Transformations of organization in uncertain and complex world "beyond" linear rationality for a circular model of decision making. Learning by bias and errors: a conceptual framework

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Abstract

That work propose a conceptual framework to redefine the role of rationality in complex organization starting from emergent transformation of last century distinguishing between linear and circular logic in economic behavior following the transition between hard rationality, bounded rationality and post-rationality also reinterpreting Adam Smith. From a managerial point of view, the sustainable development of management means simultaneously overseeing and reconciling social, environmental and economic dimensions. We can say – consequently - to open up a substantive stakeholdership as well as to a strategy of social responsibility within a multi-objective function over maximization of utility. In this way it is possible to allocate the advantages among the stakeholders according to ethical criteria of commutative and distributive equity of circular rationality. The "emergent juxtaposition" between strategy and organization has seen in the last few decades a weakening of the former, while observing an increasing complexity and management of change as a modus operandi that has evolved the latter also to compensate for those weaknesses. And yet also (but not only) as a substitute for an increasingly weaker concept of strategy and an alternative question to avoid being swallowed up by the logic of pure calculation of consequences (deterministic rationalism) or simple reactivity - more or less pavlovian - (bound by external resources), or enclosed in the narrow spaces of a contingent intuitionism of the bergsonian type (subjectivism and dependence on the constraints of internal resources). Which brings us back to the seminal contribution of Warren Weaver (1948) "Complexity and Science", in which it deals with "problems of disorganized and organized complexity", claiming that the latter ones, "are all problems which involve dealing simultaneously with a sizable number of black factors interrelated into an organic whole". More recently Kahneman, Sibony and Sustein underline the nature of error in decision-making with a cognitive differentiation between bias, noise and error. A differentiation that influences the non-linear connection, distance and priority between decision and action in organization and strategy as in case of our brain functioning able to learn by experience in condition of hyper-innovation with high level of substitution of different area of specialization as an emergent ability of the neurons of the cortex to manage any type of input data. One of the main reason why our modern organization needs of advanced trajectories of participation model as an integrated platform of mind of an organic community brain towards resilience between bias and error.

Introduction: redundancy and slack resources

From a managerial point of view, the sustainable development of management means simultaneously overseeing and reconciling social, environmental and economic dimensions looking for a dynamic equilibrium between dark and bright sides of non-rational decision making. But also to open up to a substantive stakeholdership as well as to a strategy of social responsibility within a multi-objective function in searching of emergent post-rationality between linear an circular logic. In this way it is possible to allocate the advantages among the stakeholders according to ethical criteria of commutative and distributive equity. Preventing market and non-market risks beyond efficiency and rationality as we know in the orthodox approach. We can follow the model of Weick-Sutcliffe (2007) through a redundancy of organizational design and slack resources to reach discretionality and flexibility in action by people and team-work to prevent unpredictable events and crisis, increasing adaptability to change environment with competences, vision and self-organization against hierarchy.

These notes, along a jagged emerging ridge of dynamic learning organizations, want to try to synthetically formulate the ongoing transition starting from an evolution of operational and behavioral contexts, increasingly influenced by the paradigmatic shift between predictability and unpredictability, between simple linear rationality of a stable world and another type of (post) rationality as circularity most useful in complexity of unstable world. Exploring the effects and emergence of substitutes, such as of *ecology* shows that it is possible to settle the crisis of the strategy with the appearance of new resilient organizations, just like in the *organic whole* defined by Weaver.

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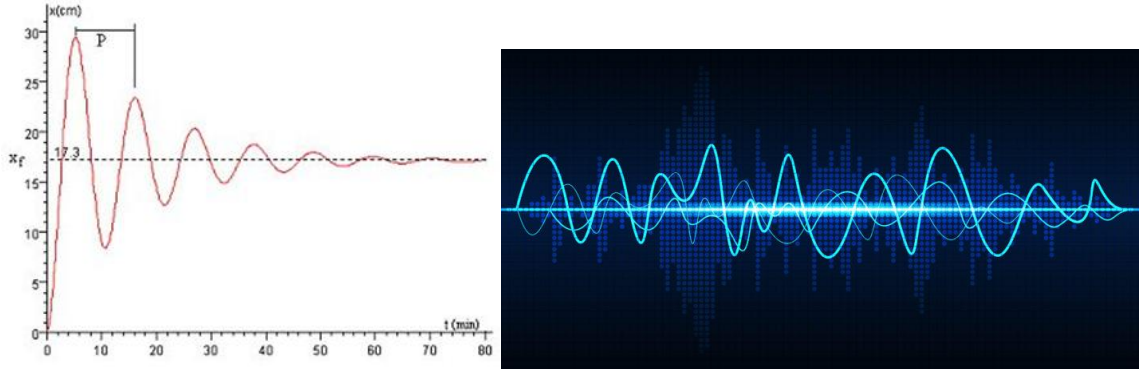
Leveraging on non-linear and dynamic complexity models, which integrate interdependent biological, cognitive and social dimensions. *Ecologies*, where change can be understood as self-reorganization of results that derive from (social and cognitive) inter-connectivity between the members of the community, the sub-systems and the environment designed by *density overlapping feed-back loops* of *network* and *network-of-network* nodes, in the sense of Maturana and Varela (1987) and Capra (1996).

