Nowoczesne Systemy Zarządzania
Zeszyt 15 (2020), nr 3 (lipiec-wrzesień)
ISSN 1896-9380, s. 75-93
DOI: 10.37055/nsz/132943

Instytut Organizacji i Zarządzania
Wydział Bezpieczeństwa, Logistyki i Zarządzania
Wojskowa Akademia Techniczna
w Warszawie

Modern Management Systems
Volume 15 (2020), No. 3 (July-September)
ISSN 1896-9380, pp. 75-93
DOI: 10.37055/nsz/132943

Institute of Organization and Management
Faculty of Security, Logistics and Management
Military University of Technology

About the Theoretical Roots for Managing the Third Middle Illustration Using COVID-19 Dynamics in France

O teoretycznych korzeniach zarządzania zobrazowaniem trzeciego środka przy użyciu dynamiki COVID-19 we Francji

Alain Le Méhauté
Materials Design, Montrouge, France
Kazan Federal University, Republic of Tatarstan, Russia
alm@materialsdesign.com

Dmitrii Tayurskii
Kazan Federal University, Republic of Tatarstan, Russia

Frederic Heliodore
General Electric Renewable Energy, Boulogne Billancourt, France

Nicolas Le Méhauté
Zeta Innovation Consulting, Paris, France

Philippe Riot
Zeta Innovation Consulting, Paris, France

Abstract. Aristotelian logic is based on the principle of non-contradiction. A proposition is either true or not true. To match this principle, a system must be plain, separable and it must meet the principle of the excluded middle. Such systems is said Cartesian. The Cartesian dichotomy stems from an often far too simplistic vision of our relationship to reality because if A is true, no-A must often be potentiated. The system (A, no-A) acquires the status of a duopoly (current & potential) whose monadic and unitary character must be considered. The third term, as an expression of intersession and mediation between both items, becomes then a constitutive element of the representation of the real. The analysis mainly based on category theory and on Grothendieck's bi-fibration of topoi shows that mediating functions are constitutive of duopoly. They only have meaning through an included middle; the "soul" of this middle is

then a dynamic in complex plane. Here, the truth assumes the status of limits, while the lie misuses the status of a "neo-state" that, seen, in the context of complex entanglements, becomes a fallacious make up. Taking as reference the interpolation given by the Riemann zeta function in complex self-similar systems, we have termed "zeta management" the ability to manage the non-separable systems involving the included middle. We shall introduce the logic of the included middle which is fundamental for understanding the dynamics of complex systems (social systems, research ecosystems, control of crisis, etc). We will also show that it is the same methods which, transposed on the social field, are the basis of the dynamics of mediation (role of institutions in development mechanisms; role of Research in the acceptance of empirical uncertainty; role of the teaching for improving the citizen consciousness, etc.). Finally, we will preview how clan systems or unduly Cartesian educational trends, lead to restrain creativity and lead civilizations to decline for lacking adaptability.
Keywords: Cartesian systems, system, management, COVID-19

Abstrakt. Arystotelesowska logika opiera się na zasadzie braku sprzeczności. Propozycja jest albo prawdziwa, albo nieprawdziwa. Aby spełnić tę zasadę, system musi być prosty, rozdzielny i musi spełniać zasadę wykluczonych środkowych. Takie systemy nazywane są kartezjańskimi. Dychotomia kartezjańska wynika często ze zbyt uproszczonej wizji naszego związku z rzeczywistością, ponieważ jeśli A jest prawdziwa, nie-A musi być często wzmacniana. System (A, nie-A) uzyskuje status duopolu (bieżącego i potencjalnego), którego jednolity charakter należy wziąć pod uwagę. Trzeci termin, jako wyraz intersesji i mediacji między obydwoma elementami, staje się wówczas konstytutywnym elementem reprezentacji rzeczywistości. Analiza oparta głównie na teorii kategorii oraz na teorii topoi bi-fibracji Grothendiecka pokazuje, że funkcje pośredniczące są konstytutywne dla duopolu. Mają one znaczenie tylko przez zawarty środek; „dusza" tego środka jest wtedy dynamiczna w złożonej płaszczyźnie. W tym przypadku prawda przyjmuje status ograniczeń, podczas gdy kłamstwo nadużywa statusu „neopaństwa", które w kontekście złożonych uwikłań staje się błędnym makijażem. Jako odniesienie do interpolacji podanej przez funkcję zeta Riemanna w złożonych systemach samopodobnych nazwaliśmy „zarządzanie zeta" możliwością zarządzania nierozdzielnymi systemami z udziałem włączonego środka. Wprowadzimy logikę zawartego środka, która ma zasadnicze znaczenie dla zrozumienia dynamiki złożonych systemów (systemów społecznych, ekosystemów badawczych, kontroli kryzysu itp.). Pokażemy również, że są to te same metody, które transponowane w dziedzinie społecznej są podstawą dynamiki mediacji (rola instytucji w mechanizmach rozwoju; rola badań w akceptacji niepewności empirycznej; rola nauczania dla poprawy świadomości obywatelskiej itp.). Na końcu przedstawimy, w jaki sposób systemy klanowe lub nadmierne kartezjańskie trendy edukacyjne prowadzą do ograniczenia kreatywności i doprowadzają cywilizację do upadku z powodu braku zdolności adaptacyjnych.
Słowa kluczowe: systemy kartezjańskie, system, zarządzanie, COVID-19

Introduction

The Cartesian approach to the world is mainly a quantitative approach based on a set of elementary units or graphs into larger finite connected structures. This approach is based on set theory with a separability of the basic entities. This means that whatever the intricacy of the final graph aggregating the elementary structures, it can be divided down into substructures whose mastery, at their own scales, is possible without any residual. Project management is based on a Cartesian description of the action and its decomposition into sub-actions (Raynal, 1996). The first scientific field likely to question the relevance of the Cartesian world is that of thermodynamics, which gives birth to a state function called Entropy, whose – despite a strong hypothesis on functional homogeneity (Euler's principle) – physical meaning is underpinned, through inversion and differential algebra, by scaling correlations, purely deterministic (Boccara, 1968; Rassias, 1990; Pogliani, 2000). Furthermore, these correlations lead to make the Entropy the only temporally irreversible extensive variable under any spectral action. For two centuries in theoretical physics this extensive variable has led many questions. Among constructivist epistemologist issues, stays the question of the ontological status of Quantum Mechanics which, unlike thermodynamics which partially forgets the time variable, is based, through the energy and implicitly, on the use of a reversible Newtonian time. In practice quantum Mechanics assigns to any measurement a radical irreversibility when measurement occurs, leading the removal of the superposition of the wave functions (Connes, 2017). As prominent experts put it (Feynman lectures on physics for instance), "who today claims to understand quantum mechanics most likely has understood nothing precisely". Without excluding these couple of sciences, the will to think scientifically, -if we admit in reverse of Heidegger's opinion that science thinks-, requires that a problem must have a solution and or at minimum can be modeled approximated and/or "computed". Computation and reproduction are indeed the essence of the scientific approach. Beyond that, and as video games show us, computer resources now make it possible to digitally build artificial worlds based on simulation, questioning then the reproduction.

