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CASE STUDY

Economic decision-making systems in critical times: The case of 'Bolsa Familia' in Brazil

Alfredo Pereira Junior[1,2] | **Juliana Moroni**[3,4]

[1]São Paulo State University, Botucatu, Brazil

[2]Goldsmiths, University of London, England, UK

[3]Academic Group of Cognitive Studies, São Paulo State University, Marília, Brazil

[4]Rio de Janeiro State University, Rio de Janeiro, Brazil

Correspondence

Alfredo Pereira Junior, São Paulo State University, Botucatu, Brazil.
Email: alfredo.pereira@unesp.br

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Abstract

Kahneman's theory of two systems assumes that human decision making in Economy is based on two cognitive systems, one that is automatic, intuitive and mostly unconscious, and one that is reflexive, rational and fully conscious. The authors consider Kahneman's approach incomplete and limited in accounting for the creativity of embodied agents grasping the opportunities afforded by physical and social environments. This limitation leads us to argue for the existence of a third system in decision making in Economy, the *creative intuition based on direct perception of affordances*, addressing not only the dispositions and goals of agents but also the social and environmental responsibility of corporations and governments. The authors argue that the third decision-making system the authors propose implies a concept of intuition that is different from the type of association process discussed by Morewedge and Kahneman [2] and gives an example of the third system operation, the *Bolsa Família* in Brazil, and finding new options for the funding of similar programs.

KEYWORDS

affordance, creativity, decision-making, ecological intuition, intuition, systems theory

1 | INTRODUCTION

The current environmental, economic and sanitary crisis urges for new political, economic and public administrative initiatives towards the route that leads to a better economic growth and integral human development. The usage of information technology brings the possibility of public policies to reduce economic inequality, avoiding corruption and promoting the activities of production and consumption of goods necessary for human development in an ecologically sustainable model. 'Green Deals' can promote the reformatting of the industrial apparatus according to the directions of ethics of sustainability. Cooperative relations in the production system, equality in the emission and distribution of money (e.g. with the Universal Basic Income) and an efficient social assistance system can promote a reduction of economic inequality and help to provide new opportunities of work and access to the consumption of necessary goods for the whole population of the planet. Attempting to make a contribution in this context, our research study addresses a critical issue: How to depart from the existing models of *economic* development and elaborate on a new model towards *human* development.

The demand of our time seems to require a new type of political, economic and public administration thinking to support the efficient and efficacious decision-making processes needed to trigger the necessary systemic changes, a task that requires a great deal of creativity and interdisciplinary cooperation. For the proponents of Two Systems Theories (TST), as Kahneman [1], there are two types of cognitive systems that guide the action of individuals in decision making: System 1 acts automatically, guided by unconscious associative information processing [2], and System 2 acts by means of conceptual processes anchored on mental representations and logical reasoning [1]. We criticise Kahneman's approach to TST in the context of the decision-making process, arguing that it does not account for the generative and creative performances of agents in a contextual, embodied and embedded framework.

In everyday life and scientific discovery (see [3]), there is a role for an *attunement* [4, 5] of dispositional states of embodied agents with the perception of contextual affordances, leading to

intuitive pathways that guide creativity. Although not explainable in terms of logical processes, this *attunement* can be understood on the basis of the co-naturality of individual cognitive systems and their environments; the dynamic patterns [6] of the living system become attuned with dynamic patterns of the environment because they are ultimately made of the same temporal, wavelike patterns that can 'resonate' with each other forming the *invariants* [5] we can consciously perceive.

To account for the latter alternative in the explanation of creative decision making, we propose a third system formed by the coupling and co-evolution of the agent's nervous system and moving body, and the physical and social environment. Two fundamental concepts are involved:

(1) *Dispositional states*, including enactive non-conceptual processes and affective drives (see [7, 8]) currently studied in affective neuroscience (as the *Seeking* operational system in Ref. [9]) and
(2) The *perception of affordances* studied in the ecological Gibsonian theory [4].

A concrete example of our proposed System 3 is the genesis of the 'Bolsa Família' programme in Brazil, considered to be the most successful implementation of a Basic Income strategy in developing countries [10]. This is a type of conditional basic income implemented in Brazil in the 2000–2010 decade, offering a small (but decisive for fighting hunger) quantity of cash to families, who have their children regularly attending a public school. We hope to make clear that this programme became possible because of dispositional states (elicited by the social and historical background) of the political agents, together with the perception of the capacity of the Brazilian federal state to successfully carry this solution for hunger and poverty.

The *Bolsa Família* programme was not the outcome of a purely logical reasoning based on information processing, such as the Herbert Simon's model used by Morewedge and Kahneman [2]. Kahneman [1], as we point out, cites the conception of memory proposed by Simon [11] to base his theory of systems 1 and 2 and his conception of intuition. For Kahneman [1], intuition is a heuristic, non-rational and unconscious activity that automatically emerges to provide answers to the most diverse situations, such as decision making in choices that involve risk of loss or gain in the economic context. In agreement with Simon, Kahneman states that intuition is access to information stored in memory, a kind of pattern recognition. The role of intuition in the choices made in different situations is characterised by Kahneman [1] (p. 230) as the usage of the information that is stored in the memory of an individual and accessed in contexts, where there is the need of decision making. The characterisation of the concept is rooted in the work of Simon [11] (p. 155), according to which intuition is defined as *recognition*:

> In everyday speech, we use the word *intuition* to describe a problem solving or question-answering performance that is speedy and for which the expert is unable to describe in detail the reasoning or other process that produced the answer. The situation has provided a cue; this cue has given the expert access to information stored in memory, and the information provides the answer. Intuition is nothing more and nothing less than recognition [11] (p. 155)

