A theory of interactional systems: semantic connections and relational contextics

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Abstract: The aim of this paper is to develop a theoretical proposition based on the study of intercultural miscommunication, which has shown that the creation, evolution and ending of interactional misunderstandings can be understood by using systemic theories (Wagener, 2009a, 2010). In this perspective, human interactions obey basic principle that can be applied to biological life in its simplest expression, although said interactions draw on sophisticated devices used to trigger and maintain relationships and communication variations. We thus wish to combine the systemic, the pragmatic and the connectionist paradigms to represent both nuances and subtleties of human rapports. A systemic model of human interactions, namely the interactional system, would then draw on the flexibility and adaptability of its fundamental parameters. The main purpose of the present work is to elaborate on a theory of interactional systems by proposing a coherent and comprehensive approach of interactional dynamics, in order to present an accurate modelisation of the complexity of human interactions – especially when said interactions suffer situations of conflictual destabilisation.

Keywords: interactions; systemics; semantic knots; emotions; connectionism; information; context; contextics.

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1 Introduction

The construction of a theory of interactional systems implies the use of basic systemic principles which need to be described. Coherence is the first principle we wish to introduce, insofar as it defines how a system can operate as a complex entity [Meunier, (2003), pp.56–60]. According to Meunier, it would become possible to understand human

relationships (and human conflicts) in general by replacing parts of a system (or systemic elements) within their own context of emergence, insofar as all parts operate collaboratively in order to maintain the principle of coherence. From this point of view, notions such as cause and effect become overshadowed by constant and ever-changing operations of co-construction, which remain submitted to environmental conditioning, inside and outside the system. Interactants themselves play a crucial part as conditioning factors, inasmuch as they commit themselves to the system according to psychological, social, educational, cultural, biological, genetic and physiological influences. Each time interactants meet, they carry the complex fruits of such influences and colour their relationship accordingly. Moreover, the relation between interactants itself also has an important part to play in the way the interactional system will evolve; casual meetings or professional rapports, friendship, love or family bonds all carry crucial information for the understanding of interactional systems.

Contemporary systemics are based on the general theory of systems, which itself draws on multiple scientific disciplines, such as cybernetics or even thermodynamics. In this perspective, Von Bertalanffy (1973, pp.23–30) builds a theory that drifts away from a simple analogy between human functioning and mechanical devices, thus leading to the initial concepts of contemporary systemics. His works suggest that every system is made of elements that remain in constant interaction, which leads to Figure 1.

Figure 1 Simplified system and its interacting elements (see online version for colours)

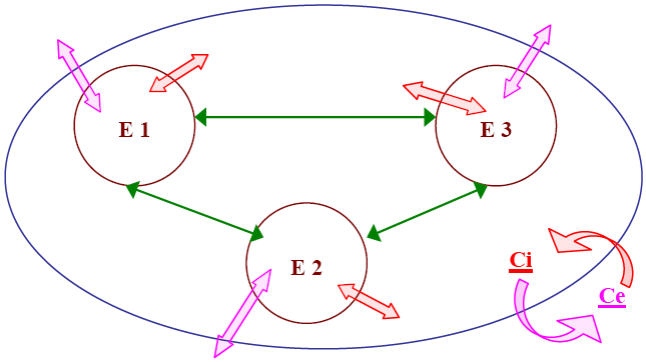


Figure 1 pictures a basic system as a whole, whose organisation remains almost cellular with distinct elements (E1, E2 and E3) and their specific relations; this model also includes both the internal (Ci) and external (Ce) contexts that maintain the system by constant and evolving links.

The systemic model allows the study of distinct objects while keeping them connected to the system as a whole, thus avoiding analytical isolationism and the misunderstanding of complex phenomena. For instance, if three individuals meet, they will build relationships which will always influence their interactions as long as contact is kept; furthermore, imprints left by these relationships continue even after the end of the interaction. However, the system itself is not only constituted of interacting individuals: parameters such as time and space for example will strongly contextualise interactions. In every interaction, individuals evolve in a contextual bath and operate according to

systemic rules that will influence their relationships. In this perspective, three more notions both complexify and enlighten the functioning of interactional systems, all based on Morin's works on the matter [Morin, (1977), p.106]:

- emergence, defined as the properties of a system that bring something new in regards to the properties of the parts which are isolated or submitted to a different form of organisation in a different type of system
- organisational factors that manage complementarity between parts of a system and its general order, thus avoiding the dismantling of the system by introducing redundancy (a concept we wish to define further in the present paper)
- complementarity and antagonism, both functioning as a dyad, which both allow homeostasis and emergence within the system by differentiating the parts and maintaining their cooperation.

However, Morin's works are not enough if we want to understand how a system truly works, i.e., how information circulates in order to maintain the system and the functioning of these basic principles.