Opposed to the Cartesian approach, but without the mathematical Pascal (1623-1662) or Descartes (1596-1650) power of thinking, we have to thank Giambatitta Vico (1688-1744) on the one hand for a very early criticism of a totalizing reason based on the "ratio", namely the division into simple independent black boxes, and on the other hand for his proposal, the replacement of the Cartesian paradigm by a *scienza nuova* (1725) now updates under the name of *science of complex systems*. Seen as a throwback to antiquity, despite a rather modern constructivist epistemology, Vico's criticism of a totalitarian rationality will be ignored of his contemporaries. The Enlightenment will contribute to the development of the modern nations which will benefit from the wealth produced by the power (and therefore the violence) of techno-sciences. The industrial growth and the mathematization of economic theories (A. Smith, J.S. Mill, L. Walras, G. Debreu, F. Hayek) will be based to the belief in a *rational economic agent* whose selfishness leads statistically to optimize the quality of life of the whole community. This point of view successes well beyond the paradoxical aspects of the Pangloss' aphorism, that after Leibniz, asserts "All is for the best in the all possible worlds" (Voltaire, 1759). In the conservative line open by the Savoyard and Freemason Joseph de Maistre (1753-1821) yet initially favorable to the rationalist vision of enlightenment, this philosophy of the "*ratio*" will be, for a long time, the only target of political criticism, when facing the abominable working conditions produced by the libertarian principle of *optimal ratios* applied by the industrial capitalism. This criticism has shed a brutal light on the common and the poor who mostly pay the economic externalities associated with the wealth acquired by a few (Saint Simon, Proudhon, Engels, Marx, etc.). It was not until

Herbert Simons (1916-2001) that, in the context of economics, the observation of the limited and incomplete nature of rationality was clearly expressed by pointing out the uncompletedness of our abilities of representation (Simons, 1997). This work had been carried out formally by Gödel, with the incompleteness theorems overturning the totalitarian Hilbert and Frege dreams of a self-justified mathematization of the real. Unfortunately, all these critical attempts violently run up against the normative charm of computation giving a guarantee of truth and universality; a charm difficult to obtain otherwise. Computation techniques give two major advantages to the formalism not only on the cognitive level but above all for supporting the political choices likely to appear as an upshot of an uncontestable optimization of action. Building any counter model of thinking is a colossal task characterized by a high level of risks in front of which not only discursive credibility fails, but also to which the principle of least effort contravenes (Lupasco, 1951). Unless we become aware in vivo of the deadlock in which the dictatorship of figures can lock us, any resistance against "totalitarian obviousness" seems doomed to failure. Thus, the powerful technical and cognitive resources developed since the beginning of the scientific and technical revolution to make man "the master and owner of nature" have, over the past centuries, been put at the disposal of human beings to produce more and more goods, quantities now increased, thanks to task-oriented industrial processes. This hyper-productive management based on cost and "local utilities" optimization had deleterious consequences on the state of the planet (growing inequalities, climate deadlock, zoonosis, introduction of addictions in the GNP, etc.), on the societies that inhabit it (civilizational homogenization, disappearance of species living, impoverishment of language, etc.) as well as on the mental health of humans now stricken by disenchantment, demotivation, bitterness, resentment, the rise of dreamlike or cultic resistance even the death drives.

We hypothesize that the consequences of a denial of reality, paradoxically aimed at regaining meaning in life, have a common origin, namely the inability of our societies to think with tools adapted to the complexity of the world in which we live. On the same vein, we could interpret the postmodern trend to glimpse conspiracies, as a refuge of the spirit in simplistic tales, thus as coming from a "rogue rationality". These dreams certainly do not match the context but the use of the simplest causal relationships (alternative facts, conspiratorial coherences, nationalisms, paranoid identity politics, etc.); allows a return to a lost paradise that excludes the third partners (designation of scapegoats, of the snake of sin, etc.) in the purpose of finding again a gone innocence. The imperious need for regaining meaning in our life, has a similar origin, namely the inability of our societies to think with relevant tools. If this point of view is right, we can at least attribute a part these this crystallization of thought, not only to an education centered on concepts which are partly revoked by the complexity of our environment (education must begin with the most basic concepts simpler) but much more by the absence of critic sense with respect to a quantitative computation considered as new golden calf. Obviously, education could be, very early be involved in a "rational" introduction to complexity in the frame of transdisciplinary studies. Of course, this introduction is currently implicit, for example, in history, geography or literature courses, all disciplines in which truth is only reached in a biased manner, as dynamic attractors of an entangled reality. But precisely it would be important for this approach to complexity to become explicit and referred to a new type of rationality that we should name the rationality of the included third or of the residue like in complex analysis. Indeed, the implicit nature of the current approach makes it all the less possible to respond to needs for reassurance of the being facing what he does not understand. This new orientation is all the best more in demand that digital technologies, perfectly mastered by pupils and students, give birth to reflex mental structures, unrelated to those that would be necessary to address with stoicism and serenity a reality much more complex than the field of life of numerical avatars. In the field of management, this type of training would be important to put into perspective the claims of the standard project methods and to start considering their externalities, namely the entropy generated by these methods of management. How can we think of the educational approach that would be necessary without plunging into the mathematical mysteries of categories while putting aside the set theory too simplest, for explaining the foundations of the logic of third parties included? In addition to previous studies already published (Le Méhauté et al., 2014-2020; Riot et al., 2018), we shall try to give a synthetic answer to this question in this note.

