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Chapter 1

The Originality of Systems Intelligence

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In their groundbreaking essay ”Emotional Intelligence” (1990), Peter Salovey and John D. Mayer define their new concept “as the subset of social intelligence that involves the *ability to monitor one’s own and other’s feelings and emotions, to discriminate among them and to use this information to guide one’s thinking and actions.”* (Salovey and Mayer 1990, italics in the original).

The theory of emotional intelligence advances the work of Howard Gardner (1983) in his theory of multiple intelligences and that of Robert Sternberg (1985) in his theory of “triartic” (three part) intelligence. All these approaches draw attention to factors in human performance not captured by previous proposals and, in particular, in traditional IQ tests (Gerrid and Zimbardo 2010).

We have proposed that the work on emotional, social and multiple intelligence has missed a key form of human intelligence that we have called “systems intelligence.” By “systems intelligence” we mean “intelligent behaviour in the context of complex systems involving interaction and feedback. A subject acting with Systems Intelligence engages successfully and productively with the holistic feedback mechanisms of her environment. She perceives herself as part of the whole, the influence of the whole upon herself as well as her own influence upon the whole. By observing her own interdependence in the feedback intensive environment, she is able to act intelligently” (Saarinen and Hämäläinen 2004, p. 3; see also Hämäläinen and Saarinen 2006, 2007a, 2007b, 2008).

As the phrase suggests, *systems intelligence* relates to *systems*. As is customary in systems approaches, systems for us are complex wholes, the functioning of which depends on its parts and the interaction between those parts (Jackson 2003). Like Salovey and Mayer, we focus upon intelligence as something that “guides one’s thinking and action”.

Key features of the “systems” of systems intelligence include the following aspects, familiar from the systems literature (Senge 1990, Jervis 1998, Jackson 2003, Ramage and Shipp2009):

1) The behaviour of the system displays features that cannot be obtained by summing the behaviours of the isolated components. There are patterns and regularities in system behaviour not revealed by the behaviour of the parts as separate entities: the system can display emergence – “much coming from little” (Holland 1998) – as

well as self-organization where the system creates a new structure. Often the system behaviour is due to the nature of system structure.

2) The relationships between parts are more important than the properties of the individual parts; interaction of the parts gives rise to patterns, regularities and complexity that is not revealed by a direct inspection of the individual parts in isolation.

3) The systems are dynamic, display changing states and behaviours on the time axis often conceptualized in terms of functions, goals, or intentionality, and may involve surprising aspects, frequently referred to as "non-linearity" when a change somewhere in the system creates a disproportionate effect, perhaps due to circular causal interconnections.

4) The boundaries of systems are re-definable, flexible and depend on the perspective taken. "The lesson of boundaries is hard even for systems thinkers to get. There is no single, legitimate boundary to draw around a system. We have to invent boundaries for clarity and sanity; and boundaries can produce problems when we forget that we've artificially created them." (Meadows 2008, p. 97)

The theory of systems intelligence claims that human beings do have *intelligence* with respect to entities thus described – i.e. intelligence with respect to entities that do not functionally reduce to their individual parts, that are dynamic and may involve emergence, non-linearity and surprising cumulative aspects.

Like "system", "intelligence" is also a multi-faceted notion. In the landmark 1921 symposium on "Intelligence and its measurement" intelligence was described as "ability to learn", "the power of good responses from the point of view of truth or fact", "the ability of the individual to adapt himself adequately to relatively new situations in life", "the capacity to acquire capacity" (Thorndike 1921). In a description by Wechsler (1958) that Mayer and Salovey allude to, intelligence is viewed as "the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment". More recently, the authoritative Task Force of the American Psychological Association started out their survey by stating: "Individuals differ from one another in their ability to understand complex ideas, to adapt to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought. … Concepts of 'intelligence' are attempts to clarify and organize this complex set of phenomena" (Neisser et al. 1996, p. 77). We list these descriptions here noting that our notion of systems intelligence fits naturally into them.

Why *systems* intelligence, and why not "situational intelligence" (acknowledging "the power of the situation", in the sense of Ross and Nisbett 1991) or "contextual intelligence" (Nye 2008), or "pragmatic intelligence" (Sternberg 1985)? The answer is: because of the special, subtle and intriguing aspects of the functioning of human intelligence *in dynamic settings*, the key theme of systems intelligence.