2 The living system: the circulation of information

The role played by information is essential in every system: its circulation alone is the main condition to the existence of any system, insofar as information makes the system evolve and helps maintain order and insert coherent disorder [Meunier, (2003), p.21]. Communication lives and evolves from one system's part to another, according to the rules and alterations of the system. In an interactional system, it is the way individuals will interpret information that will create innovation and difference in the expression of their points of view. In order to prevent the system from suffering too much imbalance, the principle of redundancy helps maintain a certain form a regularity in the interpretation of information, social, linguistic, psychological and cultural habits thus reproduce a certain amount of communicational utterances in order to include a certain amount of cognitive comfort in daily interactions (i.e., salutations, which are a remarkable example of redundancy at work). In this perspective, redundancy prevents us from constantly reinventing our communicational codes and devices, and helps build sustainable relationships between individuals or within social groups. According to Meunier, redundancy may thus be defined as a set of internal repetitions within a message which maintain a certain degree of predictability [Meunier, (2003), p.17]: this is how messages are encrypted and decrypted in interactional systems, according to codes and behaviours that are already known to individuals and groups. In other words, redundancy organises the system's functioning and its internal interactions, insofar as it maintains a given level of efficiency by increasing energy savings. In contemporary systemics, energy savings are called 'negentropy' [De Rosnay, (1975), p.172] and represent an essential partner to the circulation of information inside and outside the system, insofar as redundant information guarantees a better organisation of the system and a validation of negentropy. In human communication, this process is drawing on cultural and social codes that are always present in daily communication, thus organising the life of societies. However, a certain amount of variation and innovation is vital to the circulation of information and the evolution of systems.

Such principles at work during human interactions show that we are creatures of habits. Daily interactions, cellular evolution and world organisations (such as the European Union for instance) all undergo the same basic processes that are directly linked to our condition as living beings. In this perspective, the transmission and circulation of information sustains life and do so by respecting a certain number of rules. Every system is subject to self-regulation, which allows it to adapt to internal as well as external modifications. Prigogine and Stengers (1979, p.169) posit that, when changes appear, they evolve through three distinct stages.

- Fluctuation, the first stage: parts of the system perceive that new information may bring change – in interactional systems, this would for instance mean that individuals perceive some behaviours as uncomfortable or threatening.
- Nucleation, the second stage: change structures itself within the system and earns a proper part – in interactional systems, individuals would then acknowledge the existence of change by talking of behaviours that are perceived as threatening.
- Amplification, the third and final stage: change gains importance within the system and modifies it – in interactional systems, individuals would openly disagree about said behaviours, which may eventually lead to a conflict and maybe the end of the current interaction.

The works of Prigogine and Stengers relevantly formalise the study of systemic change and conflicts; according to them, the only way to avoid the final stage would be a constant and fast circulation of information between the parts of a system, especially about the causes, circumstances and aims of change – not to mention the fact that change itself sets up its own circulation of information within the system.

Table 1 The evolution of stability and instability within a system

	Interaction	*Communication*	*Fluctuations*	*Probability of nucleation*
Stability in the system	Diversified	Fast	Insignificant	low
Possible instability in the system		Slow	Dangerous	high

To sum it up, lack of communication raises the risk of amplification. In interactional systems, this may occur when two individuals choose not to talk to each other anymore, thus letting change play a significant part in their relational system, which may even lead to its ending (if these individuals never meet again, thus ending their relationship). However, every systemic model may suffer significant phases of amplification in order to undergo important modifications which will allow it to adapt to a new environment; in this perspective, the radical amplification of change is not necessarily something that should be avoided. If redundancy stabilises the system, it also may prevent some of its parts from answering their own needs; in this sense, amplification can help redefine the basic model of the system. This can also be applied to interactional systems, particularly in cases of harassment in the workplace: the silence of an individual (as a part of a system) may stabilise the interactional system, even if they are put at a disadvantage by doing so. This situation indicates that it is not always easy to make radical choices, when cognitive comfort is at stake in an interactional system: it may be easier to sacrifice a part of the system than to jeopardise the whole system itself.

3 The contextual complexity of systemic expression

Any elements of a system can itself be considered as a system within a system; this is obviously the case for individuals in an interactional system. Individuals themselves have their own ways of perceiving the system and its contextual elements, thus interconnecting knowledge in order to build a cohesive network: when new elements of information appear, these connections have to be reconfigured in order to setup a new perspective. This connectionist approach (which we will develop further in the present paper) has already been defined by Varela, Rosch and Thompson and their works on cognition and emergent properties [Varela et al., (1993), p.90]:

> "(…) the emergence of global patterns or configurations in systems of interacting elements is neither an oddity of isolated cases nor unique to neural systems. In fact, it seems difficult for any densely connected aggregate to escape emergent properties; thus theories of such properties are a natural link for different levels of descriptions in natural and cognitive phenomena."

In order to obtain a new perspective on things, it is crucial to reconfigure the interconnections between elements (this cognitive operation can be consciously or non-consciously performed). In this perspective, interactional systems are directly connected to the world in which they evolve: this simple assertion shows that a modelisation of their complexity is more than necessary. This aim becomes even more important if we consider the fact that interactional systems are based on individual and collective memory and experience, which are shared, represented and re-enacted in daily interactions. We thus posit that the interactional system is an open system sustained by continuous interactions with internal and external contextual elements, leading to the following representation:

Figure 2 Complexified system and its interacting elements (see online version for colours)

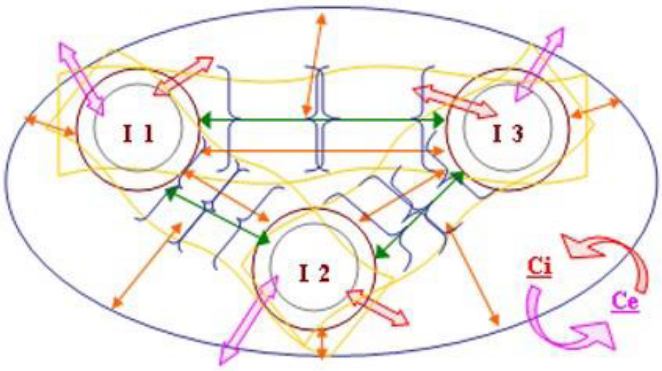


Figure 2 shows the complexity of interactions within a system: each individual operates with a perceptual filter (pictured by a circle within the individual), which allows him to interpret information from outside and inside the system. Relationships between individuals also allow interactions between relationships themselves and contextual elements from inside and outside the system. A certain form of regularity is sustained by redundancy (pictured by waves around relationships), thus reducing the importance of

noise (pictured by braces on relational arrows) in communication. Of course, redundancy and noise also exist within the system and outside of it, but we chose to reduce this representation to interactional elements only.