The originality of our proposal lies in the fact that dynamic patterns are essentially different from the concepts of discreet (binary) information patterns and mental representations, which have been formulated by cognitive scientists and philosophers of mind, and implemented in computers by engineers. In our approach, instead of this type of information processing, we make reference to *Dynamic Patterns* intrinsic to the self-organising activity of complex systems in nature, being structured in wavelike patterns (those which are analysed as modulated by frequency, amplitude and phase). These patterns inhabit an n-dimensional state space containing 'attractors' (stable states; see [6]), which can be perceived as invariant patterns. The System 3 we propose is not classified as pertaining to Systems 1 or 2, because it does not share their cognitive information-processing mechanisms. In System 3, intuition is conceived as *a dynamical approach to attractors and perception of the respective invariant patterns*, instead of the associative information-processing view assumed for Systems 1 and 2.

We first introduce Kahneman's TST and criticise it; second, we elucidate the concepts of *dispositional states* of the agent and *direct awareness* in the context of the ecological J.J. Gibson's theory; third, we present our hypothesis of the existence of System 3, on the basis of the *attunement* of dispositions and direct awareness, suggesting a different concept of intuition, and give examples to support it. In the final sections, we discuss the *Bolsa Família* as an example of the successful operation of System 3 in a democratic context and also present an extension of the strategy to promote Human Development, claiming for the adequacy of our proposed decision-making model for the current state of affairs in international political economy and public administration. In the conclusion, we compare our proposal with the two-system theory, suggesting a possible compatibility between the two systems and the third one we propose, once we adopt an extended theoretical framework.

2 | KAHNEMAN'S THEORY OF TWO SYSTEMS

In the book *Thinking Fast and Slow*[1] Kahneman [1] states that there is no way of knowing in detail how most impressions and thoughts emerge in our conscious experience. Mental work acts silently in generating decisions we make throughout our lives. Kahneman's focus is on the intuitive processes that

[1]The pages numbered in this paper for Kahneman's *Thinking Fast and Slow* book are for its PDF version.

support choices in risky situations, prioritising options in which there is a lower risk of loss. If in any situation there is any probability of loss, the intuitive choice is to decrease or eliminate it.

Kahneman and Tversky [12] studied how loss aversion dominates our choices. They criticised the capacity of the previously formulated *Expected Utility Model* to provide a valid description of decision-making processes in situations involving risk. The latter is characterised by a rational choice normative prototype that is used to describe and analyse economic behaviour. According to Kahneman and Tversky [12] (p. 263–266), this model is not suitable for evaluations involving choices in contexts of risk of loss, because these choices express diffuse effects that would not correspond to its basic principles.

They proposed an alternative model called *Prospect Theory*. For Kahneman and Tversky [12] (p. 264–268), decision making in risk situations is based on an intuitive, not rational, aversion to the risk of loss. They argue that people attribute more importance on outcomes that are tied to certainty over those that are only likely. Preference is allocated to positive perspectives; people tend to prefer a small loss over the likelihood of a big loss [12] (p. 264–269). They conclude that loss aversion is stronger than excitement about gains. As Kahneman points out, 'the response to losses is stronger than the response to corresponding gains. This is loss aversion' [1] (p. 274).

The classical work of Herbert Simon on Heuristics is referenced to support the assumption that intuition is *mostly pattern recognition*. In Simon's studies of chess masters, he showed that after thousands of hours of chess practice, they come to perceive the pieces on the board differently from us. As pointed out by Kahneman [1] (p. 15, Introduction section), 'Valid intuitions develop when experts have learnt to recognise familiar elements in a new situation and to act in a manner that is appropriate to it'.

It is important to note that Kahneman refers to aversion without attributing a constructive operational role for affective dispositions. On the contrary, the affective disposition works *against* a rational appraisal of the situation, favouring an 'automatic' response typical of System 1 [1] (p. 22–24; 31) that works quickly, making little or no effort; there is also no conscious perception or feeling related to the voluntary control of action. Kahneman [1] (p.14–16, Part I. Two Systems section) gives examples of System 1 processes: the voice of someone with whom we talk changes, for example, in medical appointments, when the doctor looking at the patient detects the health problem, and in chess games, when the player announces checkmate. This type of intuitive appraisal commonly happens several times a day.

According to Kahneman [1] (p.21), when we look into the face of an angry person, our perception is guided by sight and intuitive thinking. We automatically perceive their mood; however, the automatism is conceived as purely a pattern recognition process, not requiring from us the empathy to consciously experience the feelings attributed to the other person's state of mind.

For Morewedge and Kahneman [2] (p. 435), the intuitive judgement elaborated by System 1 is not consistently reliable. If a difficult question involving complexity needs a plausible answer and this answer is not quickly found, System 1 works through three types of automatic associative memory processes: coherence, attribute substitution, and processing fluency.

Operations of pattern recognition in System 1 involve associative learning, in which one perceived pattern triggers other previously connected ones, as a cascade. These patterns form associative mental events in complex and coherent series. Each externally perceived object or event gives rise to patterns that evoke and stimulate memories, emotions, physical expressions and reactions, creating predictions and contexts for future and likely events. The reactions occur not only in the brain but in the body as a whole [1] (p.52–54).

System 1 involves innate skills, such as action orientation or skills from prolonged practice, for example reading and understanding sentences and easy mathematical calculations. In Ref. [1] (p.24–26), while System 2 operates mental activities that involve more labour such as calculation of a 2nd degree equations [1] (p.24–26). Such operations are also related to conscious subjective experiences of self-control, agency, choice and concentration. In System 2, slow thinking operates through sequential steps to perform orderly, voluntary, deliberate mental work.