The mathematical foundations of simplicity and their challenges

Usual scientific thought is built on an analytical and algebraic approach to reality. Time "t", the unique usual longitudinal variable, is the first factor of simplicity in our representation of the keeping of identity along changes. This factor assumes a locally linear causality, the flow of action (extensity) being proportional to a force virtually deployed (intensity). Evolution supposes a permanence and a locality of the objects. The identity of these objects is assimilated to unique singularity $d(x)$ generally located at a precise point of representation if the notion of point has a meaning. When multiple functions (a local field) are concerned, the need for simplicity requires that any evolution be written as a convolution, namely a spectral linearity. Space and Time are then generally entangled (each item serving as a fiber for the other). But how are they since it remains to define what a point means in this space? This apparently simple question involves the arising of the weakness of the notion of identity (Collectif, 2020), similarly, the weakness of what simultaneity in oneself is. As Poincaré proved with Fuschean functions, any differential equation gives rise to a geometric approach, the hyperbolic space being tiled with families of self-similar functions (Mandelbrot, 1983; Hines, 1999; Leinster, 2001; Le Méhauté at al., 2005; Riot at al., 2017) that only non-Euclidean metrics allow to describe coherently. The concepts required to represent the real become abstract, and the simplicity desired must be reworked (GPS, Software, Encryption) through a Gordian node whose underlying polynomial variety remains unknown to us a priori. Who knows the details of how a smartphone works today, if not the engineers who design its components and software? The spirit of the times is far beyond that of the mechanic who, with a simple youthful apprenticeship, was once capable of repairing the engine of a Dion Bouton with handcrafted tools. But back to the concept of function as the cornerstone of simplicity.

The increase of the world population, the increase in the exchange of goods on our planet, the exponential increase in the exchange of information with its self--realized feedback effects on our behavior, those finally linked to the increase in exchanges that are out of proportion with their spatial extensions, have given rise to a world that is not only more complex but also more unstable than it has ever been. The world of data exchanges is now like a planet that is constantly shaking beneath our feet and where gravity becomes variable in time and space. How can we deal with future in such a world? To guess it, we must first use some of the simplest tools that mathematics offers us: the category theory (Leinster, 2014; Riot et al., 2020). Whatever its complexity, the strange world we live in today must be represented using the cerebral tools at our disposal, numbers (extensities) and causal arrows (considered as intensities). Note that this dichotomy is already concerned when a function is sought by means of a differential equation. The rules that determine the combination of two items give rise to algebras which, despite their subtle differences, will involve a co-product (i.e. the succession operator: $N + N$) and a product: the multiplications (i.e. the scaling operator: $N x N$). Both arithmetic operations are closely related and numbers can be replaced by any extensive variable by considering only the definition of the algebras, but this addition/multiplication connection gives all its meaning to a few functions that are systematically found in both mathematics and physics: the logarithm, the exponential and the self-similar functions (Le Méhauté, 1990). Their epistemological meaning is unfortunately largely ignored both in their algebraic implications (a self-similar internal equivalence) and in their physical consequences (a particular mastery of scale changes, thus of the spectral accommodations of our relation to the world: the principles of Noetherian symmetry and their related invariants). More precisely, the logarithmic function is statistically associated with a state function called entropy, which, dimensionless, leads to the parameterization of irreversible processes in physics. Obviously, entropy is implicitly related to another variable in physics, the "*irreversible time*" (Connes et al., 1994; Le Méhauté et al., 1998), even if this variable has no obvious relationship with Newton's "absolute physical time". Newton's point of view was adopted by Kant, who made time, as well as space, a category of our a priori understanding. Entropy is mainly derived from the divisibility of space, i.e. from the function $t = 1/x$. In other words, the maximum resolution that can be assigned to a microscope analyzing the object by means of a zoom tuned to the x number of tiles for covering the whole space. Switching from x to $x + 1$ makes it possible to improve the resolution, namely operate a change of scaling analysis, therefore obtaining a finer accommodation of the object observed. However, obtaining a sharper view means acquiring more information, which takes more time (hence the term +1) and thus leads the observer to age a little along the t-axis. This ageing can be measured by means of a derivative expressed in the order of the resolution scales. At this stage, time (contravariant variable) and space (covariant variable) are supposed to be linearly linked by means of the trivial notion of speed dx/dt which everyone obviously knows how to master even without a thorough training in mathematics (hence the idea of simplicity).

It was not until Einstein and the theories of relativity, as well as a finer analysis of the spatialization of time (suppression of its absolute character) that *space-time* was no longer considered as a plane but as a mathematical variety, namely a tensorial aera. In spite of the local conservation of the notion of velocity, this simple change of point of view (initiated in of the Einstein spirit (in part by the need to adjust the phase of station clocks because the railways were then in full development) opened unsuspected perspectives in theoretical physics. Although the notion of velocity, and therefore of energy through Noether principles, is maintained in Quantum Mechanics, the elaboration of a theory of quantum-gravity presents conceptual difficulties such that despite the intelligence and enormous financial means invested to advance research, this theory remains a Grail (Connes et al., 1994; Rovelli, 2017, 2018). Their sidereal difficulties obviously do not affect the way of thinking of philistines, nor even that majority of scientists, who are simply immersed in a linearized daily life. However, it could be otherwise in the future, because the theoretical questions raised by the complexity of our environment could reveal themselves to be more difficult than those generated by the mastery of quantum gravity. Indeed, in facing an increasing complexity, the cognitive challenges of complex systems are no less important in the management sciences than in the physical sciences, quite the contrary. Here again, the multiplication of singular micro-events causes influences on global behavior, making any causal representation and anticipation difficult to conceive. An action oriented towards the future (progress) can lead to perverse feedback effects that are unpredictable mainly because of the structure of the variety that supports the action. Similarly, a dream could eventually come true despite an opposite causal dynamic.