Despite its numerous advantages, the systemic model however has one major flaw: it remains very difficult to show how the variety of changing contexts can have more or less significant influences on individuals. The importance of contexts should not be underestimated, inasmuch as they will form an important part of daily interactions. Without the high variety of contexts, it is virtually impossible to analyse the ontological and situational relations between individuals; for instance, the simple fact that an interaction may take place in an elevator, in a train, in a bedroom or during a business lunch is far from anecdotal. Thus, echoing the works of Castella, we believe that it is relevant to put the notion of context in the centre of the present study in order to understand interactions and to contextualise perceived information [Castella, (2005), p.270]. According to Castella's theory, it would be more relevant to speak of contextics rather than of systemics, insofar as context is to be understood as an ever-evolving process. We posit that context is in fact a contextualisation process [Castella, (2005), p.143], to the extent that sequences, episodes, personal scenarios, cultural models, as well as behavioural habits represent fields of signification that can become contextual parts in the process of contextualisation. Establishing a hierarchy between these elements implies sense-making; we thus suggest that reality is merely the result of the process of contextualisation. Moreover, the evolutional process of contextualisation is not necessarily consciously operated by individuals; in this perspective, contextics can be understood as an observation grid of the way interactions develop and evolve according to a given environment. In this sense, individuals' expressions and actions become emerging properties of the process of contextualisation connected to the whole system. Any interactional system develops and evolves such as a living organism: choices are made, internal and external change is taken into account, and individuals themselves are contextual agents that are feeding a systemic organism with the history of their relations, perceptions and interpretations.

Nevertheless, knowing the context is not only a way of gaining a broader vision of the evolution of the 'interactional organism': it is also a way of understanding the anchors and movements that sustain the very existence of a system. Turn-taking in speech, fine transitions operated during topic change, physiological changes induces by our environment or the interpretation of information all represent basic emerging properties of life. In other words, contextics is based on the way contexts continuously feed the semantic links sustained between systemic elements, thus allowing to understand the fundamental and complex processes of self-regulation. We believe that this theoretical modelisation constitutes an original way of studying human interactions, insofar as it shows that psychological, sociological and cultural aspects only remain different colours or various declensions displayed by individuals, sometimes even consciously. A contextic analysis of interactions, coupled with a semiotic study of their tensions could highlight processes that are useful for the understanding, the resolution and even the prevention of interactional conflicts. The representation of such a model would need a complex and at least tridimensional depiction in order to observe the subtle nuances that stir up human interactions through emotions; systemic imbalances and modifications of human rapports indeed transit through the gate of emotional perceptions.

4 When emotions and motivations interfere

During interactions, individuals rely on semantic anchors and consciously access information; the interpretation of said information may then be modified by the way individuals perceive their environment and their interactional partners (Wagener, 2009b).

According to Monroy and Fournier (1998, p.10), conflicts themselves constitute interesting interactional situations, insofar as they reveal multiple processes and stakes for individuals:

> "[Conflict is] both chosen and endured. Each opponent feeds it with their own convictions and initiatives, and simultaneously feels that they are restricted to react to and endure their opponent's initiatives or the inevitability of the situation. (…) Conflict separates, disintegrates and deconstructs the system, while operating a different reconstruction at the same time".[1]

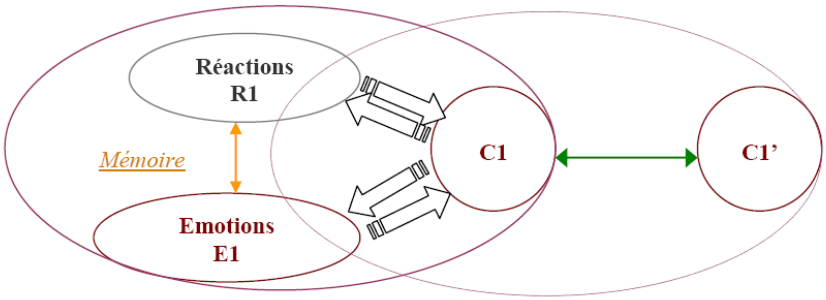
We believe that a conflict exists when an important modification occurs in the initial configuration of the system. Trying to know if the conflict is accidental, necessary or inherent to the interactional system is irrelevant: as long as the right conditions are met, a conflict can emerge and dramatically modify the system. We assert that emotions play a crucial part in this process, insofar as they act as 'motivational states' [Frijda, (2003), p.15] and guide individuals towards specific actions and expressions. In other words, if someone feels genuinely embarrassed, their actions will be conditioned by this emotional state: their hands might shake and they might blush, stutter or have trouble organising their ideas. However, perceived emotions will strongly influence our actions, to the extent that emotions emerge in specific contexts.