In addition to its conceptual power as a systems concept, our proposal also has considerable communicative force to it. In our consultancies, organizational coaching

sessions and philosophical lecturing (Saarinen and Slotte 2003, Saarinen 2008) we have been struck how easily people of various backgrounds adopt the notion. It makes immediate intuitive sense. The concept empowers people, making them mindful (Langer 1989) of something they can improve. People seem to be able to approach their systems intelligence with a "growth mindset" (endorsing "implicit incremental theory") as opposed to "fixed mindset" (endorsing "implicit entity theory", in the sense of Carol S. Dweck (2000, 2007). In other words, people find it natural to reflect on the possibility of enhancing their systems intelligence. The concept, while personally relevant, does not seem too threatening to people.

On the face of it, there is a difference between systems intelligence as a concept and the intelligences discussed by the multiple intelligences research community. To wit, it seems there is a difference in the way the "systems" of systems intelligence exist as compared to emotions, the social sphere, the body and movement, the visual, space, music, language or mathematical entities. It seems there is an element of abstract conceptuality in the notion of systems intelligence.

Indeed, systems are abstract and constructed. Yet so is language. The ontological status of a category such as "bodily-kinaesthetic" is also far from trivial. Besides, theories of intelligence are not supposed to be about ontology but of the thought-related mental abilities that account for human learning, adaptability and success in life. The theory of emotional intelligence assumes that humans have an innate cognition of emotions; we assume that humans have an innate cognition of systems. Making that assumption and focusing upon systems intelligence leads us to address vital phenomena the other intelligence constructs are not able to cover.

Let us recall that human life is fundamentally systemic at its core. Systemicity is at the heart of all of life and all of reality – not only as phenomena "out there" but also as something humans cannot help but engage with every moment of their actual lives. A person can live with some success without significant verbal, bodily, visual, mathematical, emotional, social, intrapersonal or musical intelligence. But without at least rudimentary abilities to manoeuvre intelligently within the systems of one's environment, a human being is lost. There simply is no way to orient oneself in any successful way for any significant length of time, except in relation to and in contact with what is taking place systemically around oneself.

The success and survival of a human individual, for any significant length of time, calls for systems intelligence.

All human life is embedded and located in what is going on systemically, locally and globally. All human life takes place in the systemic process contexts of something-larger-than-self. That something requires a constant and lively relating to. The success and survival of a human individual, for any significant length of time, calls for systems intelligence.

Baby Brilliance

As academic intellectuals, it may be tempting for many of us to take rational intellectualism of the adult age, along with its emphasis on explicit and verbal knowledge,

as the primary and paradigmatic form of intelligence. The systems intelligence approach radically rejects such a notion.

Instead, we look to babies for insight.

In the course of the past three or four decades, infant research has demonstrated "the infant's capacity to construct expectations of action sequences, which are then represented in a presymbolic, procedural format" (Beebe et al. 2003, p. 752). The capabilities of an infant go far beyond what one might have thought prima facie. As one meta-study emphasized, "1-year-old infants infer dispositions and future behaviors of others in relatively mature ways" (Uleman et al. 2007 p. 347). "Infants can also distinguish between intentional and accidental acts, a skill that requires mental state attributions" (ibid). All this highlights what Jerome Bruner has called the striking "systematicity" in the endowment of an infant. (Bruner 1983, p. 28) As Bruner put it "there may be differences of opinion concerning the 'rules' that govern this orderly behavior [of an infant], but there can be no quarrel about its systematicity." Whatever the details, "*the nature of infant cognitive endowment",* Bruner concludes, *" is that its systematic character is surprisingly abstract."* (Bruner 1983, p. 29, italics in the original).

The critical acumen is the "joint anticipatory system" (Bruner 1983) that the infant is capable of creating with her caretaker through "extraordinary early infant capacities" (Beebe and Lachmann 2002, p. xiv).

The powerhouse at work is the infant's innate capacity for "interpersonal engagement" (Hobson 2004) through her abilities for emotional and non-verbal exchange. "Infants are highly attuned to other people" – they have "an active social life right from the start" (ibid, p. 43). With their remarkable non-verbal abilities to perceive and respond to the behaviour of other people in interaction, the infants "are developing increasingly rich and pleasurable forms of mutually sensitive interpersonal engagement." (ibid, p, 42).

It is instructive to consider the concepts leading infant researchers use to describe the endowment of capabilities the infant displays in the first weeks and months of her life in relation to her mother: *mutual regulation*, *mutual influence* (Beebe and Stern*)*, *syncronization* (Stern), *reciprocity* (Brazelton et al.), *behavioural dialogues* (Bakeman and Brown), *reciprocal and compensatory mutual influence* (Capella), *accommodation* (Crown), *co-ordination* (Sander), *rhythms of dialogue*(Jaffe et al.), *attunement* (Stern et al.), *protoconversation* (Beebe et al.), *the moment of meeting* (Sander), and *forms of intersubjectivity* (Meltzoff, Stern, Tervarthen, Tronick) (for a discussion and a review, see Beebe et al. 2005). Even without closer analysis these concepts speak out: the infant contributes as an active partner to the process of her own growth.