System 2 can change the operating mode of System 1 by programing the attention and memory functions performed automatically [1] (p 23). This alteration requires mental effort, as it is not performed spontaneously. For instance, orienting ourselves to sound from somewhere is an involuntary action of System 1 that triggers the voluntary attention of System 2; the latter tries to resist and not turn towards sound, performing self-control [1] (p.24).

Although in System 1 automatic and involuntary functionalities unconsciously generate complex thought patterns, it is only in System 2, related to the fully conscious Self, that these thoughts reach a higher level of complexity, reaching voluntary and slow functionalities that involve reasoning. System 2 controls System 1, dominating the impulsivity and associations that emerge from it; however, System 1 dominates most of our actions as it allows System 2 to expend little effort. System 1 only needs the support of System 2 when it cannot perform its functions properly and does not provide answers to problems.

Kahneman cites Müller-Lyer's geometric optical illusion as an example of these conflicts generated by cognitive illusion in visual perception: we tend to believe that in parallel arrows with inverted angles at the ends, one is larger than the other. The one with the outward angle appears to be larger than the one with the inward angle. This is because System 1 operates automatically by directing our perception to the illusion that the lines have different sizes. Even though System 2 measures the lines and questions about the sizes being not different, System 1 is still working to make our visual perception detect different sizes. To solve this problem, System 2 generates recognition pattern-based beliefs that the length of the lines are of equal size [1] (p.28–30).

System 2 elaborates and follows rules, makes comparisons between objects and their properties, and makes choices voluntarily. Based on given options, it controls and monitors the thoughts and actions under the influence of System 1. One of the essential skills of System 2 is to set tasks in which memory can be programmed to obey instructions that avoid the usual answers. These adjustments of tasks through memory programing occur with the aid of the executive control performed by major brain regions, including the prefrontal region. As Kahneman points out [1] (p. 45), 'One of the main functions of System 2 is to monitor and control thoughts and actions 'suggested' by System 1, allowing some to be expressed directly in behaviour and suppressing or modifying others'. For instance, System 1 operates in the detection of simple relations such as difference between haircuts, difference in height between two people, and change in mood of one person through the expressions of their face, but it does not have the ability to parse different objects with multiple attributes, neither has the ability to handle statistical information [1] (p.38–45).

System 1 can dominate System 2 when the self-control of system 2 is weakened, for example by performing various cognitive tasks, under the influence of alcohol, under a sleepless night due to insomnia etc. In this sense, the self-control of thoughts and behaviours is impaired when the focus of the object is diverted due to various causes [1] (p.48–49).

3 | AFFECTIVE DISPOSITIONS, PERCEPTION OF AFFORDANCES AND INTUITION

After taking into consideration Kahneman's two systems, we argue for the existence of a third decision-making system that is based on the constructive and reciprocal interaction of *affective dispositions* and the *direct awareness* resulting from the perception of affordances. Before treating their conjoint operation in the third decision-making system and a respective concept of intuition, initially we clarify the terms being used.

According to Spinoza, 'each thing, as far as it lies in itself, strives to persevere in its being' (*Ethics*, part 3, prop. 6). This disposition was called *conatus*. For Damasio [7], the human *affective drive* arises from the conatus. In the context of the Gibsonian ecological conception, the term *sentience* is used to refer to dispositions arising within cycles of perception and action; as Gibson points out [5] (p. 4), 'Every animal is, in some degree at least, a perceiver and a behaver. It is sentient and animate, to use old-fashioned terms. It is a perceiver of the environment and a behaver in the environment'.

Gibson uses the term *direct awareness* to explain that information is immediately picked up in direct experience within the continuous action-perception cycle, without inferential processes. As Gibson points out [5] (p. 240), 'The act of picking up information, moreover, is a continuous act, an activity that is ceaseless and unbroken'. According to Gibson [5] (p. 250), 'The term awareness is used to imply a direct pickup of the information, not necessarily to imply consciousness'. We consider that the direct awareness proposed by Gibson is an elementary phase in the generation of conscious activity that is manifested in different forms and degrees in different biological species.

Understanding the concept of affordance, both for the individual agent and for the society in which the individual lives (social affordances), is relevant for the understanding of the range of possibilities operated in System 3, and how some—but not necessarily all—of them emerges in consciousness. According to Mace [13], awareness is not related to knowledge storage in the brain by a disembodied and context-free organism, but comes from the direct detection of information available in specific niches by embodied embedded organisms. Gibson refers to the direct detection of *information-about* as the perception of *invariants,* which are specific of affordances on the ecological scale.

According to Michaels and Carello [14] (p. 40), 'From a psychological point of view, invariants are those higher-order patterns of stimulation that underlie perceptual constancies, or, more generally, the persistent properties of the environment that an animal is said to know'. In this sense, invariants are crucial for perception because of their stability. For Barret [15] (p. 104), the crucial question regarding visual perception is how do organisms obtain constant perception, given that they are in an environment of continuous variability? Gibson's answer is that there are certain higher order variables, the invariants, which are related to the permanent properties of the environment and as such constitute information about the environment so that the organism can detect the information. For Mace [13], to detect invariants is to make possible the sharing of common experiences among organisms by means of communication: 'Detecting invariants, he argued, not only provided a basis for experiencing a world that existed apart from us, but made possible a public world, a world that could be experienced in common. That is, two people cannot be in the same place at the same time, but over time, they can occupy enough positions to extract the same invariants'. [13] (p. 202).

