Systems Intelligence: A Programmatic Outline

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Introduction

By Systems Intelligence (S.I.) 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 a 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.

We believe that Systems Intelligence is a key form of human behavioural intelligence.

Systems Intelligence combines insights from a variety of disciplines and schools of thought. For us, a particular inspiration is the work of Peter Senge (1990, 1994, 1999).

Like the forms of intelligence described by Howard Gardner (1983, 1999), as well as emotional intelligence as explicated by Daniel Goleman (1995, 1998, 1999), Systems Intelligence deals with the structures human agents use in order to conduct their lives successfully. Like Gardner in his groundbreaking work on Multiple Intelligencies (M.I.), Systems Intelligence is not only restricted to the verbal, analytic and conceptual aspects of intelligence. In his own criticism of M.I. Gardner (1983) refers to higher level cognitive capacities, which are not explained by it. These include common sense, metaphorical capacity and wisdom. Systems Intelligence, as defined here, is another important human competence not covered by M.I.

Systems Intelligence points beyond the forms of intelligence of Gardner and Goleman in linking intelligence with the concept of system.

Traditional Systems Thinking literature (see e.g. Churchman 1968, Checkland 1999, Flood 1999) emphasizes the importance of wholes and perspectives as it conceptualises and models systems of interaction and feedback from outside. In contrast to that Systems Intelligence wants to account for the active and practical thinking that human agents use in real life situations involving complex systems of interaction with feedback mechanisms. Systems Intelligence reaches beyond Systems Thinking in its pragmatic and active, personal and existential emphasis.

In this paper we give a programmatic introduction to the concept of Systems Intelligence, sketch out some of its different forms of manifestation and discuss its fundamental role in human life. The paper can be seen as a program description and starting point for a research initiative in the analysis of this new intelligence paradigm.

Key Ideas of Systems Intelligence

Systems Intelligence makes use of some key ideas of Systems Thinking (Churchman 1968, Senge 1990, Flood 1999), Theories of Decision Making and Problem Solving (Rubinstein 1986, Ackoff, 1987, Keeney 1992, Simon 1997, Kahneman and Tversky 2000), Philosophical Practice and Dialogue (Bohm 1980, Isaacs 1999, Schuster 1999), a number of other forms of holistic thinking and of the human sciences as well as certain forms of therapeutic thinking (see e.g. Haley 1986, O'Connor and Seymour 1990, Seligman 2002, Baker 2003). The reader is referred to the related literature to learn the historical roots of each of the ideas. Here we shall give a programmatic sketch of a new approach to understand human intelligence in a systems setting which is built on ideas described below.

Whole is more important than parts.

Human agents can influence entire systems.

"Part" and "Whole" are relative abstractions that are always subject to potential redefinition by changing the perspective.

Systems approach starts when you perceive the world through the eyes of another person.

Systems approach looks beyond isolated linear cause-and-effect chains for interconnections and interrelations.

In our culture the human conceptual system emphasizes linear thinking, isolating thinking and seeing separate units rather than seeing wholes.

Our perception mechanisms exhibit a similar tendency.

Human beings perceive themselves as independent individuals, yet they most often are encompassed in systems.

Structure produces behaviour.

Beliefs regarding structures produce behaviour.

Beliefs regarding the beliefs others have regarding structures, produce behaviour.

Co-operation is natural but extremely hard to conceptualise in a behaviourally relevant, subjectively convincing manner.

Structures of co-operation are fundamentally based on the assumptions and meta-assumptions people make of others involved in that system of co-operation.

The behaviour of people often reflects their best guess of rational behaviour but that guess can be completely erroneous.

People can get caught in systems that serve nobody's interest.

Much of the time, people display behaviours they would change if they only could see the bigger picture of the setting they are in.

A system can make people act in some undesirable ways but as people act in such ways, they maintain the system and its influence upon the others, partly causing the system of undesirable behaviours to regenerate itself.

There does not need to be an external reason for the particulars of a system, yet people in the system can feel helpless regarding their possibilities of changing the system.

In most systems, each subject separately reacts to the system without seeing the cumulative overall effect of the reactive behaviours on the others.

The System Concept

By a system we mean a structure which is characterized by and exhibits a number of the following features.

1. A system is defined by its elements, interconnections and relations and their boundaries. The state of a system is represented by the values and modes its elements are in

2. A system has properties that cannot be reduced to properties of its individual parts i.e. a system has emergent features

3. Minor changes in the interaction rules or interconnections in a system can have essential, complex and often unexpected consequences.

4. A system is always defined with respect to the point of view selected and its boundaries can always be extended and narrowed down as a result of a change in the point of view.

5. A system has generative power in the sense that its overall behaviour cannot necessarily be controlled by the inputs / decision variables available or assumed.

Systems are composed of different types of elements interconnections and feedback mechanism which can be human, social, cultural, physical, economic as well as communicational and informational.