Being confronted with a singular event, therefore with a black swan (Taleb, 2007) certainly leads to questioning the finality of the action but much more profoundly the foundations of reason. These questions can be relativized if the black swan is unique and the singularity without measurable support in the linear flow of time; however Cartesian thought is destabilized when the singularities multiply, preventing any causal anticipation whatsoever. As a metaphor, let us think of the difference in anticipation between a civilization living in the steppes of Central Asia and one developing in the Swiss Alps. The former just needs an elementary compass to think about its time-space; the latter absolutely needs much more intelligence for their representations; it will have to draw up maps with different accommodations and resolutions. The first of these civilizations can use a simple triangulation to find its way around; by attempting the same triangulation, the second one will observe that the sum of the angles of its triangulation is different from 180°, value disclosing a curvature of the local geometry. Stunned by the difficulty of anticipation caused by this curvature, the civilization of mountains, that of a world of singularities, will have to conceive straight lines no longer as standard straight lines but as geodesics; lines of less effort. The straight line of the first case will in no way be the optimal path for the second. The need for maps of the Swiss will incite to forge a geographical representation of the world much more complex than that of the Huns or that of Genghis Khan's hordes.

How to match our representation of the world to a complex environment jointly from the Euclidean plane and the simple exponential function, while remaining coherent. The idea is provided by the self-similar geometries popularized as "fractals" by B. Mandelbrot in 1975 (Mandelbrot, 1983). These geometries have the property of being constructivist. We give ourselves a generic form that we iterate to infinity as for example by constructing the "Serpinski polygon" (Mandelbrot, 1983; Le Méhauté, 1990). This polygon has singular properties: its mass is finite while its perimeter is infinite and fuzzy. The third of this perimeter is also infinite as shown by a simple calculation on the successive curves that constitute it. Paradoxically, the same applies to any fraction of its perimeter. Such an example and the multiple variations that can be given, simply illustrate the singularity of infinity that must then be considered to tell the complexity and vice versa. Based on this observation, the main question for the manager is what use can be made of these concepts. To think singularity is to think infinity, and to think infinity is to think the absence of scale effect, therefore, to think fractality, thus to think the equivalence of the local and the global. Except in one case (Peano curve: Mandelbrot, 1983), considering the polygon in its writing plane implies a dichotomy between an interior and an exterior, without providing an infinitely precise location of the place where the change occurs. Indetermination is asymptotic (whereas it is generally determination that is asymptotic). This situation certainly introduces uncertainty, but it is not a matter of chance. This indeterminacy is surprisingly perfectly deterministic. The exponential function in Fourier Space has properties that are close to this indeterminacy. Indeed, if we try to integrate from $x = 1$ the function $t = 1/x$, to obtain $S = log(t)$, we find that the mass diverges. On the other hand, if we try to integrate the inverse function, i.e. $t = exp(-S)$, this function converges if S tends towards infinity. While obvious what is the meaning of this deep difference of behavior? Our approach shall consider this question, because here we only disclose the strange properties of inverse functions as illustrated by this following example, $y = x^2$ is perfectly defined for all x but $x = y^{1/2}$ leads to uncertainty about the sign of the variable x. These examples suggest the importance of the idea of duality or beyond the concept of adjunction in category theory (Leinster, 2014). This importance, known for centuries is at the origin of many physical and mathematical discoveries. Duality is now taken very seriously by experts as one of the primary foundations of our relationship to the world because duality is probably at the origin of the categorization by Kant of *space-time* object. Among these dualities that we are going to use in this note the Fourier transformation which consists in replacing time, which parameterizes a large number of functions, by a series of sinusoids of variable frequency and amplitude so that the summation of all these simple functions allows us to approach the starting function with an accommodation, i.e. an accurate precision. It will be observed that a simple expression of the sinusoidal function is obtained by using exponential functions for complex variables. Thus, the function $t = exp(-S)$ namely $S = -log(t)$ gives rise to a Fourier transformation of the form $Z = 1/(1 + iwt)$. In addition to the use of duality, this form is very interesting because it expresses the fact that one implicitly assigns to a point located to the right of the zero point of any infinite half line, the infinite content of this same line by operating an inversion. The result is that Z takes the form of a semicircle parameterized from zero to infinity by the frequencies of the sinusoids. The line was then transformed into a circle. If we consider that the line is only the expression of an arithmetic succession in the set of relative numbers, the circle, expression of the inversion, is also the expression of a finer and finer approximation. The semi-circle is none other than the dynamic that animates us when we play with Russian dolls This dynamic can be expressed in time, but it can be better expressed by the size of the doll extracted from the "matryoshka", the number of dolls being finite. But suppose this number is infinite. We can consider this issue under another point of view. What happens if instead of using a complete semicircle we use only a part of this arc of a circle, if we introduce a sharing the whole semi-circle according to two complementary arcs (Le Méhauté, 1990; Jonsher, 1996; Oustaloup, 2016). The duality then carried out is based on the Fourier transform mapping only a part of the exponential function. This function has no inverse Fourier transform so no time variable is related with itthe frequencies distribution. In addition, it operates another duality because in this case there is an obvious relationship between this initial arc and its complementary with respect with the whole semi-circle. We can observe that each point on each arc can be associated with a distance, namely with a hyperbolic metric, at least local, and that both metrics are related together through an "a" factor of metric. In this case the deterministic uncertainties due to the form of this metric (i) diffuse over the whole dynamic under the effect of the internal correlations that arise from the surgery and of the associated sewing and

(ii) diffract over the singularity introduced by this sewing namely by the means of an "intermediate infinite third middle". The duality involves strong arithmetic correlations since referring to an arc of a circle means correlating it point to points with its geometrical complementary. It is this operation that will allow us to understand what a non-separable system (Choquet, 1953; Kojadinovic, 2006) is a system that we cannot manage using a Cartesian thought.

