it is possible to use also the birth triangle to stop the development of a system. It means that the different factors of the birth triangle could be pointed out during the development of the system. If we consider, for example, the problem of irregular migrants, a lot of countries try to prevent these migrants from crossings their borders. According to a birth triangle view, these actions deal with the environment in putting obstacles between the objects. Nevertheless, some people propose also other approaches, for example trying to decrease the pushing field by improving the standard of living of people in their country with investments... Then, in this way, the birth triangle, as a generalization of the fire triangle, may propose some ways to stop the development of systems, in particular, in decreasing the level of the different factors to remove the conjunction.

Importance of the “fertile soil” in the objects

To create a system from interactions between object 1 and object 2, there must be already some “fertile soil” in the objects.

For physical and chemical domains the fertile soil is in fact a basic property of the objects (the mass, the atomic composition...) which will not change when the system will be made

For human organizations like for example a market, it is different. Its birth needs:

- sufficient “fertile soil” in the selling company i.e. some people who can answer the demands and understand the wishes, the needs expressed by the potential clients, who can provide some specific products for clients And this fertile soil may exist, in the company, in a domain but not in another one. In particular, it consists of top managers who think that their company has to answer the demands, has to go in this direction and who can provide resources and decide the development of teams in specific domains Otherwise the response of the company will be certainly: “it is not my business”;

- sufficient “fertile soil” in the clients i.e. some people who can provide “demands” to the potential selling company, top managers of a buying company who think they may send these demands to this selling company. It concerns also the capacity of changing its buying habits by purchasing new products.

An example: a seed may fall down from the tree to the ground but it will grow only if there is sufficient fertile soil in the ground (object 2: water). If the seed is too young (and then not ready to sprout) or if there is a stone (environment) or no possibility for water to enter the seed (the activator: a pulling field), there will be not sufficient conditions to the birth of the plant. Besides, the seed may stay sometimes a long time in this state if there is not a chance meeting with a suitable environment

Another example: if a problem occurs, for example a shortage of a product (like during the oil crisis of 1973), it may induce a pushing field from the clients of a company which sells this kind of products. But a system will appear only if there are sufficient fertile soils in object 1 (enough products to sell) and object 2 (enough money) and an environment suitable for development (without obstacles).

Then, this view, from the birth triangle, contrasts with another view which indicates that a problem, an accident, an event would be the triggering factor of modifications of the organizations. According to the birth triangle, an event, like the murder of Archduke Franz Ferdinand of Austria in 1914, may induce some changes in the objects (concerning for example the wishes of people to fight together) which may create, in this case, a pulling field. But the birth of a system needs also some fertile soil in the objects (for example the resources necessary for the fighting).

Finally, the question may be even more complex for certain kinds of human organizations. Indeed, the necessary level of fertile soil in object 1 may depend on the environment. For example, to own a research department or not in its company may be a weakness or not. That depends often on the other companies of this market or those which might enter this market.

Then, let us note that this birth triangle proposes some conditions to the birth of systems (factors and their conjunction). For physical process, the birth of a system is more predictable than for human organizations since, in this latest case, we cannot know often precisely the fertile soil of object 1 or 2 which is necessary.

A causality based on the conjunction of necessary conditions

The birth triangle proposes a new framework for a triggering condition and thus a way to revise the question of causality of different factors. With this model, it is the triangle which is causal (the set of the necessary factors and their conjunction). Furthermore, we are not in a cumulative vision in which the value of a factor can compensate the value of another one (it is, for instance, the propriety which underlines the possibility to calculate a mean value). We enter in a more complex reality in which no component can compensate the lack of another one. For example, in order to create a market, the needs for the product are important but the capacity of the clients to pay for the product is naturally important too. . . . This new vision permits often to avoid some quarrels to know which factor is the most responsible for something and some debates on which is the first inducer of an effect.

5 Conclusion

Let us note that, in the birth triangle, the efficiency of each factor depends on the other factors and a suitable conjunction between the three factors is necessary to

induce the birth of a system.

And to end this article, here are some perspectives of works for the future:

- the size of systems does not seem to be linked to a pushing or pulling field. Is it true

- the more the systems are large the more the objects seem to be modified to induce the birth of systems and also after when the systems work. Does a relationship exist really between the size of systems and the amount and the nature of the modifications?

- is there a possibility to combine some birth triangles together? For example, may an object be represented as a triangle?

- in a causal analysis, could it be possible to use the birth triangle to help to identify and to go back to the root causes of an event, a problem?

- if we consider a fire, there is an auto-activation of the reaction until sufficient fuel or oxygen are present in the environment of this system i.e. until new elements can support the combustion regularly. In other words, it could be represented as a continuous birth of the system. Is this kind of functioning may be observed in a few or in a lot of systems?

Finally, it could be certainly interesting to better define the limits of this formalization. For example, it seems to be important that the two objects are different to build a system, like in a musical chord, the necessary difference between two notes. But is there a minimal difference?

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