Examples of human systems include:

Family, Friendships, School, Village, Society, Organization, Company, Industry, Administration, Traffic, Internet, Global economy

Even if a system mainly consists of human agents the overall behaviour can be determined by the seemingly invisible non-human elements included which represent active or inactive physical entities and structures such as dynamics caused by time delays or sequential communication patterns.

System Paradoxes

Most managers want to support their team members more than they currently do. Most team members would want to get more support from their managers. Yet more support does not result. There seems to be a non-support system generator in place.

Most husbands would want to be more romantic with their wives. Most wives would want their husbands to be more romantic with them. Yet more romantic behaviors do not result. There seem to be a non-romantic behavior generator in place.

Most lecturers would like to give their best in a given lecture, also when people seem restless and even negative and come in late. Most people in the audience would like the lecturer to give her very best, even at a lecture for which he came late and might not seem that focused early on. But the lecturer cannot give her best, the audience does not receive the best, and everyone is disappointed. There seems to be a lousy-lecturing-behaviors generating system in place.

Most people in the industrial world would like to produce less waste. Most companies would like to produce less waste. But more waste is produced. There seems to be a waste-generating system in place.

Most adult readers would like to see more responsible, holistic and broadly-minded journalism. Most journalists would like to produce more responsible, holistic and broadly-minded journalism. But the opposite seems to happen. There seems to be a system in place that generates relatively irresponsible, fragmentary and narrow-minded journalism.

Saarinen has explored this paradox in the context of his lecturing as a Philosophical Practice, i.e. as an effort to provide platforms of change, reflection and renewal for people attending the lecture (Saarinen and Slotte 2003). The experience is that people find it easy to identify such paradoxes from their everyday life. Furthermore, becoming more aware of such paradoxes helps many people avoid the traps involved, often with astonishing results.

Change in thinking produces changes in the way a husband sees his wife (the manager her team members) and vice versa for the wife (or the team members), thus leading to behavioral changes. This reinforces belief in the possibility of change in a crucial area of one's everyday life where most people assume genuine change is almost impossible. The four dimensions of change are:

Mental change

Perceptual change

Individual behavioral change

Change in the collaborative system such as marriage, work team, etc.

The research group lead by Raimo P. Hämäläinen (2003) has studied extensively the modeling of cybernetic and other dynamic structures as well as the mathematical models of decision making, competition and co-operation. What we call Systems Intelligence started as an effort to combine the concrete-life oriented approach of Esa Saarinen's Philosophical Practice (Saarinen 2003) with Hämäläinen's systems research and thinking. The first thoughts were described in the volume of our student essays (Bäckström et.al. 2003).

The Moral of Systems Intelligence

Systems Intelligence is about the betterment and improvement of human life. The idea is to take the ancient promise of philosophy seriously, the one that called for the Good Life, and to use a systems oriented approach to point practical steps to the creation of such life.

Surprisingly, the cause of the good life has not occupied the central focus of psychology or of philosophy in the past decades. Notable exceptions are de Botton (2000), Comte-Sponville (2001) and in psychology the work of Seligman (2002).

We believe our organizational behaviors, family life, individual lives, communal lives and co-operation in general can be improved enormously by relatively simple, even trivial means. The moral driver of Systems Intelligence is the creed that such profound changes of utmost human relevance hinge on the lack of Systems Intelligence.

Examples of Systems Intelligence in Action

Someone presents an astonishing proposal.

Low Systems Intelligence Someone reacts: "That is so stupid and so wrong".

High Systems Intelligence Someone continues: "Striking. Tell me more."

A lady is at home with his boyfriend. They watch tv. Suddenly the boyfriend picks up the remote control and switches the channel.

Low Systems Intelligence: The lady says: "What do you think you are doing, Mr. Wise Guy?"

High Systems Intelligence: The lady says: "Was this our decision?"

Much of what Senge describes as "inquiry mode", as opposed to "advocate mode" can be understood in terms of high Systems Intelligence.

A guy has a drinking problem.

Low Systems Intelligence: The guy gets furious any time his lady suggests he might have a slight drinking problem.

High Systems Intelligence: The guy turns to his lady and says, "How could we work on this major personal problem I have?"

We propose that the following forms of change-creation should be conceived in terms of Systems Intelligence in action:

Job rotation, as a result of which people gain deeper understanding of the whole organisation

The mirroring technique of certain forms of family counceling, where both parties are asked to repeat what the other just said, in order to show he or she has understood and is willing to listen to what the other just said (see e.g. Hendrix 1990).

Parents talking to their child well before she shows any signs of learning a language.

The first two axioms of to Alcoholics Anonymous (1939) that say: "We admitted we were powerless over alcohol – that our lives had become unmanageable" and "Came to believe that a Power greater than ourselves could restore us to sanity". For a discussion of AA from the systems perspective see Gregory Bateson, "The Cybernetics of 'Self': A Theory of Alcoholism" in Bateson (2000).

Virtues as Intelligence for Practical Life

 "We are what we repeatedly do. Excellence, then, is not an act, but a habit." (Aristotle).