Entanglement, complexity and alpha exponential

To understand what an arc of a circle can represent we can look for its meaning in terms of Fourier transform. We find a very simple mathematical expression using a power law named Cole and Cole representation, namely: $Z_a = 1/[1 + (iwt)^a]$ (Le Méhauté, 1982; Jonsher, 1996) or an infinite straight line inclined on the axis of the real, as is the Pisa tower in relation to the surface of the campo santo. The important point here is that the «a» factor radically changes the status of the exponential, function from which we started our thinking non integer dynamics. It is then impossible to go back through an inverse Fourier transform to a-dynamic expressed by using time; indeed, an infinite number of singularities associated with an underlined fractal geometry then appears. It is impossible to associate it with a process cut into successive slices of time, i.e. involving a derivative, therefore a velocity. The project manager who would like to pilot a process characterized by such a dynamic will have to imagine other methods than those learned at business school. Due to Fourier expression the only reasoning method he can use is the "matryoshka like method" mentioned in the previous paragraph, a method that has nothing to do with the division into elementary tasks aggregated by a manager using the cartesian "optimal" logic first order approach. The new method that we have called zeta management consists in considering the correlations between scales of decisions and projecting them onto an abstract space of representation including processes of creativity and free will of the actors. This space is linked to the fact that *Z*, collective action, cannot live on its own, just as the Tower of Pisa can only be asserted tilted in relation to the ground. Here the arc of the circle is also tilted due to the intervention of the «a». factor. This means that the arc can only mean something when it is summed or coproducts with the arc that complements it, second arc which takes and analytical form very closed but with the power factor «1-*a*» namely compared with Z: $Z_{1-a} \sim -1/[1 + (iwt)^{1-a}]$, the sign minus pointing to the presence of negentropic effects. Together the couple (Z_a, Z_{1-a}) build again an assimilable form the exponential semi-circle, which means that the operation we have carried out is a sum of two blocks of fractional form as it is suggested in the previous paragraph without any consideration for the dynamical expression. Virtually we have dualized an exponential, using a definition of an *a*-exponential, namely the couple (Z_a, Z_{1-a}). Let us observe that Z_{1-a} does not have the same dynamic meaning as Z_a. To understand it, it is necessary to go through an intermediary which consists in "fibrating" the two quantities (Steenrood, 1968) by going from the scale factor «*a*» by shifting from the field of real numbers to the field complex numbers «$s = a + iq$». This extension, which results in a dispersion over the plane of initially rightly ordered points of the spectral dynamic representation, has as its first mathematical reason the fact that the above duality induces a link to be explained between «*iq*» and «*iw*» a discrete expression herein of a set-derivative. Indeed, the result, which is has been written Z_{1-a} expresses the set derivative of Z_a with respect to the variable «*w*» when we consider this transfer function only on the set of integers. This derivation, which constructs a first geometric variety, highlights the partial order of prime numbers hidden behind the set of integers with which the dynamics must be described. The relation (Z_a, Z_{1-a}) playing with «*s*» is a bi factorization. Indeed, the fibration (each point is associated with a fiber or a bundle or a sheaf) through «*iq*» leads to the emergence of a second variety (here integral variety) which must be compared to the first variety by using a so called Kan's expansion mathematical tools (Riot, 2020). The question addressed is then reduced to knowing the difference between both compositions "*derivation then fibration*" and the inverse operation "*fibration then derivation*", namely the status of the commuter while, just as Z_a, Z_{1-a} admits also a symmetric fibration according to «*-iq*». Behind this Kan inversion (right and left), which reveals the properties of commutativity formalized in category theory, there is in fact an implicit bi-fibration of dynamics, imperatively expressed in a field of numbers based on integers, which imposes two arithmetic laws, on the one hand, that any real number is the product of prime numbers and, on the other hand, that the set of integers is characterized by a major property of scaling involving by crossing with the coproduct, a self-similarity of the mathematical structure, namely: $N + N = N = N \, x \, N$. Both properties lead to the fact that the ideal decomposition which must be considered by the project manager, evoked above for any action, must take into account a phantom information (that of a plunge analogous to the plunge of the drawing of a fractal object into a larger space or likewise an immersion of prime numbers within the natural numbers), information disclosed by the fibration taking into account the extension of the initial scaling laws in the field of complex numbers, a field whose closure then has a role very similar to that of a developer for silver photos. The fibration unveils the hidden correlations. In other words, the project manager must consider the internal correlations that characterize his project, namely «a, it» and at the same time he must project them in the space of the free will of the actors (the complex plane expressed by the couple «a, iq») outside the only reduced managerial project possibilities. The question is therefore for the project manager to identify the morphisms between the real and the potential data carried by the actors, namely their ability, for being also creative, to change their units of time to escape the only time tiling the project. We called this extension of the manager point of view "zeta management" (Riot, 2018). Why do we use this abstract term? The reason is both simple and subtle.

Zeta function: Inversion of point of view on the project world

We established ten years ago (Le Méhauté, 2010) that there is a link between Riemann's zeta function (Edouards, 1974; Ivic, 2003) and Z, even more precisely a connection between the s-exponential couple (Z_s, $Z_{1\text{-}s}$) the functional relation between Riemann zeta function characterizing the set of integers N, ($z(s)$, $z(1\text{-}s)$) and finally the couple ($z(s)$, $m(n)$), where $m(n)$ is the combinatorial function of Möbius, which we know to be the inverse in convolution of the zeta function. Now these meta-couplings are doubly fundamental, on the one hand (i) because the zeta function is then defined via bi categorical sheaves as shown above «it, iq» of any analytical function $f(n, a, q)$. In other words, we can approximate any dynamic process taking place in a "complex time" with the universal zeta function which is no longer parameterized by time but by ideal complex cycles (point of view very close to the Hodge's hypothesis), and secondly due to the relation $N + N = N = N x N$ this function is intrinsically self-similar (Riot, 2017), i.e. it has an ability of self-approximating (quadratically if the function is expressed by its poles and zeros (if Riemann's hypothesis is realized) and in a fractional way otherwise). Virtually, the zeta function provides the bridge, the mediation, (the third middle included), between an non additive representation of the dynamics (Choquet, 1953; Kojadinovic, 2006) and a "matryoshka representation" of the same dynamics but expressed on the set of prime numbers (Riot at al., 2020). Thus, it is shown that the duality (Z_s, $Z_{1\text{-}s}$) constitutes a monadic unit only on the condition that a "third included middle", i.e. the set (Z_s, $z(s)$, $Z_{1\text{-}s}$) is considered. A well-known way for mathematicians to understand this intersession is to consider the functional equation $z(s) = F(z(1\text{-}s))$. Thus, far from a continuous analytical approach, the behavior of a complex system must be considered according to a representation in the order of scales, trying to identify all the ideal cycles likely to constitute projective sheaves. This is not only a change of point of view, but a radical inversion of point of view forgetting the physical variable of time. The result is a necessity to accept an irreducible incompleteness linked to the fact that the local adheres to the global and cannot be separated from it.