1 - Human behavior between predictability and unpredictability

Science - as we know - works by connecting (or trying to connect) the causes and effects of natural and social phenomena. In the "hard sciences", however, this connectivity turns out to be relatively simpler because the variables to be considered can be "isolated" in the laboratory and replicated in their relationships to verify that a simple correlation is also an expression of causation, capable of confirming or denying a research hypothesis and therefore also a theory or segments of it. On the contrary, in the "social sciences" this exploration of the relationships between causes and effects is more complex, because laboratory replicability is almost never possible. In the social sciences the methodological reductionism, that is usually adopted in the hard sciences to isolate some variables and replicate the experiments, is rarely possible, even if it has been tried to "align" economics and social sciences with the hard sciences, with frequent disappointing results. Such unsatisfactory results have been demonstrated, for example, by the scarce ability of economists - academic and / or professional - to foresee the crises that have occurred over the past 120 years.

Robust forecasting models have always been sought also in the management trying to connect the structure of behaviors to the performances, for example, as in the well-known deterministic approach S-C-P, on the basis of a substantive (or hard) rationality followed by the agents and assuming a stable world. This led Chandler (1962) to detect that "*structure follows strategy*". Therefore, a linear approach of connection between structural market variables (average dimensions, number of occupied people, number of competitors, consolidated technologies), which would influence the conduct or choice behaviors (strategic behaviors), would eventually determine the (positive or negative) performances, precisely according to linear logics. But this would happen in the substantial absence of innovation and where the variables at time t cannot change at time t + 1, which configures what economists define *steady state* (borrowing the concept from biochemistry or physics - see figure below): situation in which the starting conditions do not influence the final or exit conditions of the process.

Example of a chemical-physical steady state representation and the opposite chaotic phenomena



In this case, the decisions would be determined by the original structural factors that would lead to specific performances, based on a good forecast of the future, having gathered the necessary and available information. "Good predictions" of the economy and management, will depend on the degree of complexity of the surrounding (as well as internal) environment. On one hand, low or no complexity will determine good predictions (which all agents should be able to provide, having the same information and knowledge, or the same technology), even for a prevalence of *close innovation*. This is a case in which the value of information approaches the "0", because all the agents can access it at almost zero costs. While, on the other hand, high complexity will force us to formulate alternative scenarios (from *best* to *worst*), scoring the results based on the probability that some circumstances will occur (or not) and in conditions of *open innovation.* In this case the information value is different from "0" and positive, because it will depend on alternative scenarios and differentiated emerging conditions. The latter, however, are perceived in different ways, which will influence the final results as well as the starting conditions.

2 - The principle of rationality in neoclassical economic theory and 'beyond' between linear and circular logic

By *utility maximizing behavior*, we mean the search for the optimum of a utility function that, in a context of free competition, would lead to the social optimum as the founding assumption of the neoclassical paradigm in economics.
As is well known, one of the strongest assumptions on which this orthodox program in economics founds its forecasting models leads back to an "*absolute or Olympic rationality* " that we can say is of the *linear* type. That is, the *superman* recalled by it simulates a *super-machine* that *selects* the information useful to achieve the expected result of optimization given the objectives and the (scarce) resources to achieve them. Effectively excluding anything that distorts (or can generate errors) this linearity of input and processing of these to achieve the expected end result. A selection that is, however, reductionist and distorting since it is assumed that the information map of the world that this 'calculating machine' has at its disposal is the best and most efficient as it is *'subtractive of potential error and distortion factors'*. An 'optimizing calculating mind' that would be able:

(A) – to connect input and output linearly without error over the entire reference population according to optimization logic, since any function will be able to determine an absolute maximum under the condition of the specific constraints assumed;
(B) - to compare the different (not infinite) possibilities to reach a given choice by evaluating its functional efficiency to be realized;
(C) - to meet the requirements of transitivity, completeness, continuity and monotonicity for the different outcomes corresponding to the one chosen as optimal.

It is well known that transitivity means the property according to which, if an individual prefers option A to option B and option B to option C, then he must necessarily also prefer option A to option C. Completeness, on the other hand, means that an individual is able to order all his preferences from among those available. Continuity, on the other hand, is that specific property according to which if an individual prefers option A to option B, then any option in a neighborhood of A will continue to be preferred to B. Finally, by monotonicity, referring to consumption allows us to say that if 2 baskets A and B contain the same amount of a good, but A contains a greater amount than the other, then A must be preferred to B in the strict sense.

It is quite evident that both quantity choices (measurable) and time choices (absence of innovation) dominate the whole process, without which we would not have the possibility of comparing different baskets and different choices by changing many qualitative characteristics. With this neo-classical theoretical-methodological core, the *calculating machine* assumes a linear logic with which expectations about the future are always correct and the calculation of probabilities about uncertain events does not, on average, produce any particular distortions.
But can such an individual and the associated super-logical, super-calculating mind realistically exist?

No, as demonstrated by Daniel Kahneman and Amos Tversky's *prospect theory*, which demonstrates the crystallization of the process of rational choice by 'liberating or purging it' of all psychological, aesthetic and spiritual components implemented by the neoclassicists and affirming a simple mechanical calculating mind that acts according to a linear *framework* responding to pure mathematical and analytical-functional logic. A linear mechanism of *Newtonian* imprint, which excludes all subsequent developments in 20th century quantum physics from Einstein onwards up to *super-strings* or *field theories* that will instead affirm the centrality of interaction. *Interaction* that denies validity to the *absolute individual rationality* adopted by the neoclassicists to support an alleged self-regulation of markets through the pursuit of individualistic (self-interested) self-interest alone capable of achieving the optimization of scarce resources for given goals and thus achieving wealth maximization. Result achieved by the neoclassicists also through a hyper-simplification of Adam Smith's theories referring only to the "*Wealth of Nations*" (of 1771) but neglecting what is contained in the "*Theory of Moral Sentiments"* defined as a "*juvenile work*" (of 1759), preferring Smith the economist to Smith the philosopher.