Systems Intelligence links with the ancient promise of philosophy that challenged people to ask: How to live a good life? Systems Intelligence aims to enhance the prospects of good life and in doing so it relates to what Aristotle called practical reason rather than theoretical reason. The theme of Systems Intelligence is a "know how" rather than "know that". The understanding required will be judged by its practical outcome and manifestation in conduct.

Traditionally, virtues were perceived as excellencies of life. Virtues such as wisdom, courage, prudence, justice, politeness or mercy related people to other people around them as well as to the

bigger picture of life. When people strive to be virtuous, they produce a better city together – a better whole, community, a better system to live in.

Virtues are Systems Intelligence. They point the subject's perspective and actions beyond her immediate benefit and egoistic concerns to a whole-in-the-making, with the possible outcome of contributing successfully to the workings of that whole.

The more we deal with other people in our environment without clear-cut roles or command-and-control, the more productivity is productivity-together, the more we need the ancient approach of a good life through internal motivation.

In innovation economy, we need virtues. We need Systems Intelligence.

Seeking an Impact on Thinking

Karl Marx: "Philosophers have only interpreted the world. The point, however, is to change it." (see Marx 1998).

Systems Thinking starts by viewing the environment and one's involvement with it in holistic terms. The environment and one's place in it are perceived in terms of interconnectivity and interdependence rather than separation and disconnection.

But as pointed out in the Systems Thinking literature, our conceptual apparatus, as well as our established ways of perceiving the world, are severely biased against such an approach. The temptation is to conceive the world in terms of separate "things" rather than in terms of systems and interconnections.

Systems Thinking can be defined as the theory, methodology and practice of perceiving and operating in terms of holistic structures. Anti-reductionism and holism characterise the world view of Systems Thinking.

The systems perspective wants to see the world as composed of systems, to examine these entities as wholes and assumes the wholes to be primary to their parts.

Yet wholes are abstractions. They are mental constructs which are relative to the perspective adopted. As a result, there is a relativistic and perspectival undercurrent in Systems Thinking. Boundaries of a system can always be redrawn.

The human being perceives the world around herself in many ways as static and unchangeable. Systems perspective explains some of this by reference to hidden dynamic systems that generate state of equilibrium and play down short-term change.

Systems Intelligence in the sense in which we conceive it wants to push Systems Thinking towards action and concrete, actual life. The effort could be described as follows:

1. Systems Intelligence follows Systems Thinking in setting out from the primacy of the whole, from acknowledging interconnectivity, interdependence and systemic feedback as the key parameters.

2. Like Systems Thinking, Systems Intelligence wants to account for change.

3. Unlike Systems Thinking, Systems Intelligence is primarily outcome-oriented and not a descriptive effort; it is intelligence-in-action on its way to create successful systemic change.

Systems Thinking is an expert discipline and a field of theoretical study and the literature can be technical and thus remain inaccessible to the layman. While not dismissing the significance of such a study, our aim with Systems Intelligence is to make it an applicable approach. We seek to have impact on people's thinking, and not merely to describe ideals for thinking. One might observe with regret that contributions to the theoretical understanding of Systems Thinking, or Systems Intelligence, might not amount to any increase in Systems Intelligence, any more than contributions to academic philosophy typically results in an increase in philosophical reflection in the actual conduct of people's lives.

Personal Mastery

Peter Senge's groundbreaking book *The Fifth Discipline* (Senge 1990) identifies five key themes as cornerstones of learning organisations:

I   Personal Mastery

II   Mental Models

III Shared Vision

IV   Team Learning

V   Systems Thinking.

We propose Systems Intelligence is the link between I and V. The way we see it, Systems Intelligence is Systems Thinking having become an integral part of a person's Personal Mastery. Like Senge's Personal mastery, it is about the way a person conducts her life, and at the same time, it is about Systems Thinking, i.e. the focus is on the impact and workings of the holistic and systemic structures that encompass the environment of the person.

The way we propose to interpret Senge's notion of Personal Mastery is: Personal Mastery is the ability of an individual to use her unique potentials as fully as possible to the enrichment of good life. Thus understood, it is clear that one's ability to manoeuvre successfully in the various systems structures that constitute the environment, is a key component in Personal Mastery.

This is Systems Intelligence. More generally, it is hard to see how Personal Mastery in Senge's sense could be possible without Systems Intelligence.

Mental Models

Behaviour is a function of one's models of thinking and of what Senge calls "mental models". Our mental models determine what actions are considered necessary and possible. They are a key driver for the human being in her actions. The aphorism, "As a man thinketh in his heart, so he is" (Allen VUOSI?) highlights this familiar fact. Thinking transforms into actions, and repeated actions into habits. Eventually, thinking and habit constitute the person's mode of being and personality.

But as observed by Senge and others, we are mostly unaware of our mental models, i.e., the modes of thinking that govern and direct our actions.

What kind of mental models support System Intelligence? We propose that particular attention should be focused on:

Mental models that relate to one's self-reflective behaviour and to meta-level mental models in general: - "Can I change my thinking", "Is there always a possibility that my thinking might be one-sided"…

Mental models that relate to belief-formation. - "How am I an active subject in the constitution of my beliefs"...