The role of chance and free will

The analysis of the conditions of commutativity of the "*complex duration*" diagrams, in particular through Kan extensions, leads to show, as Riemann had supposed in 1859 (Connes, 2015), that there are proper states on which it is possible to decompose the dynamics without any other uncertainty than chance, if and only if a = 1/2. Thus the Kan extension at right "derivation then fibration" and the Kan extension at left the operation "fibration then derivation" match each other and are then strictly equivalent giving rise to a quadratic relation between space and time: $x^2 \sim t$.

This characteristic constraining the dynamics has considerable consequences. First of all, if $a = 1/2$: (i) $(Z_{1/2+iq}, z(s) = 0, Z_{1/2-iq})$ thus both dual representations of the dynamics become symmetrical, (ii) these representations are the Fourier transforms of explicit processes according to the temporal variable. In other words $Z_{1/2}$ has an inverse Fourier transform and time takes on a physical meaning that does not fit the general case ($1 > a > 1/2$) where time loses its physical meaning; similarly for the notion of velocity that takes again a paradigmatic role lost in the general case. (iii) The equations of dynamics are written in the same way independently of the sign assigned to time. For the same reasons, the zeros of the zeta functions are symmetrical in «*q*» and «-*q*». This is due to the fact that Noether conditions of symmetry are again valid (indifference of the physical laws by displacement of the origin of time and/or of space (Caputo, 1967); likewise the major physical invariant the energy (or utility in economy) find again its physical pivotal status. By authorizing the optimization scheme, these pivots regain, with Riemann›s hypothesis, their rights lost in the general case which implies any other value of fractional metrics. Furthermore (iv) it can be affirmed that any deviation from the linear order is then based exclusively on stochastic processes of Brownian motion type. The exteriority of the process, which is then closed in on itself, disappears and the uncertainty is exclusively of thermal cause produced by the entropy of the action at work. The creative processes can then only be based on serendipity, a context very different from the creative processes giving rise to an innovative language, a specific grammar and a new texture of *Zeitobjekte* (Husserl, 1928). Due to a direct relationship between chance and determinism, project management must unfortunately be written in the constraint above context. Conversely, the zeta management (Le Méhauté, 2017; Riot, 2018) approach radically changes the usual perspective of project management, whose rules are not only modified, but in which the introduction of the zeta function reveals, in accordance with Beck‑Chevaley condition, the presence of a linking function with a unique complex parameter between the two extreme terms of duality (emergence of the role of the third including middle).

Zeta Management with mediator

The above analysis, which may seem very abstract, carries out some very practical consequences that lead to distinguish project management from innovation management, creativity, disruption, crisis and even of self-organization. The project gives way to intention, entrepreneurship, designing and the ambition, all concepts much more unstable than the standard project in this that whereas the project, supposes the existence of an optimal geodesic allowing to reach a sought-after result, any ambitious breakthrough denies the existence of such a geodesic and thus confronts the manager with the uncertainty of the paths of actions, the convolution of the actions steps and the impossibility of scheduling the future actions Even by including random disturbance, the Fordist organization loses its efficiency when facing any technological or organizational breakthroughs. In a standard organization the project manager is outside the team. He has an overhanging position. Nothing of this kind in the case of innovative organization. The manager must act as a mediator. His status proceeds from the actors and his free will is limited to finding the abstract base of a common will on which the singular interests must be projected. Written in actions, this base can only come from considering the whole particular dualities. Beyond this, the taking into account of the "triple" and "quadruple" must enlighten – through the capacities or not of giving birth to a commutativity of relational diagrams (Kan extensions (3), square diagrams (4)) – the mediator insuring the construction step by step a space (4 and associativity) – time (3 and composition) cohesive between the actors.

Conclusions

Hervé Chneiweiss in a book about the Identity (Collective, 2020) tells the following anecdote: in the Phædo, Plato recalls the last Socrates demand to Crito, one of his students helping him in his last moment of life, "we owe a cock to Asclepius". Why sacrifice a rooster to the God of healing at the very moment when Socrates is going to end his life by drinking hemlock? What kind of healing can it be while Socrates has just refused to leave Athens for saving head, just after having claimed that he would have felt cowardice if he was running away from his ability to tell the truth. One can only remain perplexed by such a demand. However, we owe it to G. Dumézil and M. Foucault the interpretation according to which the healing he evokes is the capacity that the interactions with his students gave him as human being; namely a discourse of the true about himself. The true appears here as a gift given by the incarnation of the included third middle: the students. Something in the middle of the gap between the false opinion (there always is) and the even naive enlighten judgements (whatever, regardless) that at best get near the truth. We have shown that, in the universal context of computation, this included third middle acquires a profound meaning via the category theory.

The universal zeta and mu functions arise from Beck-Chevalley constraints which imply that the interaction results in a mating of the dual terms. The mission of the mediator is of the same nature. It is dynamics in complex plane. It leads naturally to make this equivocal function come alive (between Discrete interests and continuous commons) and in fine to make emerge what, in a set of interactions, must be considered as an asymptote to the truth. Therefore, beyond the project approach, mediation clearly proposes, for reasons that we have just explained, new landmarks, a new vision, a new model of action, new tools, even a new professional identity different from the leader or the project manager. To be implemented, the practice of mediation must imperatively consider the existing constraints: Among these is the culture of the actors, whose usual analytical approach (t^n) must gradually be switched to a synthetic culture (n^{-t}), a "matryoshka culture". It is a mental evolution which cannot be denied that it represents a challenge both on a personal and a collective level, a challenge that training organizations in charge of preparing future generations for the world that awaits them should tackle as soon as possible to keep in life our democratic civilizations.

REFERENCES

[1] Boccara, N., 1968. *Les principes de la thermodynamique classique*, PUF, Paris.

[2] Caputo, M., 1967. Linear model of dissipation whose Z is almost frequency independent, *The Geophysical Journal of the Royal Astronomical Society*, No. 13.

[3] Choquet, G., 1953. Theory of Capacities, *Ann. Inst. Fourier*, No. 5.

[4] Collectif Universitaire, 2020. *L'identité Dictionnaire encyclopédique*, Edt Jean Gayon Folio Gallimard, Paris.

[5] Connes, A., 1990. *Geometrie non commutative*, Dunod Interédition «coll. U», Paris.

[6] Connes, A., 2015. *An essay on the Riemann hypothesis*, (ArXiv 1509.05576v1, Sept).