The calculating-methodological *linearity* will not be 'violated' either by the later and more robust game theories of Von Neumann and Morgerstern (*Theory of Games and Economic Behavior*, 1944) nor by John Nash's elegant approach with his game theories that, although complexifying the neoclassical analytical foundations and subtracting them from the many criticisms of 'mechanism' through hypotheses on the interactions between 'rational agents'. Game theorists will remain within the perimeter of a maximizing logic of the individual, albeit of an individual who must confront the maximizing strategy of another individual, part of the same social context. An analytical juncture where Nash's equilibrium takes hold, which refers to "*the outcome of a game in which none of the subjects has an interest in modifying its strategy unless the incentive structure associated with it is modified*". Which is why it would become a 'blocked game'. We begin to glimpse the circularity factors of a post-rational choice.

We could then say that from this 'theoretical stalemate' in which the Olympian and individual maximizing rationality of a linear type had become wedged, a *logical* (post)*rationality of a circular type* began to emerge in the middle of the 20th century with the models of Herbert Simon (1955), Jon Elster (1979), and Tversky and Kahnemann (1979), starting with the concept of *interaction*, *complexity and non-rational expectations.*
In fact, the very concept of optimizing linear rationality itself begins to be redesigned and decomposed insofar as it is oriented towards a single efficient purpose because it is at odds with the working models of the human mind as well as the results of quantum physics achieved in the 1920s and 1930s.

First of all, the human brain cannot be assimilated to a mechanism, nor is it perfectly calculating as the neoclassicists thought, and it begins to be treated for what it is with its functional, memory and cognitive limitations: an organ with precise calculating limits as far as its capacity to process information is concerned and, moreover, with functional frictions in transferring it (internally and externally). Indeed, people 'in the *flesh*', in the practical and concrete moment of making a decision, do not respond to optimizing logic, but rather follow heuristic paths and/or adopt habits or explore 'protections' within habits, sometimes to do better and faster and safer. It is Simon and Elster who lead us, for example, to consider *satisficing* logics in organizational choice behavior for calculation limits or as in the game of chess, beginning to consider even the possible or only potential moves of the competitor. Or considering the *self-commitment that* is Ulysses' to 'protect himself' (and his companions) from the bewitching and attractive abilities of the sirens that rationality alone would not be able to oppose. Interaction, context and system of ('open') goals then define the circular and ecological character of decision-making, which will be all the more stable the more strongly shared in contrast to the theory of expected utility. Because - as Maurice Allais, who started the first experiments in cognitive economics as early as 1952, would say - subjects choose *inconsistently* and systematically violate the hypothesis of *independence* between the possibilities offered by tending to weigh differently almost certain events and only possible events, underestimating probabilities close to one and overestimating, instead, probabilities close to zero. Thus clearly in contrast with the predictions of the expected utility paradigm that later studies between the 1970s and 1990s tried to 'absorb', for example with Sugden's (1993) *regret theory* or Chew's (1979) *weighted utility theory* in an attempt to safeguard the hyper-rationalist and mechanistic bed of neoclassical orthodoxy, but without success. Failure due to the fact that it was intended to safeguard the core contained in Adam Smith's *The Wealth of Nations* with the well-known reference to the *self-interested* behavior of the brewer or the butcher rather than the baker to ensure the day's lunch, because it would not be from their benevolence that we would get results but precisely from looking after their interest: *"We do not look after their humanity but their self-interest"*. Hence the ability of markets to regulate themselves if not distorted by *context and interaction* factors. But herein lies the critical theoretical and methodological point of the centrality of the context of the eco-systemic and circular relationships between agents from which a shared and stable welfare (and not definable by *one-shot* or *short termism* exchanges) can derive through factors of *reputation, trust and repetitiveness* but also of *conversation* between those who offer and those who demand to ensure a *satisfactory* medium and long term and shared *outcome*. A way to reduce risks for all agents with adequate circulation of information of product quality and people reliability by stabilizing habits and customs in mutual recognition and reduction of potential 'non-knowledge' factors.

In this way the supporting architecture of the ideological idea of a market capable of self-regulation was crumbling, where the heterogeneity of ends uses individual interest as a 'happy drive' capable by itself of determining the increase in wealth and, at the same time, the well-being of the community and that will lead to Laffer's *trickle-down theory* (with a never proven efficiency in practice) and supply-side policies and thus to Thatcher in the UK and *Reaganomics* in the US in the 1980s reinforcing the neo-liberal ideology[2] .

So it is from Adam Smith's *Theory of Moral Sentiments* that we should perhaps start again as a text in which the Scottish philosopher investigates the dynamics that lead to the birth of human communities and hinges his analysis on the concept of *sympathy* (deriving from *self-love*), i.e. *sympathy* that we should translate as sharing and interaction as happiness *with the* other[3] , as governing levers of (almost) rational expectations for widespread well-being. Again, noting that Smith's theoretical reading of the 'invisible hand and neo-liberalism' is, perhaps, too superficial. A sympathy and interaction involving *bias* and errors of a human behavior that often relies on heuristics, habits and customs precisely because the mind and choices do not act in a way that is neither optimizing nor seeking an expected utility for factors of interaction and contextual circularity. Which will lead Adam Smith to recognize that *'However selfish one*