The concept of affordance refers to alternatives of action that the environment makes possible for embodied embedded agents within their niche. There is a wide and complex range of sexual, predatory, leisure, fight, cooperation and communication interactions. For instance, tools allow affordances for handling [5] (p. 128). As Gibson [5] (p.12) points out, affordance 'implies the complementarity of the animal and the environment'. The organism-environment complementarity enables the direct perception of affordances which, according to Michaels and Carello [14] (p. 42), are specified by the information available 'in the stimulation and can be detected by a properly attuned perceptual system'. In this sense, when agents detect affordances, they are detecting meaningful information for action. As Gibson points out,

> I have already said that a horizontal, flat, extended, rigid, surface affords support. It permits equilibrium and the maintaining of a posture with respect to gravity, this being a force perpendicular to the surface. The animal does not

> fall or slide as it would on a steep hillside. Equilibrium and posture are prerequisite to other behaviours, such as locomotion and manipulation. [5] (p.131).

In addition to this explanation, there is also the conception of *social affordances* [4, 5, 16–18], further developed in the work of Schmidt [19], Heft [20], Hodges [21], and Baron [22] in the context of the relation of Social and Ecological Psychology. They are considered social properties which although constituted by physical properties and dependent on the physical environment for their emergence, they are not reduced to physical properties and objects. According to Maria Eunice Quilici Gonzalez (personal communication), social affordances are characterised as arising from *collective habits* that emerge from the relation between affordances and invariants shared collectively through perception-action of embodied embedded organisms. In this sense, for Schmidt [19], the physical and social environments are interrelated, since the actions performed by organisms occur in both physical and social contexts.

Social affordances express social meanings that provide opportunities for action. The social meaning and the subjectivity associated with this meaning are shared externally with other organisms in various ways, giving rise to a co-evolutionary system—the niche. The niche emerges from the relationship between the physical properties of the environment (soil, water, temperature, fire, stone, wood etc.) and organisms in the historical-evolutionary process. Thus, actions that occur in both the physical and social environments are directly perceived, in which the physical properties express the perceptive motor meanings, and the social properties express the social meanings. Social affordances are opportunities for useful and meaningful social action that emerge from the systemic relationship between organisms and their niches. They are systemic second-degree properties emerging from the relationship between collectively shared affordances and invariants by organisms in their specific niches. [19] (p. 137–143). For Gonzalez and Morais [23], ecological information is characterised as a set of invariants that enable action. Invariants are patterns that remain stable, dynamically structured through the agent-environment reciprocity relationship. [24]. For Michaels and Carello [14] (p. 39), information is a concept that presents a duality that can be described as information-about (invariant) and information-for (affordance). 'Information is the glue that holds the system together; it keeps the animal in contact with the environment'. [14] (p. 84).

From these considerations, we can draw a partial conclusion that for each individual or social agent there is a range of possible affordances specified by invariants in their niches to be perceived and identified, taken into consideration in conscious awareness, in the process of decision making. Our hypothesis of System 3 is based on the attunement of some of these possibilities with the previous affective disposition of the agents. We propose that System 3 operates on the attunement of dispositions and direct awareness of affordances, in such a way that the attuned pairs are more likely to emerge and be attended in consciousness, having a greater impact in the processes of decision making than those possibilities that are not attended.

4 | THE THIRD DECISION-MAKING SYSTEM: DEFINITION AND EXAMPLE OF THE *BOLSA FAMÍLIA* PROGRAMME

In the proposal of System 3, we focus on the basic perceptual experiences that involve direct awareness and that can be understood in the light of the Gibsonian ecological informational perspective. Direct awareness results from the reciprocal interaction between the organism and the environment that is different from the automatic unconscious processes carried in System 1 and from the fully conscious experiences on the conceptual level carried by System 2.

In System 3, there are two poles, the dispositional affective states of the agent and the perception of affordances as dynamic patterns in the domain of action. In this view, *intuition* should be re-conceptualised as a complex and plastic process engendered by the attunement between the dispositional states with the dynamic pattern of affordances. In System 3, the outcome of intuition is the conscious awareness that guides decision-making processes and contrasts with the logical inferences used by System 2.

We understand, with J. J. Gibson, that in order to be conscious and able to think about oneself, the agent must first have basic perceptual experiences of the environment. There are several ways to directly detect information available in the environment, experiencing it without resorting to linguistically formulated concepts, inferences and representations. System 3 is neither conceptual because it is based on direct awareness, not automatic, because there is a dynamic process in which the matching of the affective disposition for action is compared with the present affordance.

In the Gibsonian ecological perspective, the brain is an important part of the agent-environment relationship, but the emphasis of this perspective of analysis is the body as a whole and its reciprocity relation with the environment. Mace [13] points out that for Gibson, knowledge begins with perception and perception is perception of the environment. In this sense, the environment is as important as the brain for knowledge. To perceive is to perceive the environment directly, which involves the whole body and is not associated with sense data or representations. Although perspectives in neuroscience [25–27] consider the whole body in the neuroscientific approach, we understand that in the ecological perspective, the relation involves the direct perception of affordances, via agent-environment reciprocity and co-evolution, not in internal body processes. The emphasis of the ecological proposal is on the agent-environment relationship, not only on the agent, putting the environment in the background.