[7] Connes, A., 2017. *La géométrie et le quantique*, Cours du collège de France, Janvier-Février.

[8] Connes, A., Rovelli, C., 1994. Von Neumann Algebra Automorphisms and Time-Thermodynamics Relation in General Covariant Quantum Theories, *Class. Quantum Grav.*, No. 11.

[9] Edwards, H.M., 1974. *Riemann Zeta function*, Academic Press, London.

[10] Hines, P., 1999. A categorical theory of self-similarity, *Theoretical and Applied Categories*, No. 6.

[11] Husserl, E., 1928. *Vorlesungen zur Phänomenologie des inneren Zeitbewusstseins*, Lectures on the Phenomenology of the Consciousness of Internal Time, Albert Ludwig Freiburg University Archives.

[12] Ivic, A., 2003. *The Riemann Zeta function. Theory and applications*, Dover, New York.

[13] Jonscher, A.K., 1996. *Universal relaxation law*, Chelsea Dielectric Press, London.

[14] Kojadinovic, I., 2006. *Contribution à l'interpretation des mesures non additives de Choquet*, HDR Laboratoire d'Informatique, Université de Nantes.

[15] Le Méhauté, A., 1990. *Les géométries fractales*, Hermes, Paris.

[16] Le Méhauté, A., 1991. *Fractals geometry and applications*, Penton Press, Londre.

[17] Le Méhauté, A., de Guibert, A., Delaye, A., Fillipi, M., 1982. *Modèle de transfert d'énergie sur interfaces fractales*, "C.R.Acad.Sci. Paris", No. 294(II).

[18] Le Mehaute, A., El Kaabouchi, A., Nivanen, A., 2010. Riemann Conjecture and Fractional derivative, *Computer and Mathematics with Applications*, No. 59(5).

[19] Le Méhaute, A., Heliodore, F., 2020. An Early History of Lithium Batteries (1970-1985): An Example of Zeta Management, *Hyperion International Journal of Econophysics & New Economy*, No. 13(2).

[20] Le Méhauté, A., Nivanen, L., Nigmatullin, R., 1998. *Flèche du Temps et Géométrie Fractale*, Hermes, Paris.

[21] Le Méhauté, A., Nivanen, L., Nignatullin, R., 2005. *Space Time with bounded curvature and non integer differential Operators*, [in:] A. Le Méhauté et al. (eds.), *Fractional Differentiation and its applications*, U. Books, Berlin.

[22] Le Mehaute, A., Riot, P., 2016. A Trail between Riemann Hypothesis and the Founts of Currency, *Hyperion International Journal of Econophysics & New Economy*, No. 9(1).

[23] Le Mehaute, A., Riot, P., Tayurskii, D., 2015. From Riemann Hypothesis Approach via the Theory of Category to Modern Monetary Theory, *Hyperion International Journal of Econophysics & New Economy*, No. 8(2).

[24] Le Méhauté, A., Tayurskii, D., Menezes, R., Raynal, S., 2014. Innovation Management from Fractal Infinite Paths Integral Point of View, *Hyperion International Journal of Econophysics & New Economy*, No. 7(1).

[25] Le Méhauté, A., Tayurskii, D., Riot, P., Raynal, S., 2017. Grothendieck Topos, Zeta Complexity, and Arrow of Time: New Concepts for a Modern Project Management International, *Hyperion International Journal of Econophysics & New Economy*, No. 10(1).

[26] Leinster, T., 2001. A general theory of self-similarity, *Advances in Mathematics*, No. 226.

[27] Leinster, T., 2014, *Basic category theory*, Cambridge Studies in Advanced Mathematics, Cambridge.

[28] Lupasco, S., 1951. *Le principe d'antagonisme et la logique de l'énergie*, Ed. Hermann, Paris.

[29] Mandelbrot, B., 1983. *The fractal geometry of Nature*, Freeman, San Francisco.

[30] Oustaloup, A., 2016. *Diversity and non-integer differentiation for system dynamics*, ESTE Wiley, London.

[31] Pogliani, L., Berberan-Santos, M.N., 2000. Constantin Carathéodory and the axiomatic thermodynamics, *Journal of Mathematical Chemistry*, Vol. 28.

[32] Rassias, T.M. (ed.), 1990. *Constantin Carathéodory: An International Tribute: Vol. 1*, World Scientific Publishing Co., London.

[33] Raynal, S., 1996. *Le management par projet*, Ed. Organisation, Paris.

[34] Riot, P., Le Méhauté, A., 2017. Autosimilarité, fonction zêta et conjecture de Riemann, *Revue d'Electricité et d'Electronique REE*, No. 17.

[35] Riot, P., Le Méhauté, A., Tayurskii, D., 2020. *Categories and Zeta & Möbius Functions: Applications to Universal Fractional Operators*, [in:] P. Agarwal, R.P. Agarwal, M. Ruzhansky (eds.), *Special Functions and Analysis of Differential Equations*, Chapman and Hall/CRC.

[36] Riot, P., Le Méhauté, A., Tayurskii, D., Nivanen, L., Raynal, S., 2018. Zeta Management: Categorical and Fractional Differential Approach, *Hyperion International Journal of Econophysics & New Economy*, No. 11(1).

[37] Rovelli, C., 2017. *Is time arrow perspectival in the philosophy of cosmology*, [in:] K. Chamcham, J. Sick, J.D. Barrow, S. Saunders (eds.), Cambridge University Press.

[38] Rovelli, C., 2018. *L'ordre du temps*, Paris Flammarion.

[39] Simons, H., 1997. *Models of bounded rationality: Empirically grounded economic reason (Vol. 3)*, The MIT Press, Cambridge, MA.

[40] Steenrood, N., 1968. *The topology of fiber bundles*, Princeton University Press.

[41] Taleb, N.N., 2007. *Black Swan. The impact of the highly improbable*, Random House.

[42] Voltaire, 1759. *Candide ou l'optimiste*, Ed. Princep, Paris.