[2] Indeed, the very opposite can be demonstrated in practice, that only redistributive policies capable of pushing the social ascension of the poorer classes are helpful in increasing overall wealth and welfare as demonstrated in the northern European economies (Sweden, Norway, Finland, Denmark, the Netherlands). But also confirmed by the Chinese growth of the last 40 years as a push for widespread growth of the middle classes. With 'socially blocked' economies that just don't grow,

[3] What kind of happiness would happiness be without the Other?

may suppose it to be, man evidently has in his nature certain principles which induce him to take an interest in the lot of others and which make their happiness necessary to him'[4] , while recognizing that *self-interest* is 'the most *persistent, the most universal, and therefore the most reliable of human motives'.*

So we can say that cooperative or disinterested action, solidarity, does not arise from vanity or the judgement we expect from others, or not only. Instead, it arises from the judgement we have of ourselves and which derives from *mirroring* with the Other from us, to find in his eyes our authentic *inner self*, which is never definitively written but subject to change and adaptation continuously in that *sympathy which* is also called *fellow-feeling* and which makes man an essentially and inevitably social and - moreover - positively oriented being. We think in an anti-Hobbesian and negative perspective of *homo homini lupus* where man seeks shared love and happiness where kindness always prevails over hate. But all this for Smith occurs in a continuous process of adaptation - and today we would say learning - as an adjustment (*adaptation*) towards a dynamic equilibrium with others and the environment, with the context then. Within a community and an environment - a *circular ecology* we could say - where to explore a fabric of agreements for a shared harmony as in the sound of an orchestra in which *sympathy* is the strongest co-generative glue of ties and customs as well as the ruptures towards *evolutionary resonances.*

The social equilibrium, thus interpreted, also recalls the *economic equilibrium* of exchange where price, however, becomes only one of the natural elements capable of satisfying multiple and multidimensional interests and needs of the differentiated agent-subjects involved in the transaction. And in this, Smith remains an Aristotelian who anticipates what two centuries later Amartya Sen will try to demonstrate: that man's sociality is born thanks to the use of non-verbal language first and then of words, in addition to the natural propensity to exchange with the Other through *mirroring*, which will lead man to *self-consciousness* through the transition from drives to the distinction between positive and negative emotions, and finally to the choice of moral sentiments. A process that is at the basis of the constructive constitution of the *group* not so much for a defensive attitude exercised with the specialization of social tasks and the social division of labor from the tribe to the family to the community as the only (necessary) regulatory modalities of relations between economy and human beings, but to build relationships of meaning between different agents participating in the 'game of life' in the continuous dynamic balance between cooperation and conflict. A multi-oriented and multi-purpose relationship that must take place long before the exchange of goods and money, indeed if anything it is the basic condition for that relationship to become exchange and then transaction in a perspective that is then not linear but circular. A circular relationship that is profoundly human and is the basis of fair exchanges and replicable, complete and continuous transactions between trust and reliability. A relationship that is generative and constitutive of community as a set of signs, language, speech and shared values as a preliminary act and condition of functioning and effective markets and division of labor, which thus have at their basis the natural tendency to proximity without which they could not perform their tasks adequately and would be likened to mere 'mechanical machinations' more or less robotized. Markets and organizations thus defined would be pure abstractions independent of concrete reality and as such not only unrealistic but non-existent as well as inefficient, because society does not come into being illusorily because selfish and self-interested individuals find that division of labor as the most productive mechanism to increase their own wealth and that of all as rational. But market and organization are functions of the moral sentiments that arise from the natural tendency to build relationships of proximity, self-love, and mirroring that allow for the re-composition of the limits and incompleteness of the human mind as well as the boundaries of its aesthetic, spiritual and action creativity according to circular and post-rational logics (Bee, 2011).

We are thus witnessing the 'great inversion' between the relevance of the normative dimension (what should be in a desirable and perfectly rational world) and the relevance of the descriptive one (what actually is, with all the limits of a limited rationality) 'beyond' the major criticalities of orthodox economic thought with post-rationalist projections as also demonstrated by cognitive economics in the last 30 years that broadens the complexities of human feeling and *sense making* starting from the discovery of mirror neurons in the brain even in the case of remorse (Canessa and Motterlini, 2011; Guala, Motterlini, 2013).

3 - Bias, decisions and 'inaccurate' predictions of the future between psychology, war and laziness

A decoupling factor between decision and action rests on a layer that has been brought to surface only in recent decades. For many years the human behavior (judgement and decision included) has been thought as compliant with some more or less rigid version of the "rational choice theory", that is considered a cornerstone of the classical approach to decision-making. Such a theory, while having been formulated as a *normative* one (how should humans decide?), has largely been interpreted also as a *descriptive* theory (how do *really* humans decide?) Unfortunately (or luckily), this idea could not be reconciled with the volume of experimental data from several decades of scientific

[4] Cf. On these issues of happiness in organizations, Pilotti(2019), *Emotional Organizations (creative and intelligent)*, McGraw Hill Italy

studies in cognitive and social psychology, *behavioral economics* (a new discipline emerged to update the field, starting from a critique to rational choice theory), Artificial Intelligence, and much more.

After a first suggestion (in the '50s) from the Nobel Herbert Simon[5], who observed that *in real life* people rarely examine and calculate all the available options, rather stopping their analysis when a *good enough* alternative has been reached (*satisficing*), the field has been thoroughly explored by other Nobel, Daniel Kahneman[6]with Amos Tversky, giving rise to the well-known research program "*Heuristics and biases*". According to such approach, real humans do not behave, as most economists hypothesized, like a *homo economicus*, whose context is summarized below.