In this perspective, the emotional state of a single individual might influence the whole interactional system. Emotions are necessary and their presence is permanent: their goal is to inform us of a choice of possible actions and reactions according to the interpretation of various elements. They also play an important part in the constitution and evolution of identity processes (Burke and Stets, 2009) and determine the basics of cognitive operations by associating them to pleasant or unpleasant impressions (Kirouac, 2004). We believe that emotions may be defined as responses to environmental influences, implying a number of possible actions to be performed in a given situation. Emotions remain also linked to memory (Rimé et al., 1991) and are stored in order to respond to a similar event in future situations, according to the principles of predictability and energy savings:

- a new context C1 produces the emergences of new emotions E1, which in return participate in the modification of this context: *C1* -> (*E1*);
- these new emotions E1 induce new reactions R1 that will reinforce sais emotions, based on the principle of circular self-regulation : (*E1*) <-> (*R1*);
- these emotions E1 are stored inside the individual's memory M: *M* = (*E1*);
- if a future context C1' emerges and is perceived as similar to the context C1, the induced reactions may be re-activated: *if C1'*, *then M* -> (*E1 + R1*).

These four stages are represented in Figure 3, where a memorised experience linked to a precise context C1 is stored with a set of emotions E1 and reactions R1; this set emerges according to the principle of circular self-regulation and can be re-activated if a similar context C1' emerges.

Figure 3 Memory, emotions and reactions in context (see online version for colours)



If a context interpreted as similar is after all considered to be relatively different, partially or completely new emotions and new reactions might emerge. On a metacognitive level, contexts emerge through cognitive associations [Baars, (1997), p.125] that rely on past experiences, using them as cognitive 'safety nets' in our relation to the world. A cat crossing the street while we drive, dating strategies or job interviews, according to Frijda's works, every daily situation shows us that emotions influence our cognitive choices and references to previous contexts [Frijda, (2003), p.24]. Looks, gestures or intonations may be misinterpreted precisely because one is not used to perceive them in a specific context. Impoliteness, for instance, occurs when the expressions and actions of our interactional partner do not match with our cognitive habits and threaten our emotional comfort. This process functions according to a principle of relevance: what does not fit the usual cognitive and emotional frame is either ignored (which hinders any form of semantisation) or kept outside the frame and interpreted as a disruptive element. In this perspective, we suggest that a conflict only emerges if behaviour is interpreted as threatening or aggressing by an individual; without this very interpretation, relations are kept within a range of relative harmony (Wagener, 2010).

5 From perceived threats to defence mechanisms

In conflictual contexts, individuals react to a perception of a stimulus that is interpreted as aggressive: according to Paulhan and Bourgeois, the aim of this operation is either to manage an uncomfortable situation by mastering emotional reactions, thus enriching a new relational perspective, or to exclude elements that are labelled as perturbing (Paulhan and Bourgeois, 1995). However, these interpretations may lead individuals to apply

several defence mechanisms to given interactional situations. We believe that these operations are due to the fact that individuals are anchored to the interactional systems through emotional 'nerves', which represent links to semantic articulation points of the system. It is our links to the interactional system that will be necessary to transmit information, as well as to elaborate structured semantic universes and to be influenced by them. In this perspective, according to Auchlin, we then produce 'experiential blends' when the situation demands it, thus creating a new form of coherence [Auchlin, (2003), p.145]. Experiential blends allow the emergence of new cognitive activities, reactions or behaviours through the interaction of past and actual cognitive and emotional elements; in that sense, they feed the system's redundancy as well as the risk of emerging conflicts, while forming a relevant defence mechanism, according to the situation. Malewska-Peyre's (1989, p.123) works indicate that these mechanisms represent a set of manoeuvres designed to avoid anxiety and depreciation; these operations can either constitute unconscious defence reactions or conscious active responses to a given situation.

Figure 4 Simplified representation of an interactional system with semantic links (see online version for colours)

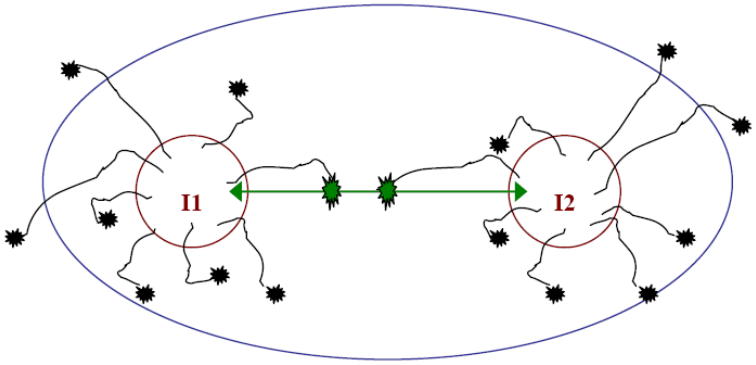


Figure 4 shows how individuals are anchored in the interactional system through semantic links, by using the visual image of neurons; semantic knots operate inside and outside the system, and within the relationship between individuals. However, this vision has to be enriched by pragmatics, in order to understand how individuals manage interests, goals and meaning in their relationships.

6 Understanding complexity with pragmatic principles

In order to render the complexity of communication as a process, we posit that it is necessary to draw upon pragmatics. Pragmatic principles themselves remain very useful when analysing interactions through the circulation of communication. One of these first basic principles has been largely described in Grice's works, and is called the 'cooperation principle' [Grice, (1975), p.45]. We believe that participants do not need to consciously agree on these shared purposes, in order for the interaction to function

properly. As long as communication is maintained, participants will have no other choice than to reach a common goal, even if it only is casual communication itself. In this case, conversation topics and relationship statuses do not matter, as they are only mere contextual parameters. Even during conflicts (Wagener, 2010), individuals still share a common vision of the relationship and of the aim of the communication, such as interactional confrontation for instance. In this perspective, the common aim of the interaction is not consciously shared between individuals, yet it still sustains the ongoing interaction.