However, the possibility of attunement between affective dispositions and perceptions of affordances imply the possibility of both being ontologically conceived as dynamic patterns [6]. In the Kahneman [1] example of recognition of

humour of people from their facial expressions, the recognition of patterns that indicate humour on people's faces (in a process that he conceives as occurring automatically) implies the attunement of the visual affordance with an affective dynamic pattern (e.g. feeling happy or sad). This recognition requires an intuitive step that cannot be simply reduced to Simon's mechanistic associative process, because neither affective dispositions nor facial expressions are mental representations as those codified in current computers.

The concept of *agency*, elaborated by (Eleanor) Gibson [28], expresses the relationship between control, action and intentionality without resorting to mental representations. We consider that agency emerges from the relations between our affective dispositions and sensorimotor experiences of direct perception of affordances in the environment. For Reed [29] (p. 11–19), the ecological non-mechanistic model is proposed to understand how organisms act in the world without resorting to mental representations, through the perception of invariant information patterns that specifies affordances in specific contexts. The delimitation and context determination of these actions is performed by agency, requiring internal dispositions to get attuned with the affordances. In this sense, the organisms' actions are not characterised as effects arising from a cause such as the mechanistic perspective of action-reaction, but these actions are part of a system that regulates their activities, which are influenced, delimited by factors internal and external to their bodies [24].

On the basis of the previous considerations, the following concept of intuition is considered to be proper to System 3: when an affective disposition of the agent becomes attuned with their direct awareness of the environment, then the dynamic invariant pattern of the affordance may emerge in consciousness and be used to guide the decision-making process. There are two possible outcomes for this type of intuitive process: the solution of a problem may consciously emerge without explicit reasoning from previous representations; or, alternatively, the invariant that emerges in consciousness may be used for further logical reasoning leading to a conclusion. In the latter case, there is a combination of Systems 2 and 3 strategies.

For (Eleonor) Gibson [28], there are three properties of agency: prospectivity, retrospectivity and flexibility, all of them are characteristics of the operation of our proposed System 3. These are not automatic but do not require conceptual representations and logical inferences to be carried out.

The property characterised by anticipating the action is called *prospectivity*. Action and attention are directed to situations that emerge in the same or different contexts. Retrospectivity, on the other hand, is defined by coordinating past-related experiences with controlling the actions performed in the present time. As far as flexibility is concerned, this is a property of agency that allows for the end of actions in situations that are not favourable to the organisms. An example is the behaviour of a cat when affective dispositions lead the animal to observe a possible prey and perceive the affordances for catching it. The prospective action occurs when the cat jumps where and when the prey would be at a later time. If this same cat waits for minutes or hours for the possible prey to appear in a more conducive place for him to kill it, then we designate this the property of retrospectivity. When the cat perceives that its potential prey is in a difficult place to reach it, it will give up even temporarily [29] (p. 13).

We understand on the basis of the above conceptions that the concept of *agency* involves an intentionality that is characterised not by mental representations and cause-effect logical inferences, but by the attunement of affective dispositions with the direct perception of dynamic patterns that specify affordances. Intentionality cannot be described as 'mental' as opposed to the 'physical', to the extent that intentionality is embodied in the actions performed by cognitively fit organisms. In the words of Reed [30] (p. 62), 'From an ecological point of view, intentions are not causes of action, but patterns of organisation of action; they are not mental as opposed to physical, but are instead embodied in the kinds of performances most likely found in cognitively capable creatures'. (see [24], for more).

As we can see in this passage written by Reed, affordances enable different possibilities of action choices for embodied embedded agents. Such possibilities, when matched with the affective dispositions of the agent, enable the emergence of different patterns of intentionality, which allow the agent to select affordances, directing and controlling her actions towards specific goals [31] (p. 253). In this sense, we understand that System 3 is formed by coupled agent-environment subsystems and operates with the attunement of affective dispositions of the embodied embedded agents with individual and social affordances available in their interactions in the environment, within a larger process of co-evolution in ecosystems.

In this context, we consider that some examples given to indicate the functionality of System 1, that is, automatic, without agency, without voluntary control, without awareness and intentionality, are not sufficient to explain actions such as for example making decisive moves in the game of chess, when whoever plays is an expert in the game, or expressing a face of disapproval when faced with photos that arouse disgust, recognising humour through people's faces etc. Our hypothesis is that these examples are not sufficiently explained by System 1, since it operates only in automatic and involuntary mode. Such examples are better approached by the consideration of System 3, which involves agency, affective dispositions, direct awareness, perception of affordances and intentionality. We consider that the emergence of agency, with the properties of prospectivity, retrospectivity and flexibility, are related to the intuitive capabilities of System 3.

Examples of System 3 operationality range from everyday experiences to government policies; for example, the popularly called 'butterflies in the stomach' or 'shivering in the spine' in situations involving diverse contexts of anticipating information; gambling in games, as when a player makes good guesses; in contexts of scientific discoveries or elaboration of works of art in which the authors are affected by an 'Eureka' experience; in sports games, in which athletes act intuitively successfully, as in the case of the 'Pelé dribble' applied to the Uruguayan national team goalkeeper in the 1970 World Cup final game; or in

cases of public policies, as in the Brazilian case of the creation of the *Bolsa Familia*, a type of conditional basic income programme, which was the result of dispositional states of political groups with affective dispositions against hunger, combined the perception of affordances regarding resources and legal opportunities to implement a programme to fight hunger and misery. In these cases, we consider that creative people related to these artistic, sporting, scientific, political-economic-social actions learn from experience and use the System 3 operationality to make intentional decisions and actions.