Mental models that relate to the subject's beliefs regarding the beliefs of others. - "Could it be that she does not convey her meaning accurately in her actions; Could it be that her way of talking hides her true aspirations"…

Mental models that relate to co-operative possibilities. - "Could we succeed spectacularly together"; "Have we reached the top"…

Mental models that relate to possibilities of human change. - "Could I change at the age of 52", "Is mesmerizing love still possible as a trill after all these years"…

Our beliefs reflect our experiences but are also influenced by highly idiosyncratic coincidences. Our beliefs could be something dramatically different from what they are now, had certain particular incidents not occurred. In particular, our beliefs regarding other people in our neighbourhood as well as *their* beliefs, could be different from what they are. Yet we believe, regarding our entire mental realm, that it rather accurately simply mirrors the actual states of affairs.

One's beliefs might seem unchangeable and yet they can be subject to massive redefinition in an instant. You come home one day, and suddenly everything is different – because your mother has died, because you almost drove over a kid running after a football, because you have found a new love from an old school mate, or perhaps because you have simply thought about the words of a familiar song with insight and sudden inspiration.

To the extend beliefs determine action, the possibility of change in beliefs amounts to a major window of opportunity of change for the individual in question. It is because of this that Systems Intelligence, as skilfulness in complex systems environments, will call for the ability to change beliefs and ability to work with one's mental models.

Belief management accordingly, becomes a cornerstone of Systems Intelligence. Systems Intelligent people can manage their belief systems better than those low in System Intelligence.

We acknowledge two particularly critical dimensions of belief management:

Thinking about one's own thinking, and realising the opportunities therein.

Thinking about what others are thinking, and realising the opportunities therein.

Thinking about Thinking

Thinking about thinking is a meta-level capability fundamental to man as a self-corrective system.

Thinking about thinking is a key to learning systems intelligence. This involves the following:

1. Acknowledging that one's action and behaviours are a function of one's thinking (mental models, beliefs, etc.);

2. Acknowledging that one's thinking is likely to be highly idiosyncratic, one-sided, egoistical and a far cry from an accurate, multidimensional grasp of the bigger picture; the holistic system around self is likely to be mirrored in one's thinking only partially and possibly in a highly distorted form.

3. In order to act more intelligently in the holistic systemic environment, I need to mirror mental models and engage in meta-level thinking regarding my own thinking, in order to change my behaviours and actions to be more in line with my true aspirations, interests and the parameters at hand, as defined by the environment in which I operate.

4. One's framing of the environment and its holistic, interactive systems is likely to be severely subjected to idiosyncratic limitations. Meta-level reflection on my own framing systems is thus a particularly promising path to more intelligent behaviours in the context of such systems.

It is a well-known fact of cognitive science and creativity research that re-framing is a key to creativity. Thinking about thinking is about identifying one's favoured framing patters, challenging them and adjusting them accordingly. It is clear that the possibilities to re-frame the holistic, feedback-intensive structures around self, as well as their relation to self, are literally enormous. At the same time one is likely to have gotten stationed to some particular framing.

A Systems Intelligent person will acknowledge the limitations of her thinking and mental models particularly when it comes to conceiving the interactive environment, looking for fresh openings through challenging her own thinking.

Systems Intelligence begins when the person starts to re-think her thinking regarding her environment and the feedback structures of that environment.

We Have a Dream

Our views might be distorted regarding our environment. Our views might be distorted regarding what people are like – team members, the boss, key customers, our spouse, our aging father.

As a result, we approach a situation from an angle that might trigger negative reactions in the other people involved. Seeing the reaction, we react accordingly. A self-maintaining and self-verifying system takes over. If nothing from outside disturbs the system, it can reach a seemingly unalterable state, and all people involved believe that their picture of each others is totally accurate – in perceiving others as fundamentally negative, down-putting people. "It is a little miracle I can survive in the first place in the company of such frustrated and cynical people."

You might entertain the dream of having totally different type of people to work with, a different spouse and different personalities in you immediate neighbourhood. How different you could be, how much the true yourself – so generous and so caring, so attentive and so productive. If only the others would be different.

But other people around you might have exactly the same dream – in fact, this is what they are likely to have.

A major motivation for the work at hand comes from the experience of Esa Saarinen from the context of his company lectures (Esa Saarinen 2003). In the course of his hundreds of lectures and seminars for all kinds of companies and organisations for over a decade, it became apparent to Saarinen that 95 % or more of all people in any organisation want the same kind of humanly relevant qualities from their everyday – qualities pertaining to human basic behaviours such as listening, humour, empathy, presence, expressing gratitude, showing respect, etc. No matter how easy it is to generate such behaviours technically, people do not get it, due to the nature of the interaction patters of their everyday.

It seemed appropriate to ask, how can people get caught in seemingly unalterable systems that lead people to deliver behaviours almost nobody wants to be faced with nor to produce at a deeper level of their aspirations.

This is the question of Systems Absurdity as opposed to Systems Intelligence.