Particularly importantly, the infant is able to operate in relation to her mother and with respect to the time axis as part of the dynamics that feeds development. This is a sophisticated undertaking. "Patterns of experience are initially organized in infancy as *expectancies of sequences of reciprocal exchanges* … in which each partner contributes to the ongoing exchange" (Beebe and Lachmann 2002, p. 13). As one researcher put it, infants are endowed with a "motive system that is seeking another emotional being with whom to play together a cooperative, complementary, intersubjective game" (Kugiumutzakis 1998, p. 80).

Far from being a passive receiver, the infant is an active partner of the process of her own growth. She actively contributes. Anticipation is in a leading role here – the infant's

abilities for forming *expectancies*. She *is* expecting personal engagement, attunement, co-ordination and emotional availability of her mother. Through her abilities to anticipate, to imitate, to perceive emotion and to react to emotion, she influences her mother to influence her, and vice versa. The two of them together give rise to a higher-level phenomenon with emergent properties and non-linear features of considerable sophistication. The infant and her mother are involved in non-verbal communication that is typically extremely rapid and frequently simultaneous. They create together a whole that has a direction and is goal-oriented, although not consciously intentional.

The Dyadic System as a Basic Unit

Stemming from the seminal work of Louis Sander (1977, Amadei and Bianchi 2007, for an overview, see Nahum 2000), a number of leading researchers have made explicit use of the systems concept to account for the principal features of "the first relationship" (Stern 1977, 2002) and the "interpersonal world of the infant" (Stern 1985). It amounts to a view according to which the origin of mind is dyadic, dialogic and intersubjective, involving the participation of a relational partner (Beebe et al. 2003).

The formation of a *dyadic system* that the infant "co-creates" with her mother becomes "the basic unit of interest" (Beebe et al. 2003, p. 752). That dyadic system influences the baby and the mother, while they influence the system. In particular, the dyad moves ahead, is goal-directed on the time axis and has features not detectable by the inspection of the baby and the mother separately as isolated individuals.

It is important to appreciate that the infant possesses "unsuspected capacities to regulate his own state" (Beebe and Lachmann 2002, p. 22; Beebe and Lachmann analyse the case of a particular baby boy but the point is generic). These capacities are due to the remarkable infant skills in the art of relatedness. They reflect the infant's ability to engage in interactive processes. Remarkably, interactive regulation and self-regulation become integrated in a coordinated and goal-directed process-whole of a higher order.

The skills of relating that facilitate development in infancy, will later be the basis from which the subject can tune in to systems beyond what one knows objectively or conceptually about those systems

The fundamental point is that intersubjectivity precedes subjectivity. Relatedness is prior to isolation. This amounts to a radical rejection of "the myth of an isolated mind" (Stolorow and Atwood 1992). The dyadic system becomes the fundamental unit "within which both interactive regulation and self-regulation can be defined, each affecting the other" (Beebe et al. 2003, p. 752). The "patterns of expectation" amount to "the anticipation of the partner's pattern in relation to one's own" and "define presymbolic representation in the first year" (Beebe et al. 2003, p. 752).

The intersubjective system of the infant and the mother is not one of alternating turn-taking and of a ping-pong-like reciprocal exchange where each partner would generate her actions in response to the other's isolated actions. Instead, the infant and mother tune in to one another and synchronically work together. This is highly important from the point of view of systems intelligence. The non-verbal, procedural, and affective skills of relating

that facilitate development in infancy, will later be the basis from which the subject can tune in to systems beyond what one knows objectively or conceptually about those systems.

Since her early infancy, the baby is dealing effectively with certain unfolding emergencies of her environment and is able to create expectancies. She is able to regulate her own states at the same time as she influences the interactive processes which in turn influence her.

We find it remarkable that leading researchers in the empirical field of infant studies have used the concept of *a system* to describe what may be the single most warmly attuned theme in human life, the infant-mother relationship. It has not been an obstacle that the infant remains almost totally ignorant of the objective functioning of the system that she cannot represent verbally or conceptually and with which she operates mostly on a non-conscious level. Indeed, infant researchers have made impressive progress in describing how exactly the infant contributes to the emergence of the dyadic system through various forms of implicit processing. Facial mirroring, vocal rhythm, spatial orientation, touching and self-touching are among the non-conceptual means that the baby utilizes in the intersubjective field.