Agents
Methodological individualism
rational choice of agent with perfect information and knowledge
discrete and dyadic transactional exchanges,
general economic equilibrium of the contest,
individual as well as independent utility maximization,
neoclassical theory of the firm (min-max costs and prices),
moral and social values as "external effects" disturbing perfect information
negative externalities "compensated "
Organization
Is an instrument/strategy objective min-max resources (quantity-value)
Is "sum" of individuals and material and immaterial resources in stockholder view
Is a subjective function of a "rational choice" min-max short-term resources for given objectives
Is a separation of technique and human activity
Is a Weber bureaucracy procedure

As Richard Thaler (a third Nobel involved) suggests, such an abstraction should "*think like Albert Einstein, store as much memory as IBM's Big Blue, and exercise the willpower of Mahatma Gandhi*"[7] to conform with these assumptions. Real persons simply have not enough time, memory, computation power and – let us say – willpower to *calculate* each relevant decision in our life Rather, we are just *humans*: emotional, lazy about thinking hard, sensitive to context and framing[8], but very smart in remitting even complex tasks to our *autopilot*.

How could humans solve the problem of surviving to such a mess of decisions? Mostly by evolving (by natural selection) a large toolbox of mental shortcuts that helped us in making decisions and assessments - usually in a *satisficing* way - swiftly, and with a minimum cognitive effort (*heuristics*). Luckily, this set of tools seem to have worked fine, on average. Unfortunately, like any tool in a set, heuristics give correct outcomes *only* within their own *range* of appropriateness. Therefore, when we face types of challenges – e.g., dealing with our electronic devices - that our ancestors could not even imagine, errors can arise. The name we give to these errors is *cognitive biases*. "*Cognitive*" points to the fact that these biases are not the result of emotional interference, rather just "quirks" in our mental software. By the way, the role of emotions in decision-making has been widely re-evaluated in the last decades, as essential guides to give meaning and direction to our decisions.

According to a widely diffused perspective, the workings of our mind can be more easily grasped if we refer to two systems operating in it, System 1 and System 2[9]. In the words of Kahneman, "System 1 operates automatically and quickly, with little or no effort and no sense of voluntary control. System 2 allocates attention to the effortful mental activities that demand it, including complex computations. The operations of System 2 are often associated with the subjective experience of agency, choice, and concentration."[10] Kahneman playfully adds some of "anthropomorphic" features for both modes. System 2 is an energy-intensive system, so it is inherently *lazy* and only intervenes when insistently pressed. System 1, by contrast, has a response (often inaccurate) for everything, and you can't keep it silent. In the dynamics of many biases, System 1 usually tries to respond immediately and automatically to any question or request for judgement, often based on the large set of *heuristics* it owns (a *machine for jumping to conclusions*, as Kahneman again suggests). System 2 has the ability to overrule statements that can be incorrect, but because of his

[5] Simon, H., 1956. "Rational Choice and the Structure of the Environment". Psychological Review. 63 (2): 129–138
[6] Kahneman, D. and A. Tversky, (1979). "Prospect theory : An analysis of decision under risk", *Econometrica* 47, 263-291
[7] Thales and Sunstein (2009)
[8] Tversky A. and Kahneman, D. (1981), "The Framing of Decisions and the Psychology of Choice," Science 211: 453-58.
[9] Stanovich K. and West, R., (2000), "Individual Differences in Reasoning: Implications for the Rationality Debate," *Behavioral and Brain Sciences* 23: 645-65
[10] Kahneman (2011)

notorious laziness, as well as the fact that the activities of system 1 are invisible to consciousness, gives up most of the time. A *bias* is born. Many biases can actually be regarded as dealing with a complex issue by answering a much simpler question.

Cognitive biases are *universal* (even experts are regularly victimized), *systematic* (they always point to the same direction, as remarked above), mostly *unconscious* (we are unaware that we are making such mistakes). Moreover, even when we rationally realize we made an error, the biased decision still often seem dangerously common sense to us. The last two features make biases truly dangerous under most conditions; while their being *systematic* allows us to hope that some way to limit their impact can be found.

Cognitive biases can be annoying in our personal life, but they evolve into really dangerous when they appear in organizational decision-making, involving exponentially growing risks as decision levels grow higher and higher. Up to become catastrophic when global dynamics are involved, such as in environmental issues and international relations (as aggression in Ukraine 2022). Deterrence, for good reasons, was widely studied after the Second World War, mainly under the aegis of Game Theory, which prevailed at the time: that is to say under the assumption of full rationality of the parts. But, as Robert Jervis suggested[11], human decision-makers bring into their behavior all the *biases* we all are exposed to. Just to name a few, deterrence can be made less effective by:

- *Confirmation bias* (our tendency to search for arguments or facts *confirming* our previous ideas or preferences, ignoring any clue suggesting that alternative theories may be equally acceptable).
- *Availability heuristic* (we interpret reality mostly under the influence of facts that most easily jump to our minds – emotionally charged, recent or salient[12]).
- *Overconfidence effect* (probably, for now, it does not need additional explanations).
- *Groupthink*[13] (a pathology of group behavior, typical in overly cohesive teams, obsessed by the need for unanimity in front of an outside enemy, leading to *illusion of invulnerability*, *illusion of consensus*, a stereotypical view of opponents as inept or unethical, *self-censorship* and active mind-keeping against unorthodox opinions, and a strong certainty of *morality* – as in case of the *Bay of Pigs invasion*).
- *Sunk costs fallacy*, our irrational predisposition to *continue to invest* in an irreversibly compromised project, *exactly because we've already dumped tons of resources* into it, even if just emotional ones (*throwing good money after bad*.)