Seeing the Situation through the Eyes of Another Person

"Systems thinking starts when a person looks at the world through the eyes of another person." (West C. Churchman 1968)

Becoming aware and exploring the views of other actors and from the outside perspective is one way to enrich ones own viewpoint. Exploring the views of others is one way to grasp features of the system in a given situation, and to understand ones own input into the system.

The following techniques are likely to be of particular use for a enhancement of Systems Intelligence:

1. Inquiry-mode in the sense of Senge as opposed to "advocate mode"

2. Dialogue techniques.

3. Listening to –techniques.

Such techniques have been described in the literature intuitively and technically but notice that ultimately the question concerns age-old human behaviours that are not technical at all. We might be able to force ourselves to see the world through the eyes of our spouse better as a result of a family therapy weekend that teaches us a "Listing to Your Lover" –techniques. That escape from the current system of interaction with your spouse might be welcome but it does not change the basic fact that it is the system that counts – more so than your individual needs, aspirations and even love in your heart.

Systems Intelligence is about compassion and love that makes good pragmatic sense.

Seeing Oneself in a System

"The human experiences himself, his thoughts and feelings as something separated from the rest – a kind of optical delusion of our consciousness." (Albert Einstein, quoted in Senge 1990 p.170)

There is a difference in how people see themselves as opposed to how they see other people. We do not observe ourselves as we observe other people. We do not judge ourselves the same way as we judge others. Self-centeredness is a prominent feature of the human perceptual apparatus and of our mode of thinking.

It is this self-centeredness that Systems Intelligence tries to challenge. In Systems Intelligence

1. The agent perceives herself as part of a system environment, breaking away from her own limited personal perspective in favour of a more holistic perspective;

2. The agent, perceiving herself and her environment from a systems perspective, acts intelligently in that system.

As pointed out in Systems Thinking, cognitive science and philosophical literature repeatedly, our mental apparatus tends to want to decompose the observed reality into separate disjoint categories. Bipolar subject-object distinction lurks deep in our conceptual apparatus.

In bipolar subject-object thinking, the person either perceives herself to be a subject that acts upon an external system, seeking to cause an impact, or else the environment as a subject acts upon her as an object. Notice that when an agent in a system (an employee or employer in a work-system, husband or wife in a marriage-system, parent or a child in an upbringing-system) perceives herself in these modes, her options of rational behaviour are immediately restricted.

In Systems Intelligence, the agent operates with a far vaster universe of options for possible behaviours:

1. Me as a subject operating on an object

2. Me as a subject reacting to having been treated as an object

3. Me operating in a system with an impulse that changes the system.

4. Me and the others forming a system, with my perspective as focused on changes in the system as helped by potential leverage as created by the other agents and the system.

The child gets mad and throws herself on the floor. High Systems Intelligence mother, instead of getting angry at her or trying to calm her down by pointed calm and rationality, also throws herself on the floor and pretends to act like a child in rage. The High Systems Intelligence mother is likely to stop the child from acting in rage. Her surprising behaviour changed the system.

A manager is not satisfied with a team member and tells about the problem. The team member reacts very negatively. The High Systems Intelligence manager listens to the angry team member and gives him an extra bonus salary but still confirms the need for a change.

Seeing oneself as part of a system is likely to involve the following aspects:

1. The impact of one's behaviours and possible changes in interaction patters upon the behaviours and possible interaction patterns of other agents in the system.

2. The impact of one's behaviours and possible changes in interaction patters upon the behaviours and possible interaction patterns of other agents in the system, as these feed back to my behaviours and possible changes in the interaction patterns.

3. The impact of the current system on all of us, in the long run.

4. The impact of one's behaviours and possible changes in the interaction patters upon the behaviours and possible interaction patterns of the other agents in the system, as these feed back to my behaviours and possible changes in the interaction patterns, in the long run.

5. The modes of adjustment that I have already adopted as a result of conformity, history, established practices and flat thinking.

6. The modes of adjustment that others have already adopted as a result of their conformity, history, established practices and flat thinking.

7. The desired ideal state I would like to reach with others.

8. The dream we might share.

Change Optimism

Change starts somewhere. The start might be incremental. But it might amount to huge restructuring of the fundamental aspects of some aspects of people's way of being and acting – because of the leverage created by

change in the system

change in the way people perceive other agents of the system

change in the way people perceive their own possibilities of acting within the system

change in the way people perceive the likely structure of the system in the longer run.

When Ms. Rosa Parks refused to give her seat to a white man in a Montgomery city bus in 1955, most people had not heard of Rosa Parks, considered bus lines a routine matter, did not perceive the city of Montgomery as anything particularly striking and the question of a particular bus seat on a particular bus leg is a minor question among millions of such for most people of the United States and in the rest of the world. But as Rosa Parks was arrested the civil rights movement got an impulse into its system that eventually would change the entire system of race distinction in the most powerful country in the world.