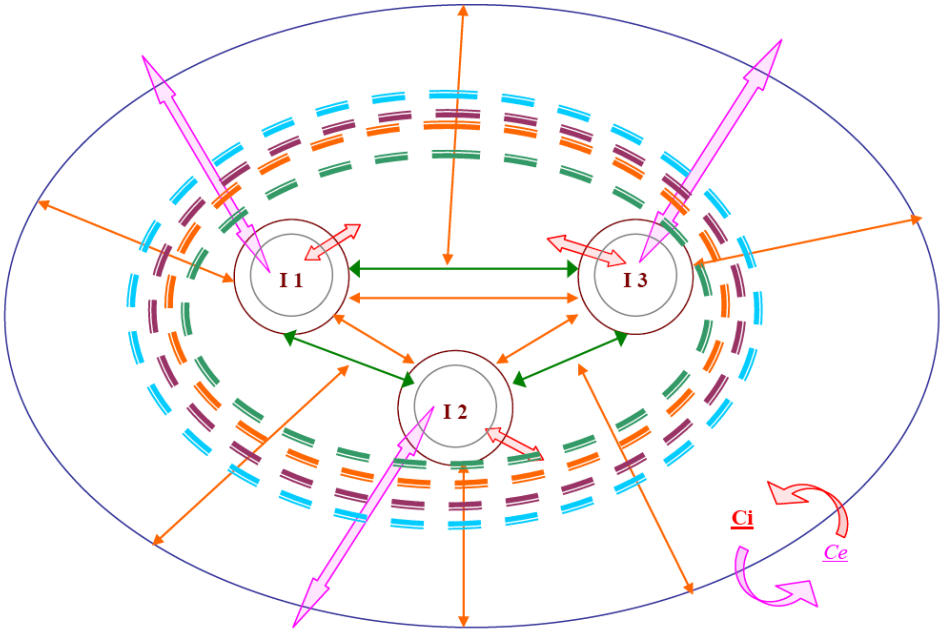
Another pragmatic principle needs to be added, in order to prevent the cooperation principle from any form of internal strictness: the negotiability principle first explained by Kallmeyer. According to him (Kallmeyer, 1997), interactions are constantly negotiated in order to maintain a stable form of cooperation: topics, verbal and nonverbal forms or relational evolutions all participate in this flexible and comprehensive stability. When two individuals get engaged in an intimate relationship, their rapports have to be unconsciously negotiated through flirting, maybe evolving to a stage of close friendship, before eventually moving on to mutual love; in this subtle game, new forms of meaning and semantics are created through the interaction. In other cases, negotiations may be more conscious, we posit that the analysis of interactions demands a thorough study of ever-evolving salient semantic traits that may be negotiated between participants. In this perspective, the negotiability principle shows that individuals are able to use their own influences in order to change the interactional system.

The last pragmatic principle we wish to present is the reciprocity principle, which has been defined by Lewis while working on the notion of convention (Lewis, 1969). According to his works and to the cooperation and negotiability principles, we can assess the following hypothesis: when cooperation operates and evolves through the negotiation of significant parameters, these evolutions will have a reciprocal impact on individuals themselves. The reciprocity principle is based on the sharing of information within interactions, insofar as individuals adapt their behaviours according to the interpretation of said information. Moreover, reciprocity even functions during conflicts, since interpretations diverge yet find a new common ground in conscious and mutual disagreement.

These pragmatic principles underpin the systemic basis of human relationships: we cooperate, negotiate and constantly feel the reciprocal effects of the choices we make. We believe that these pragmatic principles are synchronised and set in motion by the driving force of politeness (Bange, 1992; Kerbrat-Orecchioni, 1996), since this social device relies on a set of preferential codes and behaviours that are used by individuals in order to facilitate relational and cognitive operations. Cooperation, negotiability, reciprocity and politeness all sustain the dynamics of the interactional system.

Politeness, reciprocity, negotiability and cooperation (from the inside to the outside of the system) are all represented through four distinct belts that frame the ongoing interaction. These orbital belts may help define the degree of implication of individuals within the system, the more the orbital belts are kept away from the centre of the system, the more they will stay generic and participate in the basis mechanics of the ongoing interaction. In this perspective, politeness always stays closer to the participants, inasmuch as it represents a toolbox for interactants – while cooperation is a mere fundamental principle to every communicational process.

Figure 5 Simplified representation of an interactional system with pragmatic principles (see online version for colours)



7 Relationships: to the core of interactional systems

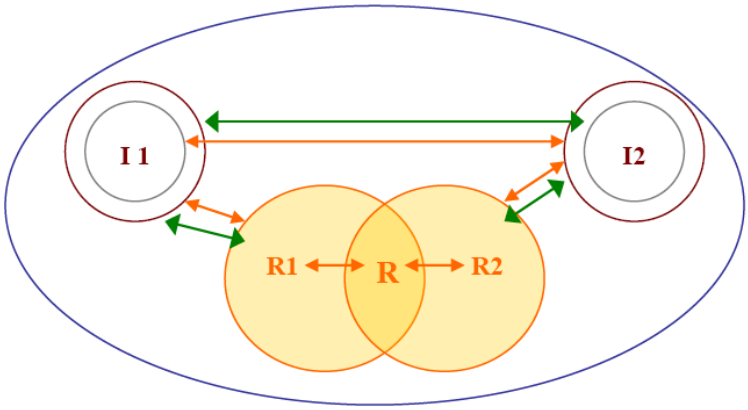
Pragmatic principles only explain the basic functions of sustained communication within the interactional system; in order for them to operate, there has to be a relationship between the participants – an essential bond linking systemic elements together. Relations maintained by individuals are a crucial element of the interactional context, insofar as they are invested and given meaning to in a specific way, depending on the participants involved. Lerbet-Séréni (1994, p.46) explains that, from a systemic point of view, relationships remain core elements that completely animate the system and emerge according to the historical rapports between individuals.