Bolsa Familia is a conditional cash transfer programme that aims to combat poverty and social inequality in Brazil, created under the government of President Luiz Inácio Lula da Silva, in 2003. The cash transfer to families living in the situation of poverty and extreme poverty has the objective to guarantee these families the right and access to food, education and health. The programme was inspired by other social programs of income transfer in the struggle against poverty such as the Bolsa Escola (School Grant), gas aid and food card, implemented by the government of Fernando Henrique Cardoso. However, it was under President Lula's government that all these programs were grouped into the *Bolsa Familia*. Considered the idealiser of the programme, the researcher on income distribution programs, Ana Maria Medeiros da Fonseca, coordinated the programme from 2003 to 2004. The programme is considered by the International Labour Organization as the most important Brazilian programme conditional capital transfer and the Food and Agriculture Organization of the United Nations [32] as the programme that took Brazil off the world map of hunger in 2014.

We consider that in the case of the *Bolsa Familia* programme, the roots of conceptual elaboration as well as its applicability lie at the intuitive basis of system 3. This is because if we think about the life path of its creators, we understand that they are researchers who work or worked in research on income distribution and were directly involved with the exceeding conditions of poverty. In the case of former President Lula, he directly experienced hunger as a child and in the case of other creators involved in the programme, such as Ana Maria Medeiros da Fonseca, she experienced, but in a different way from Lula, the conditions of poverty in Brazil during the conduction her research in popular environments.

The programme derives from the intuition that emerged between its creators, from the attunement between the affective drive against hunger, involving proprioceptive perception (feeling the muscles of the legs bend with hunger and feeling one's own weakness from lack of sufficient food) with the properties of the environment beyond poverty (empty pots, taps without water, children crying from hunger etc.). Dispositional states emerge from these informational non-conceptual exchanges, which become effective in action through the perception of affordances that provide opportunities to fight against this environment of poverty. For Gibson [5], information that specifies the environment is not fragmented from information that specifies proprioception. This inseparability can be observed through the direct perception of people, who experience hunger, for example from walking through areas of poor sanitation or by taking an empty pan with nothing to cook for. Intuition emerges from the creative attunement of these dispositional states with informational meaningful patterns of affordances (for instance, in this case, a social disposition to fight poverty and the availability of funds in the public budget), which led to public action in miserable environments, via Bolsa Família.

Unlike dual-processing theories, such as Kahneman's theory of two systems, in which there are two distinct models of information processing: the intuitive (fast, unconscious, automatic, heuristic and involuntary) and the deliberative (conscious, analytical, voluntary and slow), in the conception of System 3, the conceptual conscious processes, such as Bolsa Familia or the 'Pelé's dribble', that generate actions that stand out for creativity were instigated through intuition, via direct awareness through the direct perception of affordances. According to Zhu et al. [33] (p. 181), information processing in the intuitive mode has results that show more effectiveness than processing and deliberative information in situations of decision making, especially in cases involving complex circumstances.

Intuition is also the core in the generation of ideas that involve creative processes, as in the case of Nobel laureates in various fields of knowledge [3]. In addition, research shows that individuals who make greater use of intuition generate original, higher-quality solutions to specific problems to the detriment of deliberative and analytical individuals. Changing paradigms in science, for example, involves intuitive capabilities that generate creativity.

For Barrena [34] (p. 3–5), based on the ideas of Peircean pragmaticism, thinking is a continuous flow, with no permanent ideas. Creative thinking involves the continuity of ideas in more advanced processes in the continuous flow of thought. To be characterised as *creative*, there are four issues to consider about creative thinking: being new, intelligible, original and valuable. In relation to novelty, it exists in reference to past experiences, but not limited to past knowledge. It is past experiences that somehow allow creativity to flow. The novelty that creativity expresses must be intelligible and identifiable in the flow between old and new, past and present. Novelty and intelligibility must have the originality of their creator. Creative objects or ideas have instrumental value but must also have value in themselves.

From the perspective of our proposal for System 3, this flow between the present and the past that forms the bridge through which creativity flows comes from the dynamic encounter between individual properties and environmental properties that characterise an 'ecological memory'. The access to this memory feeds intuitive processes, enlarging the range of possible attunements of dispositional states with informational invariant patterns that specify affordances. In addition to access to invariant informational patterns, via ecological memory, the dynamism of the encounter between organism and environment properties generates new information full with meaning, through which creativity emerges.

We call *ecological memory* to the state space—built in previous co-evolutionary processes—that contains all possible

relations between perceptive systems and the meaningful informational patterns available in the environment that specify affordances, enabling non-linear and continuous perceptual experiences through adjustments between organism and environment. These past and present adjustments merge providing the emergence of new affordances. Invariant informational patterns, which specify affordances, are associated with the conception of 'pattern that connects' proposed by Bateson [35]. The 'pattern that connects' expresses similarities between parts of the same organism or different organisms as well as similarities between organisms and environment. In this sense, by detecting invariants informational patterns and 'pattern that connects', we detect affordances specific of meaningful information available in the environment, which enables access to ecological memory [36].

According to Gibson [5], there is no division between present and past insofar as we have no exact perception of the instant in which our perception oscillates between present and past. The flow of experience is not linear and is neither present nor past, but continuous. In the words of Gibson [5] (p. 253), 'A perception does not have an end. Perceiving goes on'. We perceive information directly without the need for extended and conceptual memory that links past and present. Memory understood in its classical view as a receptacle for information and storage of representations may influence the perception of affordances, but it is not a *sine qua non* condition for perception.