Beebe and Lachmann conclude: "the organization of behavior in infancy should be viewed primarily as the property of the mother-infant system rather than as the property of the individual … It is the dyad, rather than the individual, that is the unit of organization." (Beebe and Lachmann 2002, p. 67) They stress that "it is critically important that interactive and self-regulation be viewed as a system" (Beebe and Lachmann 2002, p. 87) and to view the interaction between the infant and the mother as "an emergent dyadic phenomenon" (Beebe and Lachmann 2002, p. 88) in which "inner and relational processes are co-created in tandem" (Beebe et al. 2003, p. 754). Critical to development, as Alan Fogel puts it, is "the co-regulated communications system" of the baby and the mother (Fogel 1993).

From the conceptual point of view, the dyadic system is an active partner along with the baby and the mother. Beebe and Lachmann stress "the dyad's ability to make use of whatever abilities the infant brings" (Beebe and Lachmann 2002, p. 88). In the context of infant research, the systems concept makes it possible to welcome capabilities from the implicit, non-conceptual realm. This possibility proves essential for systems intelligence.

Broadening the Scope of Adult Intelligence

The work on multiple intelligences has tacitly assumed that the capabilities of pre-verbal infants need no particular focus. It has been taken for granted that there is no significant dimension of intelligence *that would be paradigmatically represented* in pre-verbal infants. We challenge this assumption.

Systems capabilities are fundamental in infancy *and* later in life, we propose. The skills and capabilities for relating in the non-verbal, procedural, affective, out-of-awareness realms is highly significant for the functioning of intelligence in dynamic settings. They are vital means to *relate to systems*.

The contribution we offer here is conceptual but with a strong empirical footing. We offer a framework and a terminological platform from which to integrate phenomena that relate to intelligence, human adaptability, the systemically embedded nature of human life,

and early infant capabilities "of sensitivity and emotional exchange that are a feature of human relations from the cradle to the grave" (Hobson 2004, p. 46). We venture to suggest that prior intelligence research has left gaps we hope to fill.

Our systems intelligence perspective amounts to the vision that humans have a set of skills and abilities that

- Involve relatedness to relatedness (skills that relate the subject to others and to the dimension of relatedness).

- Involve relatedness to the sphere of intersubjectivity.

- Make use of non-verbal and implicit expectations which take place out-of-awareness.

- Involve engagement with larger-than-self entities without clear-cut boundaries and with boundaries that can be re-defined in the course of the process.

- Involve relatedness to the unfolding of qualities that cannot be reduced to qualities of the constituent parts (emergence).

- Make use of human sensibilities, timing and synchronization skills, emotional attunement, and feedback mechanisms that involve non-explicit, non-verbal and non-conscious dimensions.

As already observed, these skills and abilities are critically important for human growth. We find it significant that empirical models of those highly sophisticated capabilities in infants are articulated in terms of systems with the dyadic system recognized as "the basic unit of interest" (Beebe et al. 2003, p. 752). The contribution we offer extends that discourse of systems to address the functioning of human intelligence in dynamic adult contexts.

Accordingly, we suggest that the remarkable human abilities to attune to and live with systems that are uncovered empirically by infant research concern the whole human life span. The infant's capabilities in dimensions such as *attunement, mutual regulation and influence, coordination, reciprocal and compensatory mutual influence, synchronization* and *intersubjectivity* give rise, among other things, to various forms of *implicit relational knowing* that Karlen Lyons-Ruth has stressed as fundamental to the human relational experience (Lyons-Ruth et al. 1998, Lyons-Ruth 1999) and to *intersubjective systems sensibility* of the kind elaborated in the intersubjective systems view of Stolorow, Atwood and Orange (Stolorow et al. 2002; Buirski 2005).

The seeds of systems intelligence are sown when the infant is engaging with her mother in the dyadic system she co-creates with her, adaptively reaching out towards development and growth.

Systems Intelligence: A Definition

Consider the following definition of systems intelligence: *Systems intelligence (SI) involves the ability to use the human sensibilities of systems and reasoning about systems in order to adaptively carry out productive actions within and with respect to systems.*

This characterization can be compared with the description that Mayer, Roberts and Barsade (2008) provide of emotional intelligence in their extensive meta-study: "Emotional intelligence (EI) involves the ability to carry our accurate reasoning about emotions and the ability to use emotions and emotional knowledge to enhance thought." (Mayer et al. 2008, p. 511).