"The moral, rhetorical, and political brilliance of Martin Luther King, Jr.", write Paul H. Ray and Sherry Ruth Anderson in their *The Cultural Creatives (2000)*, "was his ability to expose the old frames and to reframe segregation as an *American* problem." (p. 120)

Our philosophy of change is optimistic because of the possibility of latent beliefs in people around us that do not show up in their actions but which might actually express their deeply held aspirations, should they have a chance to come out. Such a chance could be provided by people around them, but all of them hold back, each of them individually, thus creating a system that nobody endorses.

Beliefs are distinctive in having a fundamentally ephemeral essence. They can be changed dramatically, massively, instantaneously and with incremental input. For Systems Intelligence, this is a tremendous possibility as people's beliefs affect their actions and therefore other people.

The dominating paradigms of change conceives change in terms of notions such as

linear cause-and-effect

hierarchy

control

predictability.

Systems Intelligence focuses on changes as leveraged by the system. Because the system itself can change as a result of a small intervention, there is a possibility of enormous leverage built into the system.

Systems Intelligence acknowledges that beliefs influence actions and actions influence beliefs. But one might be massively misguided with respect to the representations of what the others truly believe. There might be a systematic flaw in the way a group of agents perceives the way others think and what they truly want. As a result, the possibilities of co-operation among the whole group might be severely curbed as a result of the beliefs each has of the others as participants of the currently prevailing and dominating system.

Systems Intelligence is based on a principle of dynamic humbleness which acknowledges that my perspective on others might be drastically mistaken, particularly regarding what the true aspirations of those others might be. A relatively small change, an incremental and even trivial change in my behavior might intervene with *their* beliefs regarding me, and thus trigger a chain of changes in the actual behaviors in each of us and in the system we form together.

To the extent there is a veil of ignorance in our beliefs regarding the beliefs of others in the system, there also is a possibility of a cumulative enrichment and improvement. Systems Intelligence is a philosophy of realistic optimism, based on acknowledging the possibility of such upward-spiraling systems.

This sort of leverage thinking is often bypassed. It amounts to an articulation of some of the seemingly miraculous mechanisms of actual change. Senge (1994) for one points out in *The Fifth Discipline* that "Small changes can produce big results – but the areas of highest leverage are often the least obvious" (p. 63). The highest leverage points might indeed be hiding because they are likely to lurk in the shadows of the beliefs systems of oneself and others plus in the subtle system of interconnections we make up together.

Without going into the details, we observe that many key successes of so-called Brief Therapy (Haley, 1986) and other solution-oriented forms of therapy (Baker, 2003) can be understood in terms of changes in belief systems and in terms of Systems Intelligence.

Changing the System

Bringing about change in a system is likely to take one of the following forms:

Intervention or disturbance from outside (external catastrophe; major change in the market situation; the doctor's diagnosis that you have cancer)

Intervention from within the system such as: the boss surprisingly stops and suddenly listens; the husband comes home and without taking his coat off, but taking his shoes off, goes immediately to hug

his wife of 20 years; the CEO of a supplier calls the customer's lower level people in order to hear it straight from the front line; Head of Soviet Union Mr. Hrutschev taking his shoe off and banging the table with it on the United Nations General Assembly.

Internal change of a relationship such as: the supplier and its customer decide to share the same physical site for their joint actions; President Nixon visits China; husband and wife agree to listen to each other for a minimum of ten minutes each day.

Planning ahead; scenario working.

Communication with other agents in the system.

Optimism is a cornerstone of our change philosophy due to the fact that changes in a system are often the result of a relatively small disturbance.

Higher Order Change

In their classical work *Change*, Paul Watzlawick et.al. (1974) conceptualise change in terms of a type theory. They follow the ideas of Gregory Bateson (2000) in what has become a groundbreaking work in the field of short therapy:

"To exemplify this distinction in … behavioural terms: a person having a nightmare can do many things in his dream – run, hide, fight, scream, jump off a cliff, etc. – but no change from any one of these behaviours to another would ever terminate the nightmare. *We shall henceforth refer to this kind of change as first-order change*" (Watzlawick et.al. 1974, p. 10, their italics). "Waking, obviously, is no longer part of the dream, but a change to an altogether different state. *This kind of change will from now on be referred to as second order change.*" (p.10-11, their italics).

A first order change takes place within a type, while a second or higher order change takes place among alternatives each of which consists of lower order possibilities.

In many cases the first order change is superficial, illusory or non-effective. It might amount to not more than running away from the true problems at hand, and the necessary changes of a deeper level that in fact are called for.

Very often, an effective change will involve a change in the perspective regarding the way the problem is perceived, and with that will involve a shift of thinking that introduces possibilities of change of a higher order.

Similar distinction is helpful when conceptualising possible solutions to a problem one faces. A solution might be superficial and only temporarily hide the real problems, yet it might seem natural and advisable given the alternatives. We might fail to look for genuine, more productive solutions because they are situated in a box or category of a different type. We might fail to perceive them, because they might point to directions we are not accustomed to taking. They might seem to carry a cost in the short run and only pay off in the long run. They might seem counterintuitive or challenge some deeply held convictions of the given industry. They might involve us getting out of the box – the box of alternatives as they present themselves seemingly exhaustively right now.