  A (not too good) set of "reasons" explaining why the most rational choice (keep the equilibrium) may be surprisingly replaced by an often-self-defeating action.

In our decision – action processes, *biases* may interfere, outside our consciousness, with virtually all phases: *historical analysis*, *context evaluation*, *parameter estimation*, *forecasting*, *feed-back interpretation*, *learning by experience*, and even *anticipating* (as we will see later) *the extent to which we individually or collectively feel happy (or sad) when we achieve (or fail) our personal or organizational goals*.

A first set of *biases* – historically the first to be studied – concerns judgement, and in particular the assessment of probabilities. Kahneman and Tversky, in the 1970s, assumed, and experimentally verified, that, as humans, we are far from being good *intuitive statisticians*. Think of our inclination, for example, to be overly influenced by similarity to *stereotypical* representations of people, circumstances, trends, etc. Thus, in a database (70% lawyers, 30% engineers) of psychological sketches, ignoring their CV, a vivid description of a quintessential engineer will compel us to ascribe the report to an engineer, despite more meaningful data (the *base rates*) should suggest a different assessment (*representativeness heuristic*)[14]. Even *randomness* has its own *stereotypes*. A head or tail sequence like TTCTCCTC looks much more "random" than a - equally probable - TTTTCCCT. Just a further expression of a not responsible inclination of our *System 1* to avoid ambiguity, frequently believing to recognize patterns where no pattern exists, in a quest for meaning and causality. In the same vein, we tend to assume vivid scenarios, rich of details, as more likely than of more generic – and accordingly more probable – ones (*conjunction fallacy*)[15]. As in case of an emergent incident between China and Taiwan.

[11] Jervis, R. (1976), "*Perception and Misperception in International Politics*", Princeton University Press

[12] Tversky A. and Kahneman, D.,(1973), "Availability: A Heuristic for Judging Frequency and Probability," *Cognitive Psychology* 5: 207-32.

[13] Janis, I. L. 1971. "Groupthink", Psychology Today. 5 (6): 43–46, 74–76

[14] Schwarz N. et al., 1991. "Base Rates, Representativeness, and the Logic of Conversation: The Contextual Relevance of 'Irrelevant' Information," Social Cognition 9 : 67- 84

[15] Tversky, A. and Kahneman D., "Extensional Versus Intuitive Reasoning: The Conjunction Fallacy in Probability Judgment," Psychological Review 90, 293-315

Other *biases* in the same category include our propensity to *underestimate large probabilities*, and, conversely, to *overestimate small probabilities*. Inappropriate influences on estimates also result from how information is presented (*framing*), and even from mere snippets of unrelated information casually (or sometimes not so casually) creeping into our minds. As it happens with *anchoring & adjustment heuristic*. It is a mental shortcut we developed early in our evolutionary history, that we operate, sometimes intentionally, but more often automatically and unconsciously, when we must assess something too unusual or complex for our direct or indirect knowledge. Starting from a piece of information (*anchor*) we keep as known (or we think we know, or maybe just vaguely remember), we attempt by successive approximations to adjust its value, based on what we consider reasonable assumptions, according to our knowledge, our culture, our readings, or access to reliable data sources. The process continues recursively until the outcome make sense for us. Although this process is ubiquitous, and often working fine, there are two factors that contribute to its deception. First, we don't always choose that bit of information intentionally. Often it is the effect of an intrusion of unrelated data into our mind (*priming*). People that have got number "30" spinning a wheel of fortune, will answer to a question on the percentage of UN countries in Africa with a sensibly lower estimate than subjects that read "70" on the same wheel, though the two kinds of data are totally unrelated. Even manifestly absurd anchors may influence the more trivial estimates. Second: given the known cognitive *laziness* of our System 2, we usually stop iterating too early, often reaching an *underestimated* value[16]. Just as we were tied to the *anchor* through a chain not long enough. After all, a range of plausibility is, well, a *range*, not a number, and too often we stop just when we reach its closest edge, failing to explore it sufficiently.

Just like a hidden chain "anchors" a budget for the next year (the anchor is, typically, the last year budget), less obvious *anchors* greatly limit the range of possibilities we can envision for the future. When we rethink an organization, to adapt it to new evolutions in markets and technologies, too often we lack the mental freedom to cut the thread that links the future shapes to the *image* we hold of our current set-up. More dramatically, when *envisioning* the future (markets, behavioral changes, transformations in values, political and social trends, etc.), our picture of it is all too often constrained by a heavy, heavy *anchor*: our *present*. Our *vision of the future* is irremediably too much *close* to the image of our *present*. Maybe you need a good science fiction writer to do a better work.

Other *biases* concern how we relate to money and economic value. *Mental accounting*[17], for instance, directly undermines a cornerstone of mainstream economics, the *fungibility of money*. In our personal lives, we are often inclined, in a strange parallel with budgetary practice in business organizations, to segregate revenues and expenditures into inviolable categories, according to their provenance or destination. Money for a mortgage, or for future education of your children; or the godsend of a lottery. Often experiencing a psychological barrier to withdrawing cash from a "sacred" account, so comparable to the frustrating "administrative" barriers you meet when trying to move a sum from one budget to another.