Notice the emphasis of the *ability to adaptively carry out productive actions* in our definition of SI. Here we depart from the Mayer et al. (2008) definition of emotional intelligence and from its strong emphasis on knowledge. We prefer to maintain the emphasis on action, like Salovey and Mayer in their (1990) description.

We acknowledge the following two convictions as part of the systems intelligence construct:

1. In terms of what are known as "dual processing accounts" (for a review, see Evans 2008), we note that SI will involve both forms of processing identified in the literature. The ability to attune to and live with systems will involve fast, automatic, intuitive, instinctive, procedural, implicit, non-verbal and non- conscious aspects *along with* the slow, deliberate, explicit and conscious aspects of systems comprehension and relatedness.

2. In the process of development of thought from infancy to adulthood, systems intelligence is nothing short of being the primary form of intelligence, we believe. Intelligence is fundamentally about interconnectivity, relationality, embeddedness, attunement, action, and about oneself-in-relation-to-others and oneself-in-a-larger-whole. Intelligence develops and is demonstrated primarily in dynamic settings.

Typically, "intelligence" is taken to be a faculty exhibited by adults and to some extent by children. Howard Gardner stresses that the study of intelligence should be informed by work with adults and children, gifted persons and people of different cultures, as well as with individuals who have suffered selective forms of brain damage (Gardner 1983; cf. Neisser et al. 1996). Gardner does not include pre-verbal infants on his primary list. This is in line with the commonly accepted idea stressed also by Gardner according to which "a human intellectual competence must entail a set of skills of problem solving … and must also entail the potential for *finding or creating problems* – thereby laying the groundwork for the acquisition of new knowledge" (Gardner 1983, p. 60-61).

Adopting Gardner's description, systems intelligence can be conceptualized as a human intellectual competence that entails skills of problem solving and skills to resolve genuine problems and difficulties that he or she encounters *in systemic settings.*

Space is a systemic setting, as is language, the world of mathematics and music. In as much as these domains give rise to specific intelligences, as argued for by Gardner, those intelligences will involve domain-specific aspects of systems intelligence. This does not

change the fact that even before learning to master language or mathematics or her own movements the child already has systemic engagement with her environment of the kind elaborated by infant research. We highlight the general systems skills and ability to live with systems over and above the specialized intelligences like linguistic, mathematical or kinaesthetic intelligence.

What are the most important forms of systemic engagement in human life? This question need not have any once-and-for-all answer. New systemic environments relevant for human adaptability may well arise. Our own times bears witness to this fact. The human race has developed tremendously powerful system structures that have enormous positive leverage within certain boundaries but also potential for enormous destruction from the point of view of certain other boundaries. Minimally what is called for is systems intelligence with the man-made systemic environments in the systemic context of natural life. With the creation of powerful man-made systems environments, new forms of systems skills are taking high priority in terms of success and even survival. Our perspective makes room for the discussion and analysis of the imperatives for human intelligence in that vital and emergent setting.

Our vision does not refer to people only becoming more informed *of an important systems domain. Any knowledge helps, but ultimately it is the actions taken in concrete terms that define the level of systems intelligence of each of us as individuals and of the human race as a whole.*

Notice that this vision does not refer to people *only* becoming *more informed* of an important systems domain (such as the functioning of food chain, the climate system, the functioning of the world economy). Any knowledge helps, but ultimately it is the actions taken in concrete terms that define the level of systems intelligence of each of us as individuals and of the human race as a whole.

Systems Intelligence is Acting Intelligently with Systems

You walk into a situation, and you enter a system. You meet a person, and something larger than the two of you starts to have a say. No matter where you are, systems embrace you, and no matter what you strive for, systems obstruct and support you, influence you, tempt you, inspire you, hinder you, coerce you and often also suggest how to proceed. The anthropomorphic phenomenology of systems is important to acknowledge because systems intelligence operates with systems as they appear to us. As structures to relate to, working via our beliefs, systems present themselves to us and indeed become part of us. Sensing and figuring out what seems possible and necessary, we set-up a realm of the "real", along with the narratives that make sense of it, and act on the stage framed by our meaning-giving structures.

What is remarkable is how comprehensive our perspectives typically seem. You catch a glance between two persons and realize that "everything has changed". The phone rings and you are informed of the sudden death of your loved one, and nothing will ever be the same. Life is conducted in and through changing, meaning-filled contexts and environments that are enormously complex. Those complexes come across as integrated, holistic "onenesses". We choose to call such coherent wholes *systems*, reflecting the

assumption that their internal functioning is relational, their form of being dynamic and their boundaries re-definable.