For instance, if a person with a canoe tries to fight a strong current by struggling to slow down by sticking the paddle between the rocks, trying to choose the right rocks, the current is likely to defeat the

paddler. The most successful way to paddle in a foaming current is to paddle faster than the river. But this might seem counterintuitive to a layman who reacts to speed already too high.

Systems Intelligence is about getting out of the reactive loop and onto the tracks of higher-order possibilities. A systems intelligent person acknowledges the fact that her perception of the system in which she operates might be distorted, one-sided or mistaken. She is constantly on the look-out for possible redefinition of her very perception of the system – for possibilities of a higher order.

Explosive Possibilities of Co-operation

A person's beliefs about co-operation are a limiting factor on her conception of, perception of and success in human interaction. They limit her Systems Intelligence.

How an individual acts with other people, approaches them and frames herself and the situation are all influenced strongly by his co-operative beliefs. The urge to make room for new forms of co-operation is a major driver of Systems Intelligence.

An illustration provided by Jukka T. Bergqvist, a senior executive in the Nokia Corporation, will illustrate the kind of possibilities we have in mind here.

Let us consider a project team consisting of six persons. They meet in a meeting room:

1 1 1 1 1 1.

In the meeting room they interact meaning that their individual effects multiply. Let us illustrate this phenomenon or overall impact of the interaction by multiplication:

$1 \times 1 \times 1 \times 1 \times 1 \times 1 = 1.$

In real life, however, things do not work that way, given the perceptions and beliefs that people have about one another.

Let us use a story to illustrate the case. Imagine a situation where the first person to come into the meeting is a Finnish engineer, Jaska, 50 years of age. Technically a top originally present by specialist but somewhat introvert and not comfortable with the spoken English language. As he comes in, he is thinking about Mark, 32, an Australian engineer. Like many of these Aussies in Jaska's experience, Mark is incredibly self-assured and articulate – he speaks his own mother tongue – a tremendous man-of-the-world who believes he knows everything. Arrogant guy, Jaska finds him, a person who never listens, particularly someone like himself who is a pretty awkward with his spoken English. Jaska is put down by this advance projection, losing some of his excitement and best energy. Some 20 % of his best edge is cut off and he enters the room as 0.8.

Mark is approaching the room through another corridor, already put down by what he expects the meeting to be. These Finnish technical guys, such a depressive lot. They might be pretty good technically but you would expect them to be able to say something without three beers. I'm tired of sitting in the saunas all the time, in order to have a discussion, Mark thinks. I try to be a little bit provocative in order to open the discussion but usually to no avail. He loses some of his best edge, say 20 % and enters the room as 0.8.

A lady is also coming in, quite feminine, a controller, who finds it irritable that she always has to act like a "tough bird". She can do it, but she loses some of her sensibilities as a result. She is a loving mother of two fabulous children but she can never talk about her children, not with these guys that act so touch and work-achievement oriented all the time. She loses some of best energies, say 20 %, and enters the room as 0.8.

A senior 54-year old market guy also shows up, a bit weary because he knows what this meeting will be like. These young hungry lions. They believe they command the world. To be sure, he himself is not quite so eager to board the next plane to HK as in the old days. But you would expect there to be some respect for experience in our company. But no. He loses some 20 % of his best creativity and enters the room as 0.8.

Each enters the room as 0.8. They interact as 0.8's but interaction multiplies the effects. Thus the actual outcome is

0.8. x 0.8. x 0.8 x 0.8 x 0.8 x 0.8 x 0.8 = 0.26.

This is a far cry from the 1 they could have achieved as an outcome. But even more, there would have been the higher-order possibility all along for Jaska the Finnish guy, when coming to the room, to think how lucky it is that Mark could make it. That guy is so quick on his feet. A tremendous articulator. He knows that when it comes to the technical side of things, I'm pretty good. Jaska the Best he calls me. And he knows I'm not that comfortable with my English language nor with situations where you have to impress a lot of other people. It's great to have Mark by my side, Jaska thinks. He enters the room as 1.2.

How lucky I am, Mark is meanwhile thinking, to have such colleagues. Colleagues such as Jaska the Best. A bit shy, Jaska is, a bit innocent even – a tremendous guy of integrity. It feels great to be able to contribute in so many ways, not only as a professional – my articulation powers are an additional bonus here, something I never thought of when working in Australia. He approaches the room as uplifted by his projection of the immediate future, getting a boost of some 20 %. He is 1.2.

Each enters the room as uplifted by the projection they have of one another. They start to interact, but interaction multiplies the effects:

1.2 x 1.2 x 1.2 x 1.2 x 1.2 x 1.2 = 2.98

Systems Intelligence is based on the assumption that human interaction is a system of tremendous leverage, i.e. that the possibilities avoiding 0.26 and reaching 2.98 are always there, by positioning oneself not in the 0.8 but in the 1.2 mode.