Or think of the *endowment effect*, our tendency to overvalue everything we *own*, even *virtually* or temporarily, *just because, at that moment, we own it*. A psychological reason why the offers you receive when trying to sell your home always look outrageously miserable. The *endowment effect* itself is partially explained by a much broader and pervasive *bias* which focuses on the deep asymmetry in the way we view *gains* versus *losses* of the same amount. As everyday life suggests, the psychological impact of a given loss outweighs the joy of an equivalent gain by a factor which has been estimated at about 2[18]. The scope of this *bias* (itself a particular instance of *negativity bias* – less documented) is very wide, including more than just economics: it can also extend to status, feelings, security, self-esteem, etc. Thus, *loss aversion* (as it is known) anticipates, for example, that a failure to achieve a personal objective, or a demotion in the workplace, will sting much more than you will appreciate a success, or a promotion. *Loss aversion* plays a central role in the overall dynamics of management and entrepreneurship. While it helps to prevent unnecessary risks, enhancing the perceived impact of negative outcomes, on the other hand it also represents a powerful *inertia factor* operating at every level of the organization. Every change is about losing something, to gain something else; thus, often, *loss aversion* manifests itself in the form of the *status quo bias*, the inclination to keep things as they are. After all, how many companies have more than twice as many benefits as costs to overcome *loss aversion*?

Thankfully, while *loss aversion* plays a conservative role in organizations, another group of *biases* tends to offset its impact. This cluster revolves around the *overconfidence effect*, which we have already met previously. What we are talking about is our *overreliance on our own judgments*, beyond what is reasonable. Too easily converted to a severe *overestimation* of our actual *performance* and *capabilities* (in driving or at school) Daniel Kahneman considers

[16] Epley, N. and Gilovich, T., 2006. "The anchoring-and-adjustment heuristic: Why the adjustments are insufficient*",* *Psychological Science* 17 (4):311-318

[17] Thaler, R. 1985. "Using Mental Accounting in a Theory of Consumer Behavior." Marketing Science 4:199-214

[18] Novemsky, N. and Kahneman, D. 2005. "The Boundaries of Loss Aversion," Journal of Marketing Research 42 (2005): 119-28

overconfidence (more precisely *optimism*) as the real *engine of capitalism*. Without a bit of *overconfidence*, it would be almost impossible to overcome the inertia imposed by our *loss aversion*. Indeed, the interplay between *loss aversion* and *overconfidence*, together with their prevalence among the various groups within the company, has a strong influence on the overall dynamics of an organization. It is not by chance that CEOs rank very high among the most *overconfident* categories in today's world.

As a final example of this non-exhaustive list of how *biases* can interfere in decision-action processes, let us introduce our difficulties in what is known as *affective forecasting*, defined by Daniel Gilbert and Timothy Wilson as *"the ability to predict one's hedonic reactions to future events*"[19]. What does this mean? A characteristic feature of our mind is being able to anticipate the future, simulating one or more versions of what may happen, and choosing from the different alternatives we could imagine the single one that most closely matches our goals, or best adapts to our beliefs or prejudices. In this sense, mental simulation - whether it occurs consciously or unconsciously - is an essential part of our decision-making. As it happens, this extraordinary tool is sadly prone to some *design errors*, precisely what we named *cognitive bias*. Including, here we come to the point, *distortions in the way we anticipate how we will react, emotionally, to the many events, both ordinary and extraordinary, that mark our personal and organizational lives*. In other words, we are seldom as happy or unfortunate as we expect to be.

Apart from the personal side this 'bugs' in our mental software should also be an organizational concern. Especially when a company explicitly recognizes how important it is sharing values and goals with its employees. If, as an HR function, we are interested about building a motivational system for our people, we need to know what really makes people happy - beyond the declared - and whether it really works. At the individual level – for instance, for a coach - the implications are even greater. If our task is helping an employee, or a manager, to bring his/her personal goals to light (harmonizing with organizational objectives) then it becomes crucial to know whether pursuing them really makes him/her happier. A person sets goals in the belief (or at least in the hope) that achieving them will make him/her, shall we say, happier: but it is precisely on this last, crucial point that Gilbert signals storm clouds.

Now, if our mistakes were random, we'd be unarmed. We could just shoot in the stack, hoping to guess the prediction every now and then. What makes *affective forecasting* interesting, however, is that, as for the other *biases*, our errors are usually *systematic*: that is, they always point to the same directions. Same as optical illusions, where everybody, and always, sees the *same* distortion effect.

But which are these mistakes?[20]

The most important - and the easiest to check - is our propensity to *overstate the impact of future events*. Not to underestimate it. Here comes the systematic nature of the error. It is not that events have no impact, but we typically expect it to be a lot more powerful, and much more durable than it actually is. This is what is called *impact bias*. How do we measure it? We ask people to predict how will they feel before a given future event (minutes, days, or months ahead); then, once they have experienced it, we ask them how they really feel (minutes, days, or months *later*). You can try yourself. *Impact bias* is the systematic difference between predictions and actual outcomes.

In Italy (February 2023) we are living in a relatively quiet condition despite the COVID-19 pandemic and price gas, and we are slowly resuming many of the habits of our previous lives. Think what kind of life you were expecting for next summer only six months ago. Of course, this is an example of a particularly traumatic event that none of us had experienced in the past. But think instead of more ordinary events that we have all come across at least once, which we should therefore have greater experience with: the break-up of a relationship, or, on the other hand, a desired promotion, or a purchase we cherished. How long have you been unhappy or pleased, respectively? Perhaps not minutes: but, generally, much less than we had imagined before.