Life with systems and within systems can be conducted more or less intelligently, depending among other things on

- One's ability to identify the relevant systems with respect to given goals, purposes, functions and ways of meaning making.

- One's ability to act upon the relevant systems and take advantage of their leverage.

- One's ability to take advantage of a potential to change a system.

- One's ability to read other agents' actions and moves within and with respect to systems.

In order to live better with systems it is often beneficial *to know more of systems.* This is where many schools of systems thinking have made remarkable contributions providing descriptions of systems on a general level as well as in specific contexts. Along with the generic contributions of systems theorists, scholars working within various sciences and disciplines have shed light on a number of specific domains through use of the systems framework.

However, as John D. Sterman once so aptly put it, "all models are wrong" (Sterman 2002). Life is richer than any modelling of it. A map is useful for covering a territory, yet movement within the territory will require more than a map.

This is the cutting edge at which our systems intelligence hopes to make a major contribution. This is also where our initiative hopes to spark energy to some of the humanly-tuned and ethical aspects of the early systems thinkers such as Ludwig von Bertalanffy, Kenneth Boulding and C. West Churchman (discussed particularly lucidly in Hammond 2003). Bluntly put, it is more important to get actions within systems right than the theories of those systems right.

Systems intelligence refuses to bend to the demands of fragmentarism. We insist on context-bound, local holism as part of the very core of human intelligence.

Systems intelligence is a holistic and action-bound faculty within us humans. As observed above, it is already present in infancy in the form of the implicit and non-verbal yet sophisticated skills that operate in the affective dimension of relatedness and intersubjectivity. Systems intelligence builds on such abilities for interrelatedness, connectivity and sharing. Yet the dominant forms of discourse in our culture are biased because of what physicist David Bohm (1980, p. 7) called the human "habit of fragmentary thought" which "divides everything up" (Bohm 1996, p. 9). What comes naturally in infancy turns out tricky in adult life. The challenge is primarily conceptual. Indeed, one of the reasons systems intelligence as a theoretical perspective is powerful is due to its refusal to bend to the demands of fragmentarism. We insist on context-bound, local holism as part of the very core of human intelligence.

It might well prove difficult to measure an intelligence that is fundamentally tied to sharing, to co-created processes that are ongoing, to intersubjectivity and to abilities that relate to wholeness. Recall how difficult it is even to make scientific sense of what Gardner recently called "the synthetic mind": "Few individuals and even fewer institutions have expertise in inculcating the skill of synthesis." (Gardner 2008, p. 47). Very little is known of the vital act of synthesis. To quote Gardner, "even when synthesizing is desired and cultivated, we lack standards for determining when a productive synthesis has been accomplished" (ibid).

But the fact is, people have been remarkably successful and adaptive in living with complex, unfolding, emergent and interrelated wholes in their environment. It seems to us vital to call attention to the form of intelligence that generates such a remarkable outcome – and also gives rise to what Gardner calls "the synthetic mind". This is the human ability we call systems intelligence.

The result is a proposal that

1) Takes the systems approach of infant research, together with the rich empirical data that accompany it, and adds the notion of *intelligence* to that perspective along with extending to adult life the perspective of early human systemic and relational abilities.

2) Takes *the systems perspective* of the systems sciences and disciplines, along with the holistic orientation of that perspective, integrates them with the concept of intelligence, with the result of introducing the perspective of an adaptive, acting and feeling human subject to the systems framework, along with her capabilities for implicit relational knowing, for systems sensibilities, and for procedural, non-verbal and affect-based interrelating with larger-than-self wholes.

Recall our definition, according to which systems intelligence involves *the ability to adaptively carry out productive actions within and with respect to systems.* The emphasis on action is pivotal here and could hardly be timelier. The point of human intelligence comes from its service to human life. It is in the dimension of actual conduct and behaviours with more and more complex humanly made technological and social systems that a more intelligent relation and "attunement" (Stern 1985) are urgently needed.

The call comes in various guises yet echo the same basic message. We need what the Nobel Laureate Murray Gell-Mann called "a crude look at the whole" (Gell-Mann 1994), in order to bring "the necessary revolution" (Senge et al. 2008) of "healing our fragmented culture" (Goodwin 2007).

The call is to a radical, dramatic increase of systems intelligence.

The Positivity of Systems Intelligence

Systems thinkers emphasize phenomena of interconnectivity and interrelatedness, representing what has been called "the relational turn".