But the upscale possibility what we here represent by the 1.2. mode and 2.98 outcome most often goes unnoticed because:

People do not see themselves as parts of interactive systems but they see themselves as individual agents affected and limited by others and the interaction patterns of the environment misperception of one's relationship with the environment;

People do not see themselves as parts of interactive systems which systems could change and raise each to a higher level scepticism of the possibilities of massive positive change in other people and the system;

People do not see themselves as parts of interactive systems which systems could change and raise themselves to a higher level - scepticism of the possibilities of massive positive change in oneself.

Collapse of Systems Intelligence

There is a number of limitations for the growth of Systems Intelligence. The bugbears of systems intelligence include:

1. Static State Thinking.
Failure to test different perspectives i.e. system models in action. The world is not a collection of individual states. The world is not static. But one's mental models, modes of thinking and talking, patterns of conceptualisation and of discourses might presuppose otherwise. Systems Intelligence presupposes focus on progression, possibilities and change.

2. No-Growth Thinking.
If no growth is possible, no need to look for it from within or from surrounding systems of interaction and feedback.

3. Mechanic Improvement Thinking

Focuses growth to technical arrangements only.

4. Command and Control -Thinking

5. Status Quo Contentment Thinking

If all is well already, no need to seek out fresh perspectives and avenues for growth.

6. Elementalism and Individualism.
Seeing people as insulated objects narrows perception. It leaves out processes and wholeness, so that one does not see systems and their interaction, feedback and generative impact.

7. Cynicism

Systems Intelligence presupposes the possibility to improve interaction. Perceiving the fundamental role interactive systems for each, Systems Intelligence is a philosophy of optimism and faith in life, as opposed to cynicism, which assumes there is an upper limit to everything that can be done and to everything that people can become together.

Systems and Game Theory

Some of the basic systems theoretical concepts (see e.g. Luenberger 1979, Rubinstein 1986) are useful when describing systemic phenomena and situations of the kind we are here exploring.

In systems theory a system is defined by first identifying the system inputs, i.e. the control, decision or stimulus variables and the system output variables, i.e. the responses or reactions. There can also be exogenous inputs sometimes called disturbances. An input causes the state of the system to change. The term forcing function is also used for the input.

The outputs of a system are the variables that we observe directly. The state of a system consists of the state variables representing the elements in the system. The real system and its state representation model need not to be the same. One can have different state representations for a given system. An element in a system can also be a subsystem. The states and the inputs determine the future behaviour of the system.

Elements and subsystems can be interconnected in different ways. Feedback refers to a connection from an output variable to an input variable. A feedback connection is often included in order to stabilize, i.e. regulate the state and output to given desired goal values. Negative feedback acts to decrease, i.e. to stabilize the deviations from the goal. Depending on the system structure a strong negative feedback can also result in a too strong corrective response, which results in instability. Positive feedback loops act to increase deviations and are usually destabilizing.

A system is adaptive if it is able to learn and accommodate changes in its parameters by itself.

Typical dynamic elements in a system represent phenomena such as time delays, integrative accumulation or the build-up of potential.

A system is controllable if we can bring it with the available control variables from one state to any other state in a finite time. A system can have subsystems or elements which are not dependent on the controls used. This means that all changes in the system state cannot be achieved by the inputs (decision, control) available. In an uncontrollable system the structure can be the reason for behaviour i.e. then the structure produces behaviour.

A system is observable if one can identify the state of the system in a finite time by observing the system output under changes in the input. Systems are not necessarily identifiable unless forced or disturbed with sufficiently rich inputs.

Systems can have triggering states or controls which lead to a bifurcation path with a completely new overall behaviour. Such phenomena are called chaotic. Systems can also be trapped in limit cycles where the behaviour oscillates back and forth around a focal point.

Systems which consist of independent goal seeking agents can be described by game settings. The overall behaviour depends on the form of agent interaction. When each agent always reacts by one sided optimization the result is the generation of a prevailing non-cooperative Nash equilibrium becoming the status quo from which change is not possible. A famous problematic phenomenon and paradox of game theory is called Prisoner's Dilemma. In this situation the agents end up in an inferior non-co-operative equilibrium solution even if a jointly dominating solution would also be available. However, in evolutionary process and human systems we often observe the spontaneous emergence of the evolution of co-operation generating superior dominating overall behaviour for all the actors. A system can also include a coordinator who is able to introduce rules or interactive mechanisms to induce co-operation by imposing controls which are conditional on the actors' own behaviour. Such incentives can produce stable self enforced co-operation. For related literature see Smith 1982, Axelrod 1984, Simon 1990, 1997, Gigerenzer and Selten 2001, Smith 2002.

Future Research Agenda

The concept of Systems Intelligence as outlined here naturally calls for researchers and practitioners from different disciplines to start working both to enrich the concept and report and analyze its practical manifestations in different realms of life including education, organizations, counseling,

leadership and personal growth. It will also be very interesting to analyze the evolution of human social behaviour and cultures from the Systems Intelligence perspective. The Systems Intelligence web site (Hämäläinen and Saarinen 2003) will provide access to our future work in this area.

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