> "The creation of a couple' emerges and becomes a third and interfacial space invested by each element of the couple. The borders between this system and its environment depend on the way that the couple will develop a common core which will also keep contact with the outside. The creation and development of this third part is based on the couple's common projects and will guide the system by contributing to its completion."[2]

According to Lerbet-Séréni's works, the relationship between individuals can be considered as the 'third element' of the interactional system; it may be defined as a sort of hologram emerging from communicational events that guide participants through their rapports. The relationship thus may be following its own scheme (or sometimes drive individuals to it), even if it leads to a conflict, depending on the way individuals will invest this relationship. This relationship maintains the communicational bond and gives meaning to new anchor points progressively needed by individuals. We posit that each

individual has their own distinct perspective on the relationship: psychological, social, educational or familial influences will give a particular colour to the individual filter used to perceive and feel the relationship. We believe that the following equation has to be applied to an interactional system involving two individuals: 1 + 1 = 4. Since perspectives of the relationship become true elements of the system during the interaction, each individual will act within the system with their own perception of the ongoing relationship. These interpretations of the relationship interpenetrate in order to form a common ground for the relationship, while each interpretation owns a distinct space.

Figure 6 Simplified representation of a systemic relationship between two individuals (see online version for colours)



Both representations of the relationship (R1 and R2) feed and condition the relationship R between participants; communicational links are maintained between these systemic elements. Such a representation of relationships between individuals surely complicates our model of human interactions; however, the interactional system becomes enriched by a new element matched with two new distinct entities. R, R1 and R2 also follow the same systemic laws and pragmatic rules: we believe that this representation of individuals and their relationships gives shape to an open, comprehensive and integrative model of human interactions.

8 Interactional complexity: emerging networks of subsystems

Completing a model of interactional systemics is impossible without bringing in cognitive and connectionist elements, in order to comprehend the mechanics of emergence, insofar as it is not clearly and steadily located inside our cognitive tasks. According to Varela et al. (1991, p.38), these tasks are optimally operated by systems made by numerous simple components that, if connected according to appropriate rules, produce a global behaviour related to the desired task. The connectionist theory posits the following hypothesis: systems and subsystems are submitted to specific constraints and operate actions that need to be interrelated in order to participate in the emergence of a

new state of the system or a new action; this hypothesis also works for the interactional system. This set of operations will thus constitute the enaction as described by Varela, Rosch and Thompson, but also explains human conscience as an form of ultimate emergence made of a complex architecture of systems and subsystems (Dennett, 1993). Interrelated architectures of systems and subsystems thus participate in the progressive emergence of the interactional system and of its sustainability as an integrally open unit, which fits the metaphor of cybernetic systems described by Laks (1996, p.33). In other words, it is important to give a short definition of four crucial notions directly related to Laks' works in order to give a further description of the operations emerging within the interactional system:

- the notion of impulsion represents essential communications that take place around semantic anchors and links (which guarantees the interpretation of relevant meaning)
- interpenetrations at stake between the system and its exosystemic environment, which underlines the need of a global approach that considers all units as macrosystems or as microsystems of their own
- complexity as the basic operational mode of the system, which may temper the description of basic elemental rules that might only lead to a dangerously reductionist analysis
- contradiction also shows that subsystems and sub-networks might feed on paradoxical or opposing tendencies, yet still participating in the emergence of a state or an activity that go over them while mobilising them.

Contradiction should not be understood as a difficult problem to solve, but integrated as an essential condition to the sustainability of a connectionist system. In this perspective, it might not be necessary to find solutions to paradoxes, insofar as they participate in the emergence of a whole: any system is able to integrate an element and its contrary, without threatening its own homeostasis. The connectionist approach goes beyond the causal model by conceptualising emergence as the product of interconnections of architectures of sub-networks. Using the causal model would lead to a supposed origin of the conflict (a form of 'element zero') that would be responsible for it. However, we believe that there might not be any form responsibility to be looked for, insofar as each individual actively participates in the emergence of the interactional conflict. We thus assess that it remains important to explore interactions as complex sets submitted to particular influences – an explanation that can also be found in meteorology or geophysics, for instance. Social sciences (anthropology or sociology in particular) can use the models constructed by neurosciences, in order to build new and specific objects of study, as well as relevant and realistic analytic tools, while taking into account the way individuals can give and create meaning from information they receive from their environment.