The relational orientation is based on the idea that whatever is being studied should be thought of in terms of relationships and with respect to something other than itself. (Cf.

e.g., Senge 1990, Capra 1996, Bradbury and Lichtenstein 2000, Stolorow et al. 2002, Beebe and Lachmann 2002). The key idea is that "human cognition and the sense of self are fundamentally and originally *relational*." (Fogel 1993, p. 4)

Along with the emphasis on relations, the systems approach highlights holism and focuses upon "wholes". It is interested in dynamism and change. As opposed to individual events, the focus is upon processes, patterns and performance over time. Instead of single causes, the limelight is upon multiple causes and bi- and multiple-directional relationships. Systems thinkers articulate modes of conceptualizing the world in terms of *the big picture* and *the longer term.*

Thus described, one could say that the systems perspective is relatively straightforward. Key ideas of systems thinking can indeed be found in the folk wisdom of various cultures and traditions where they are presented as rules of thumb, proverbs and sayings. (On this, see Meadows 2008.)

Yet the phenomena of gradual change, delayed effects, feedback, the big picture, reciprocal causality as well as those of gradual change are remarkably difficult to appreciate in actual human practice (for a vivid discussion, see Jervis 1998).

One of the cornerstones of the systems thinking literature is the description and modelling of the most common "systems archetypes". Among them: "Tragedy of the Commons" (made famous by Hardin 1968), "Shifting the Burden", "Fixes that Fail", "Eroding the Goals", and "Limits to Growth" (for discussion, see Senge 1990). Our notion of "the Systems of Holding Back" (Saarinen and Hämäläinen 2004) can also be included here.

These archetypes are powerful. In her highly illuminating and accessible book *Thinking in Systems,* Donnella Meadows goes through the *International Herald Tribune* during one week, and in the coverage of world events that week finds illustrations for each one of the most celebrated traps identified in systems dynamics literature (Meadows 2008). Thinking in terms of wholes rather than parts, in terms of processes rather than time slices, in terms of interconnectivity rather than isolated parts may seem simple enough in theory but is difficult in practice.

Yet as already observed, there is a sense in which even infants can do it. To some extent anybody can do it. There is a sense in which human beings cannot but be systems thinkers. The fact that there is an imperative to improve should not lead us to dismiss the worth of the endowment each one of us has right from the start.

The promise of intelligence is one of adaptability. With your intelligence you can learn and adapt better. While it can be taken for granted that the world is systemic, it is a priori clear that at some point, intuitive systems thinking – like any intuitive thinking – is going to prove insufficient or inadequate (cf. Kahneman 2003). "When the interconnections are dense", Jervis points out, "it may be difficult to trace the impact of any change even after the fact, let alone predict it ahead of time, making the system complex and hard to control." (Jervis 1998, p. 17). That does not change the fact that for the benefit of the much-needed refinement process there is a platform and a base: our innate systems intelligence.

The fact that systems effects are hard to predict and control is bad news but also good news, depending on the perspective. The systems literature often takes the negative stance, emphasizing the problems that arise out of the sheer complexity of the social, political or natural systems. Systems intelligence takes a different tone. For one thing, with its

emphasis on human sensibilities and notions such as *feel for the system* (Hämäläinen and Saarinen 2008), the systems intelligence perspective was never about the command and control of systems. The interface with systems, as with life in dynamic settings, was always assumed to be broadband.

The systems intelligence perspective emphasizes what we do right, with the hope of generating more of it, as opposed to what we do wrong. Accordingly, in place of "Shifting the Burden", "Fixes that Fail" or "Tragedy of the Commons" as negative systems archetypes, the focus is on "Sharing the Burden", "Fixes that Fire" and "Miracle of the Commons" as *systems intelligence archetypes* with distinctly positive emphasis (Hämäläinen and Saarinen 2006). Given the fact that "we can never do merely one thing" (Jervis 1998, p. 10), our actions can backfire but they also yield tremendous success. By just one action we can generate a whole range of right things at the same time – with others, with our wide-ranging humanity, with the help of richly and prudently facilitated systems.

In terms of its tone, our approach matches that of positive psychology (Seligman and Csikszentmihalyi 2000) and positive organizational scholarship (Cameron et al. 2003). It is in line with Fredrickson's Broaden and Build Theory in its emphasis on the significance of positive emotions (Fredrickson 2003, 2009). Indeed, as we see it, the initiative of systems intelligence advances the original idea of Gardner's "Project on Human Potential" (Gardner 1983) and also follows Sternberg's insights (1985) of appreciating intelligence in terms of its practical value and sensitivity to the varying aspects of the context.