Annex

Containment modeling test on the spread of COVID-19 pandemia in France (from E.W. Montroll studies on "Social dynamics and the quantifying of social forces")

In a very elementary cases the duality mentioned above is for the problems of pandemic, the number of contaminations at a given time with respect to the number of possible contaminated cases. Elementary intermediation is represented by the political decisions that will superimpose on the previous distribution a social force that is supposed to be all the stronger as the number of contaminations is important. In the absence of any "social" force, the rate of change in the logarithm of a contaminated population is constant, $dlog(N(t))dt = constant$. If a "social force" F is applied we can write, $dlog(N(t))dt = F(N(t))$ with, for example, $F(N(t)) = k - \alpha N(t)$ is linear. "Evolution" is the result of a sequence of "replacements". The solution is then an "S-curve" or generalized entropic type evolution and an applied "force" generates a change of trajectory (acceleration/deceleration). We observe experimentally:

(i) an S curve type evolution here linearized in representation.
(ii) A change of trajectories with the hypothesis of an effect of containment.
(iii) Oscillations on the derivative (force effect, relative derivative).
(iv) A differentiation according to regions.
(v) Renormalization properties allowing to distinguish containment from epidemic, a highlighting a couple of possible paths (containment path & epidemic path if renewed contagion).
(vi) Different velocities of epidemic spread (slope).
(vii) Estimation of containment effect (with scale effect, with a-stable laws)).
(viii) 3 scale levels & classification (country, region & department).

The preliminary data given below about the second wave of epidemic and associated social constraints disclose:

(i) The impact of containment is highlighted by the emergence of a new (post--containment) social force, much less effective. The number of patients cured was reduced accordingly (estimate of the "spread of the epidemic" made with containment alone).
(ii) This (post-containment) force becomes representative of the social behavior in the face of the spread of the COVID-19 (with 2 forces in permanent interaction). The constraints are released, and an adaptation is found efficient.
(iii) Regions and departments do not react in the same way, with different components pointing out the role of local culture while facing the pandemic;
(iv) Some continue to decrease since de-containment (memory effect).

(v) Others, having experienced a new spread, have controlled it or are in the process of controlling it (adaptation effect).
(vi) Some departments show almost at a standstill (balance of forces);
(viii) Some departments are experiencing the beginning of new propagation, detectable on a very small scale, waiting for future reaction.

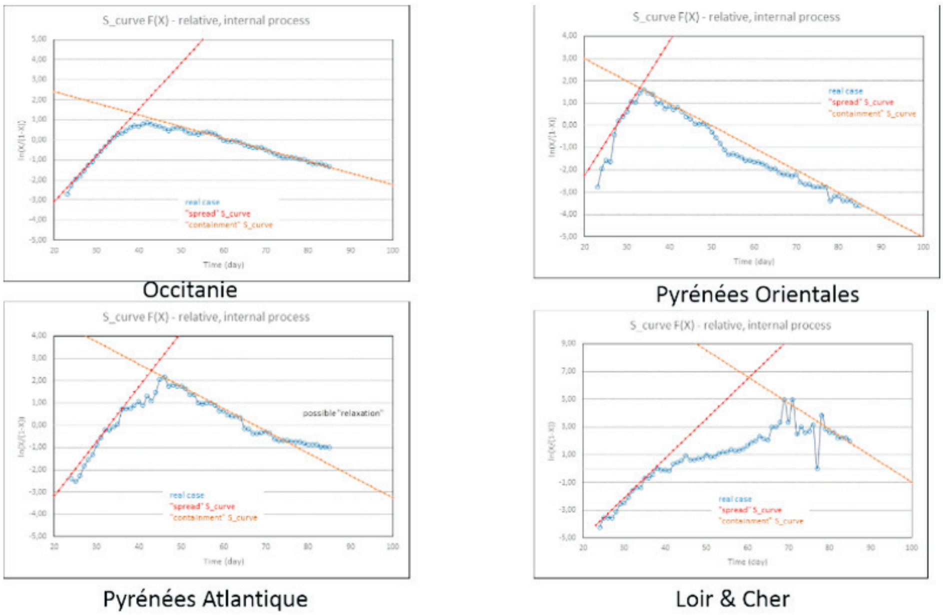

Fig. 1. Demonstration of the confinement effect of the French population (4 regions) during the first epidemic wave in a linearized dynamic representation

Source: Own elaboration

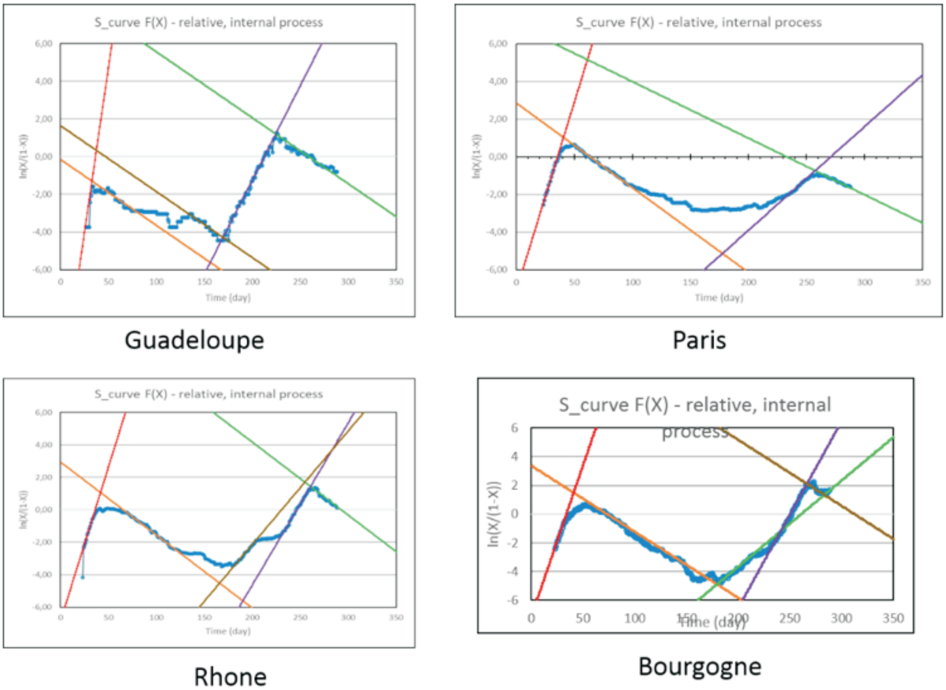

Fig. 2. Demonstration of the confinement effect of the French population (4 regions) during the first and second epidemic wave in a linearized dynamic representation. A fluctuation of the second dynamical wave can be observed

Source: Own elaboration