9 Semantic knots and interactional hermeneutics

We believe that the concept of 'semantic knot' is the missing link that enables us to precisely understand the mechanics of emergence within interactional systems. Introducing this very concept has to be done by drawing on the connectionist approach

and its definition of reality as a form of nodal complexity, particularly in the case of Reyna's (2002, pp.114–115) description of neurohermeneutics. Reyna thus suggests that the precise study of connective knots by drawing on the neuronal model enables the production of a global and complex approach of social and cultural choices made by individuals; these connective knots operate as meeting points from which meaning will emerge for interactants, in order for them to interpret and give shape to elements within and outside the system. We wish to call 'semantic knots' these connective meeting points, insofar as they encompass an important amount of clues that can give a significant comprehension of interactional systems. A tridimensional figure would be needed in order to integrate these new complex parameters, inasmuch as time and space experienced by individuals themselves, as well as their way of making sense of these knots, become basic components of the system. In fact, modelising the interactional system should allow a deeper understanding of human sociality in terms of fundamental transmission of information. This ontological approach draws on basics that are essential to every living system, in order to explain the way human behaviours and social or cultural codes can emerge, form and function, relying on the emergence, shaping, semantisation and effectiveness of said behaviours and codes. The purpose of this approach is to encompass the general properties of human beings as interacting living systems, so as to understand what is at stake in relationships, particularly when they undergo disagreements and conflicts based on representational confrontations and the interpretation of communicational utterances as a perception of potential aggressions or threats. The need for a synthetic theory of human interactions has to be driven by the study of complexity, in order to understand the sophistication of singular strategies developed by our species, as described by Enfield and Levinson (2006, pp.62–63):

Constructing an ontological and complex model of human interactions has to lead to the proposition of a hermeneutics based on connections and relations between individuals and the ways they interpret and articulate meaning, according to a certain amount of semantic knots: this process is operated through a basic context of emergence. In that sense, it remains important to delimit the dynamics of transmission of information throughout this model, in order to show the infinite complexity of human relations and their different declensions, while trying at the same time to define a certain number of recurring dynamic processes. Although complexity sometimes looks like a whole that is lacking rules and trapped in a permanent and inconstant random cycle, the human species' own biological, cerebral and social limits lead to a certain amount of behaviours, expressions, interpretations and ways of producing meaning that are already coded. In fact, every individual within the interactional system has access to a network of information which is itself composed by many sub-networks. Even if the information is incomplete, human beings draw on their memory and experience in order to complete the information, by analogy with previously experiences situations and according to five elements delimited by the works of Bechtel and Abrahamsen (1993, pp.65–74):

- the neuronal metaphor, which is based on network models and the parallel processing of information, combining both local and general architectures in order to favour emergence
- the flexible model, which draws on nodal connections rather than linear causal elements, thus questioning the very existence of predefined interactional rules and sustaining a more realistic analysis of adaptation as a process;

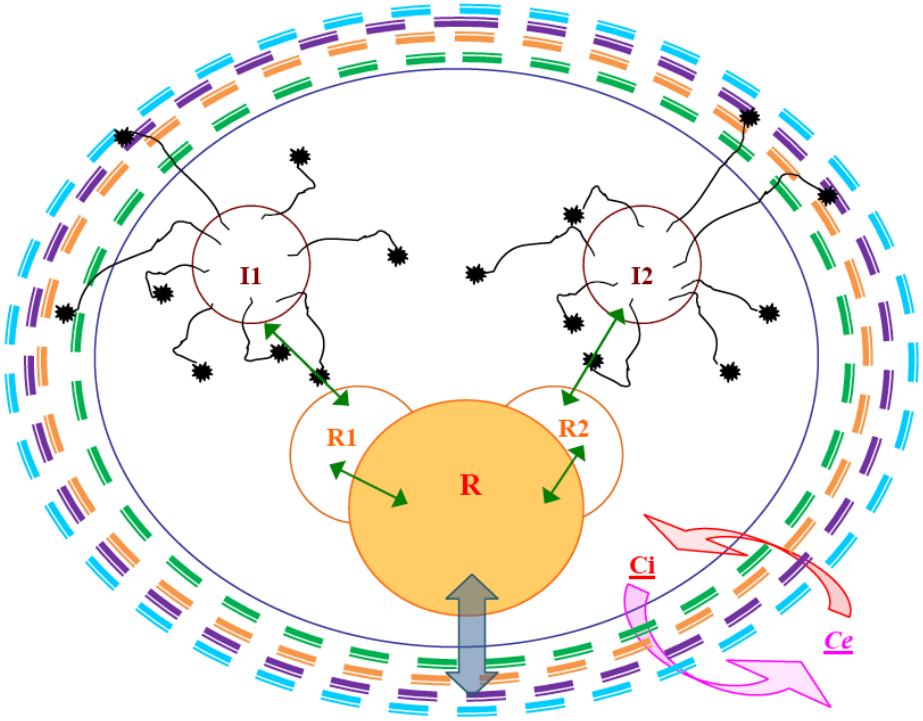
- the ‘graceful degradation’ process which combines the notion of systemic fluctuation with the whole interconnected architecture, while implying that the disappearance or alteration of a single element does not necessarily plays a part in the whole realisation of the interaction, but also that a critical mass of nucleated information has to be reached
- the content addressable memory that operates by locating clues and elements in order to access the whole it is searching for
- finally, the capacity of being able to integrate experience and learning new elements transforms the interactional system in a moving whole that can adapt to new contextual constraints, so as to guarantee its own sustainability.

The relationship represents the interactional system’s neuralgic field of expression and homeostasis, inasmuch as it crucially influences the interactants’ behaviours and becomes both the vessel and vector of information and interpretations constructed by interactants themselves.