Turning the Tide with Men and Women in the Loop

We would like to see our perspective encourage a growth-mindset in the sense of Carol Dweck. Trivially, the linguistic abilities of a child are lesser than those of an adult, or of a Shakespeare. Nobody takes this as an argument to dismiss the significance of what she does right with her linguistic endowment. Similarly, it is obvious that no matter how skilful someone is in identifying feedback loops and patterns over time in a given area of life, still it is possible to improve as a practitioner in that area. No matter how brilliantly adaptive someone is in acting within the confines of a given life system, surely there is room to do even better. The more there is complexity to the unfolding environment, the more there is space for creativity, productive actions, and for systems intelligence to grow.

In view of the possibilities to improve, it is particularly important to realize that there is no particular reason to think that in the realm of systems skills, symbolically-coded and explicit *knowledge* should reign alone. It is useful to learn science-based systems disciplines and thereupon become a better systems thinker. But this is not sufficient. People still need to act with their systems knowledge with respect to systems – intelligently. To the extent the world is a mess globally and locally, we need more intelligent systems "out there", but even more intelligence with systems *in here*. It is not only the understanding of the loops that need to be improved. Also men and women *in the loops* need to change.

In the human world, the malfunctioning of systems is often humanly made, and hinges on people. Many systems thinkers have explained the world in systems terms, but the point is to change it through our increasing systems intelligence. Here our proposals bring back the ethical and emancipatory emphasis of the early systems thinkers, in particular *the*

humanistic concern of Ludwig von Bertalanffy (von Bertalanffy 1969, p. xxiii). That ethical emphasis has often been marginalized in the name of modelling, objective description, and command-and-control oriented systems practices (for an extensive discussion, see Hammond 2003). Our initiative attempts to turn the tide here and do justice to the founding fathers.

Knowledge is the essential ingredient of the good society, yet humanity is even more fundamental. One should be careful not to fall into *the cognitive systems trap* – into believing that once we have cognitively identified the relevant systems, most of the work is done. From the point of view of systems intelligence, an adequate representation of a system is only the beginning, and the lively challenge lies ahead, calling for personal involvement. There cannot be systems intelligence with respect to systems without intelligent actions supported by personal responsibility as the backbone of those actions.

We may note in passing that along with the cognitive systems trap there is *the cognitive trap of complexity*. That goes off when the concepts of complexity theory are used to articulate how complex the complexity is in a given field of application. A diagnosis might be intellectually illustrative and indeed mesmerizing but the main question concerns the cure. More often than not, a modelling via complexity theory does not yield much more than an intellectually extravagant celebration of the complexities that have been found, without any indication of what to do about them. (For inspiring exceptions, see Losada 1999, Fredrickson and Losada 2005, Stacey 2003, Taylor 2004.)

Sensing the System of Betterment

In general, the systems perspective emphasises connections and warns against isolation. It warms against cut-and-dried approaches to boundaries (Midgley 2000). The systems intelligence perspective takes these points very seriously. We should take note not to separate actions from systems, systems from human sensibilities, and intelligence from the non-verbal, non-conscious abilities for interconnectivity that are part and parcel of the human condition. We should take note not to cut off intelligence from the dynamic setting in which it takes place.

We should take note not to cut off intelligence from the dynamic setting in which it takes place.

Recall the fact, often overlooked by scientists, that human beings not only have abilities to measure and calculate quantity but also capabilities to *sense quality.* That endowment is the basis of art and of much of what makes life worth living. It is also the base from which a mother and an infant regulate and co-regulate their intra- and inter-personal processes in a highly cost effective way. Something just feels right – the smile of the baby, the face of the mother – and something else – the cry of the baby, the inanimate object next to the face of the mother – does not. Systems intelligence looks at the whole of human potential as a resource for better systems-living with others and with the environment. The human ability to feel, sense and to resonate, the ability to move and be moved, to enhance and be enchanted, to uplift and be uplifted are some of those ways holism works within us as our innate systems intelligence.

As noted above, Beebe and Lachmann emphasize the infant-mother "dyad's ability to make use of whatever abilities the infant brings" (Beebe and Lachmann 2002, p. 88). It is

indeed intelligent to use whatever abilities you have in order to cope with and live with the systems at hand – it is systems intelligent.

This is where our perspective of systems intelligence pays homage to the vision of Donella Meadows, in her posthumously published synthesis, when she states that "Living successfully in a world of systems requires more of us than our ability to calculate. It requires our full humanity – our rationality, our ability to sort out truth from falsehood, our intuition, our compassion, our vision, and our morality." (Meadows 2008, p. 170).

More human intelligence is needed, more systems intelligence. The point of intelligence is that it can foster learning and improvement. Our initiative seeks to give positive impetus to that vital process of uplift, glory and necessity as part of the human condition in our time.

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