We can think of applying system 3 to analyse other types of choice involving economic contexts. For Kahneman [1] (p. 438), knowing which of his two systems is involved is important to understand the decision-making process, not only as a matter for philosophical discussions, but carrying implications for public policies applied in different sectors such as health, social security etc. For him, when we consider investment that should be made in healthcare aimed at treating various types of problems (such as deafness, blindness, kidney failure, cancer etc.), it should be questioned to what extent these investments are determined by people's level of fear about these problems. Kahneman [1] (p. 438) questions 'Should the investments be determined by how many people fear these conditions? Should investments be guided by the suffering that patients actually experience? Or should they follow the intensity of the patients' desire to be relieved from their condition and by the sacrifices that they would be willing to make to achieve that relief?'.

Our hypothesis of System 3 allows a constructive role for fear in the decision-making process. We do not consider that affective dispositions involving fear (or any other emotional feeling) or the perception of affordances attuned with these dispositions, are intrinsically biased towards erroring. The perception of ecological perspective is based on compatibility, fit and coexistence between agent and environment. In this sense, there can be no logical errors of relations in the ecological scale, but only adaptive pragmatic considerations [14] (p. 96).

Unlike mechanical associative learning, the proposal of System 3 expresses that the attunement of affective dispositions with the direct perception of affordances in the environment is a dynamic process within the larger co-evolutive spatiotemporal process of an ecosystem. If for Kahneman the association of ideas form a set of information characterised as associative memory through processes such as associative coherence, attribute substitution, processing fluency, in the ecological perspective of System 3, intuition and ecological memory formation as adaptive processes involving dynamic patterns of the agent and the environment.

The table below (Table 1) illustrates the differences between the three systems proposed in this article:

5 | THE OPPORTUNITY FOR SYSTEM 3 DECISION MAKING TO PROMOTE HUMAN DEVELOPMENT IN THE THIRD WORLD

The induction of human development is a major goal of popular democratic governments in sovereign countries. Public debt, corruption, inflation and credit intermediation are obstacles to providing money for the production and consumption of goods. This context requires a pathway to seeking solutions that may be based on the principles of System 3. In this section, we elaborate on an example of a further application of System 3 on the financing of Basic Income and Human Development in the Third World, suggesting, on the basis of recent developments in Monetary Theory and Public Administration, a system based on information technology that is potentially able to overcome the obstacles.

The pandemics era revealed the necessity of public spending above tax revenue to avoid recessionary crises. The central question became how to make public spending generate economic and human development, instead of increasing the health of those who are already privileged. The solution suggested by Modern Monetary Theorists seems to be simple: 'When the government spends money, that money goes somewhere: into the broader economy'. As (Stephanie) Kelton puts it, "their red ink is our black ink'" [37]. However, as pointed by Brown [38], the existing financial system prevents public spending from reaching the 'real economy' and inducing human development. There is a 'web of debt' that prevents money from reaching productive enterprises and the poor.

As a counterexample, China has a financial system that allows public spending to finance techno-industrial enterprises, placing this country at the top of economic growth and allowing a large part of the population to overcome poverty. Is it possible to reproduce useful aspects of this system in the Third World, possibly in democratic political systems? The solution to this problem requires the two pillars of System 3: the disposition to face the problem of underdevelopment, and the necessary tools to implement the theoretical solution.

In the field of Public Administration, Macroeconomics [39] is not the main focus, but the 'state concept of money' [40] is a central issue. According to this theory, the main form of money issuance is public spending, and the power to issue currency is not limited by revenues. The power of the state to issue money is greatly extended by information technology,

TABLE 1 Three types of systems that guide agents' action in decision making processes

Three Types of Systems That Guide Agents' Action in Decision Making Processes

System 1	System 2	System 3
Indirect perception - Information formed and processed in the brain	Indirect perception - Information formed and processed in the brain	Direct perception - Information detected directly by perceptive systems (visual, auditory, tactile, etc.)
Fast	Slow	Cadenced on the ecological scale of perception-action
Perception based on sensations/ inputs / outputs	Perception based on sensations / inputs / outputs	Perception based on direct detection of information
Impulsively, automatic and heuristic unconscious processes	Reflexive, rational and analytical fully conscious processes	Attunement of dynamic patterns
Information is stored in memory	Information is stored in memory	Ecological memory
Without agency - Involuntary control	Agency - Voluntary control mediated by mental representations	Agency - Relationship between our sensorimotor experiences in the direct perception of affordances
Conceptual	Conceptual	Non-Conceptual

especially with the new ways of creating and using digital money. Bernard Lietaer, in a different perspective, called our attention for the impact of information technology in the money system: '(The) change in our money systems is in fact already well under way, irresistibly driven by the social and technological forces of the Information Age. The real issue is not whether widespread changes will happen or not, but how much awareness there will be about where these changes are leading us' [41].

Aiming at a financial system that serves the people, Brown [38] endorses the creation of the Central Bank Digital Currency (CBDC) with this purpose. The Bank of England, the Federal Reserve Board (FED) and Massachusetts Institute of Technology are collaborating on this new technology. According to recent news, 'direct deposits of cash by the Fed into individual accounts is becoming increasingly probable, the only thing missing is the "digital currency" that would be used by the central bank… it will use digital money apps…to transfer

money directly to US consumers' [42]. This may be a revolution that will enable the state to control the flow of money it emits so that it is channelled to productive activities and reinforcement of popular income.

In Brazil, departing from the perspective of Lara Resende [43], we find an opportunity to apply System 3 thinking to overcome the fiscal crisis of the federal state and generate funds for investment in the production system and to boost the consumers' budget. The main sovereign money (the Real) can be kept under a limit, while a parallel budget in CBDC (the *Digital Real*) is created and managed by a committee of experts (a *Development Agency*) to face the demands of the development process. This would be a genuine example of System 3 thinking, because the solution depends heavily on contextual issues. There are several implications to be addressed for this type of programme (about the Brazilian public accounting system, see [44–46]).