Why? The truth is that we are naturally gifted with a powerful protective system, which Wilson refers to as the *psychological immune system*. Just as the immune system *tout-court* automatically intervenes when our body is threatened by an external agent, so the psychological immune system is triggered, without our being conscious of it, when something endangers our psychic balance - and something else too: the way others, and, more importantly, ourselves, view us. This system has a several weapons at its disposal, but one of the most powerful means is the ability to *rationalize ex-post*. We become quite adept at coming up with very good (perhaps even true) reasons why the event, upon reflection, is not a tragedy, quite the opposite. And its impact, more or less quickly, fades away.

[19] Gilbert, D. and Wilson, T., 2009. "Why the Brain Talks to Itself: Sources of Error in Emotional Prediction," Philosophical Transactions of the Royal Society B 364: 1335-41

[20] Gilbert D. (2009)

So why, despite such powerful weapons, do we repeat the mistake every time we try to imagine the hedonic effect of future events, just to prevent, if nothing else, an anticipated unhappiness? Because rationalization is an automatic, and mostly unconscious, process. Working below the level of consciousness, we are not aware of its action.

A second source of error has to do with *attention mechanisms*. When we imagine the pain of a future loss, or the happiness for an expected promotion, we put that event at the center of the spotlight. This is how attention works. However, the large dark area surrounding the light is not empty: it contains countless other events, trivial or otherwise, which may not be equally intense, but in the days and months that follow they accumulate, contributing to our hedonic balance, and eventually diluting the impact of the big one, in many cases decisively. Life goes on.

No wonder that many classical economists, already uncomfortable with psychology, consider these *biases* an obstacle to good decision-making: if I don't know how happy a purchase will make me (and for how long), how can I maximize my utility function? Hence, a certain pressure to seek out those famous corrective glasses mentioned above. However, as with other cited biases, from an evolutionary point of view, even these mistakes have reasons to exist. For example, expecting the loss of a child to be lived as a tremendous and inconsolable tragedy may have helped our ancestors to redirect resources towards strict risk control, with a predictable increase in Darwinian fitness. In the same vein, expecting from a successful enterprise a level of happiness well beyond what will be likely experienced, probably boosted both experimentation and pursuing objectives.

Debiasing (mitigating the negative impact of *cognitive biases*), presently, is more an art than a science. A possible strategy is to give people a complete understanding of their mechanisms. It helps, of course, but usually is not enough, most of all because, as we know, they operate unconsciously. Learning to identify situations where a bias is most likely to occur, or its impact is more harmful, allows us to alert System 2 for a higher level of vigilance; but, again, often it is not enough. Moreover, some *biases*, like *confirmation bias*, are particularly resistant to any form of debiasing. Kahneman, kidding, suggests practicing recognizing *biases* in the behavior of friends and colleagues. It can be fun, but a sort of *meta-bias* (*blind spot bias*[21]) indicates that we think we are less *biased* than other people, and, in any case, we are far worse at identifying biases within ourselves than in others. Generally speaking, each *bias* requires a specific set of measures in order to be contrasted. However, a different strategy stems from the idea of *choice architecture* (Thaler and Sunstein[22]). In many cases, when a decision is likely to be undermined by one or more *biases*, moving the decider away from his/her own goals, it is possible to specially design the *decision environment* so that the *context* gently "*nudges*" persons towards the *best option* (according to their own judgement), bending, so to speak, the *bias* itself in their favor. A *nudge*, the main character in the *choice architecture* theater, "is any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives." An approach that is rapidly evolving in the last years (Sérieyx 1993, p. 248). While working hard on debiasing, in the meantime we cannot forget that our world, today, is not yet in the hands of *homines oeconomici* using latin language (at least until machines will take it over), but is still made up of *humans*, with all their *biases*. We cannot afford not to take it into account.

4 – Conclusions

In the *standard approaches*, we see the centrality of indicators that generally refer to: costs, product, quality, level of profit, customer satisfaction. While in *ecological approaches* we see relevance: relationships, patterns, scenarios, processes, motivations-emotions and contexts. Where "dramatized narratives of possible scenarios" - hybridizing and contaminating languages-roles-functions (*semantic capital* of Floridi - 2019) - can try to shed light on disorder by constructing / reconstructing - tentatively - a new order, by assigning a *meaning* to those connections to reduce entropy without reducing variety. Giving origin in this way to resilient organizations, in the ecological activation of conversations and dialogues that Peter Drucker (1986) already referred to as a necessary outcome almost 35 years ago maybe thinking darkness of orthodox rationality.

Among the main findings of our paper we show a significant change in the decision making of many organizations which are therefore facing a new level of complexity. The decision making process of modern organizations needs a transition from a linear relationship between decision and action (orthodox rationality) to a circular one where there is higher flexibility and resilience. Circular rationality does not give the opportunity to address a precise forecasting, but it allows to carry out good practices when there is an economic and social shock or in complex organization to reach equilibrium. When you have strong wind in sailing boat or in house with earthquake is important an organization as

[21] Pronin E., Lin D., Ross L., 2002. "The Bias Blind Spot: Perceptions of Bias in Self Versus Others", *Personality and Social Psychology Bulletin* 28(3):369-381

[22] Thaler and Sunstein (2009)

"substitution" of strategy looking for an ecology equilibrium between different (conflicting-cooperating) forces (internal and external) and relevance of resilience.

A more rigorous implementation of main variables would have been useful to develop an empirical analysis applied to measure different efficiencies between vertical and horizontal control of organization for different connection between decision and action in different context of complex conditions of (post) rationality. We can explore the transition necessary to governance of next interdependence change of market, technology, society and environment towards resilience for both sense making and sharing value "over" darkness of our rationality.

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