In a certain sense, the relationship constitutes the core of the system (according to the metaphor of the cell) and organises the redeployment and processing of a lot of information. Individuals play an active part in the construction and sustaining of the relationship and its representations, insofar as these relational representations can operate through the individuals’ own anchoring points and semantic knots. In this perspective however, individuals do not directly come in contact with each other, yet establish the interaction through the relationship, which thus plays an important role as a third party; this distribution within the system explains the importance of the relationship as a neuralgic centre of reception and production of information. The relationship can be seen as ‘bathing’ in a sort of contextual ‘cytoplasm’ that can be within or outside the system, which itself constitutes an environmental vector of more or less relevant information. The relationship itself is also fed by the individuals’ representations of it, furthermore, these representations are the only interfaces that can sustain communication between interactants. Individuals are to be defined as moving elements of the system that are influenced by numerous constraints and linked to the world through semantic knots, which enables them to produce interpretations that will condition communication and the transmission of information. This complex process is surrounded by the four pragmatic principles that have been previously defined, which leads to Figure 7.

In Figure 7, the relationship R clearly appears as a central core to the interactional system. It is fed by both representations of the relationship R1 and R2, which are directly produced by the interpretations of individuals I1 and I2, who both enable the circulation of information within the system, drawing on the semantic knots that tie them to their contextual and cognitive environment. The relationship itself is directly linked to the four pragmatic principles represented again by four distinct belts (from the inside to the outside): politeness, reciprocity, negotiability and cooperation. Interactants remain linked (or even tied or knotted) to the system that evolves according to an internal and an external context. We posit that this model is able to show the areas of fluctuation that may emerge during interindividual conflicts, although such modelisation indubitably implies a form of scientific simplification; yet we believe that this simplification is not too important and still enables the representation of complex dynamics at stake in an interactional system.

Figure 7 Interactional system involving two individuals (see online version for colours)



10 Complex modelisations of interactional systems: new perspectives in ecological applications

Our suggested modelisation needs to take into account the way individuals activate and manage semantic their own semantic knots in order to fuel the evolution of the relationship within the interactional system. In this sense, the study of conflict situations becomes important, insofar as they represent cases that remain on the edge of 'normal' or 'habitual' interactions, thus uncovering the salience of certain systemic elements and processes. The study of interactional conflicts has to draw on the analysis of the way individuals give meaning to the conflict after its emergence, thus leading to an a posteriori analysis of the situational confrontation; in this perspective, a discursive and linguistic survey needs to be conducted. In fact, although language is indeed not the one and only means of semantisation in communication (paraverbal and non-verbal utterances also need a thorough analysis), it still implies a huge variety of possible expressions that are supposed to give a more or less faithful transcription of the feelings, needs and mental constructions of interactants (Wodak and Meyer, 2009; Delanty et al., 2011). We thus posit that the 'experiential sampling method' (or ESM) exposed by Hektner et al. (2007) allows scholars to measure the pragmatic effects of situational and interactional environments on individuals, in this method, individuals have to regularly fill in a

notebook used to describe their feelings and thoughts after situations of disagreement or conflict. The ESM method has been used in recent works in sociolinguistics (Lamarre and Lamarre, 2009) and anthropology, especially to study questions linked to fluctuating identities (Burke and Stets, 2009). We believe that this proposition may help deepen the study of human interactions through the analysis of semantic knots, inasmuch as they are at the centre of the transmission and interpretation of information within the system, as well as being able to sustain or modify the relationships in a given context, such as posited by Mühlhäusler (2003, p.9) in his works on language, interactions and ecology. According to Mühlhäusler's works, context as an interactional environment should not be separated from the study of discursive utterances generated by the ESM. Meaning emerging from both environment and discourse has to be observed as a situational emergence based on precise parameters: thus, an individual may for instance hate a certain trait or personal characteristic (such as cupidity for example) and deem it as non-preferable when building new relations, yet still being able to accept it according to given interactional environments (making business with a colleague, or engaging into dialogue with a family member, etc.). This relativity of contextual meaning means that we are able to activate and combine elements in order to give meaning to a situation according to the adaptability we wish to develop at a certain degree, although an absolute perspective would imply contradictions. Yet context is never absolute and needs creativity and cleverness: thus, describing individuals according to definite traits would be an impossible project. According to the context, interactants have to reactivate one trait preferably to another, in order to answer environmental and social constraints, as well as in relation with the choices and strategies they want to adopt. Furthermore, the choices that have to be made during interactions do not undergo a determined form of linearity or causality that would be based on stable individual and interpretative data; these choices rather emerge through inferences and implementations of interpreted information or set of information (Elman et al., 1998), in order to solve the paradoxes produced by our social environments. According to the connectionist model and the works of Marcus (2001, p.11), these paradoxes can be described when focusing on the weight of connections between pieces of information processed by interactants, rather than the weight of information itself. The value given to semantic knots, as well as their impact on our appreciation of the interactional situation, remains crucial elements for the understanding of interindividual interactions. We believe that the application of this exposed theory would produce a probably better understanding of interacting human beings and their choices, doubts, contradictions and incredible capacities of adapting, organising and organising great amounts of information in order to activate them accordingly, given the situations we have to face.

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Notes

1 "[Le conflit est] à la fois choisi et subi. Alors que chacun des adversaires le nourrit de ses convictions et de ses initiatives, il a en même temps le sentiment de se limiter à subir et à réagir aux initiatives de l'adversaire, ou à la fatalité de la situation. (…) Le conflit dissocie, désagrège, déconstruit le système en même temps qu'il le reconstruit autrement", our translation.

2 "[Il y a] émergence de (…) la 'création du couple', espace tiers, interfaciel, investi par l'un et l'autre élément. Les frontières de ce système avec l'environnement sont variées dès lors que le couple s'emploie à développer un noyau commun en contact, lui aussi, avec l'extérieur. La création et l'enrichissement de ce troisième terme à partir des projets communs aux deux membres du couple orientent le système et contribuent à le finaliser", our translation.