The choice of strategies in public administration may build on suggestions advanced from compatible theoretical perspectives [10, 41, 47–49] and technical suggestions [38, 50–52], which can be encompassed under the umbrella of *economic complexity* [53, 54] and *self-organising systems* approaches [55]. This theoretical body of work should be framed adequately to fit with each country's characteristics, because Human Development is a process to be induced by the state but effectively implemented by the people, and for the people, using the people's affordances to make it happen.

Hudson and Brown [56] trace the possible scenario of Western capitalism if the current financial system is not improved: 'The Federal Reserve is the official Ponzi scheme that keeps finance capitalism operating in the United States. Obviously, at some point every exponential growth scheme has to stop, because otherwise you'd have an infinite amount of debt'. As an alternative, CBDC operations open new possibilities to improve social functions of the monetary system. The primary movement of money is internal to the computers of the state and may be kept under control. This system also makes possible to create a parallel public budget to transfer money directly (see [47]) to producers and consumers.

The advantages of this strategy are as follows:

(1) As the CBDC currency is created in the state's computers 'out of nothing', there is no need of generating a corresponding debt in public accounts;
(2) Monitoring the pathways of the money, avoiding misuse of the credits and blocking unwanted transactions; guaranteeing that money is going to accomplish the designed social functions;
(3) CBDC money being directed exclusively to production and consumption of goods induces the generation of wealth in the society;
(4) Direct deposits of CBDC in citizen accounts in the Central Bank computers avoid the problems of having intermediates.

Central bank digital currency is adequate for programs aimed to increase economic complexity, resulting in human development. It can be used to provide income for poor citizens, creation of new enterprises that add value to national products for export, opening new jobs and financing educational opportunities for the new generations.

A recent study conducted by United Nations Conference on Trade and Development (see [48]) arrived to the conclusion that the most effective way of boosting economic growth is the transfer of money to the poor, instead of lending the money in the form of microcredit [10]. The transfer may be unconditional, as Basic Income, or in the form of benefits conditioned to the satisfaction of some requirements to enrol in the programme. The parallel public budget, controlled by a committee of experts indicated by the scientific and technological community, can be applied to form new entrepreneurs and create new enterprises adequate to the available natural and human resources.

In the Brazilian version, to obtain funding projects must meet requirements such as the usage of natural resources in a sustainable way (e.g., cultivation, industrialisation and commercialisation of products from our biomes); high employability, organisation in cooperative form, use of adequate scientific and technological knowledge, originality and/or innovation of the products and services, respect to local communities and their knowledge and international sale of products.

6 | CONCLUDING REMARKS

Our proposal of System 3 leads to a discussion of the concepts of *mind* and *intuition* underlying Kahneman's two systems and the differences between our theoretical assumptions—based on Gibsonian psychology—differ from those assumed by him. For instance, he understands processing fluency as characterised as a subjective experience of the degree of easiness or difficulty to accomplish a cognitive task. As pointed out by Morewedge and Kahneman [2] (p. 35), 'The subjective experience of the ease or difficulty with which a cognitive task is accomplished'. Processing fluency does not indicate an accurate accuracy of choices in specific situations. This is because the consistency of an associative pattern that is one of the bases of a given judgement can be misleading when the information is redundant or when there is a small database to be accessed [2] (p. 437–438).

For Kahneman [1] (p. 232), we tend to rely on unsubstantiated intuition as it generates cognitive comfort and coherence. However, this does not guarantee that a belief deemed reliable is true. One way of not yielding to wrong associations and unsubstantiated beliefs based on intuition is not to believe in intuition when it is not based on information that indicates stable regularities in the environment. As Kahneman points out [1] (p. 234, Part 3 Overconfidence section), 'Remember this rule: intuition cannot be trusted in the absence of stable regularities in the environment'.

The above remark indicates that System 3, although being a different one, can be accommodated in Kahneman's worldview, by adding supplementary capabilities to his concept of *mind*. System 3 implies the move beyond the mechanistic or computational view of the mind formulated by Simon [11],

towards the dynamical and ecological concept of perception anticipated by J. J. Gibson and compatible with current developments in Affective Neuroscience and Biophysics.

We presented an example of the operation of System 3 and claimed for the adequacy of this type of thinking in the current social crisis. The attunement of affective dispositions of the individual or social agent and their direct perception of affordances, in this context, is the proposed way to find solutions. The decision-making System 3 we propose implies a concept of intuition and creativity of economic agents, other than the one assumed by Morewedge and Kahneman [2], that fits better the complexity of the society and the demand for a truly democratic process, in which the necessary actions are carried by and for the people, using the tools available to the people in the context they live.

The proposed process implies that the people will learn with their experience, resulting in better collective decisions and actions. In the ecological perspective of system 3, this pattern recognition is not subject to the fear of making mistakes in risk choices between losses and gains, but the detection of information that enables appropriate action in a given context, thus assuming social and environmental responsibility. Inappropriate actions in a given situation generate affordances for potential agents, who throughout their perceptive experience will learn to act otherwise in similar situations. We argue System 3 can have the advantage of being more creative and adaptive than that System 1 because it is based on direct awareness; it is not based on fear of risk or mistake, and it is more likely to adapt satisfactorily in the environment, influencing System 2 on appropriate choices in greater number than inappropriate ones.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

DATA AVAILABILITY STATEMENT

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ORCID

Alfredo Pereira Junior https://orcid.org/0000-0002-5960-041X
Juliana Moroni https://orcid.org/0000-0002-4878-4823

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