

Systems Intelligence: A Key Competence for Organizational Life

Raimo P. Hämäläinen and Esa Saarinen



Raimo P. Hämäläinen



Esa Saarinen

We all have to act without knowing for certain what our choices will bring. We cannot seize a situation or stop the flow of time in order to analyze the various underlying patterns of the system in which we are embedded. And yet we all wish to act intelligently – indeed, we must.

By *systems intelligence*,¹ we mean intelligent behavior in the context of complex systems involving interaction and feedback. A person acting with systems intelligence engages successfully and productively with the holistic feedback mechanisms of her environment. She experiences herself as part of an interdependent environment, aware of the influence of the whole upon herself as well as her own influence upon the whole. With this heightened awareness, she is able to act intelligently.

We believe that systems intelligence is a higher-level cognitive capacity, similar to the many forms of intelligence Howard Gardner identifies in his theory of multiple intelligences,² and that it can provide a significant fresh approach for organizational learning practitioners. The systems intelligence approach acknowledges the systemic nature of the external world, but its main emphasis is on the concept of a system as part of the *human* experience and orientation. A “system” is a generative frame within which a subject experiences her life as taking place. The system moves, pushes, restricts, conditions, encourages, suggests, seduces, and commands: It seems to have a will and voice of its own. There is no way to fully know what it is.

The human race clearly must have had some form of practical intelligence to have survived as long as it has. That intelligence must have demonstrated itself in *action*, as humans reacted to, adjusted to, and made use of sometimes rapidly changing circumstances. Insight, knowledge acquisition, judgment, and analysis must have had prominent roles in the success story of the human race, of course, but before them came action – action that must have been intelligent before being acknowledged by a rational subject *as* intelligent.

From Systems Thinking to Systems Intelligence

When we launched the systems intelligence project, our starting point was Peter Senge’s *The Fifth Discipline*.³ But we felt that a link between Senge’s discipline of “personal mastery” and his discipline of “systems thinking” was missing.

The systems intelligence approach basically takes Senge’s discipline of personal mastery and the systems *perspective* as fundamental, and considers the discipline of systems *thinking* as secondary. We feel there is an objectifying bias in systems thinking, a bias for cognitive rationality and external viewpoint. Systems thinking highlights a domain of objects it believes is neglected – systems. But systems remain objects nonetheless, entities to be identified

and reflected from the outside. The systems intelligence approach avoids this externalist trap. Another aspect of the descriptions of systems thinking we felt uncomfortable with was the negative impacts that systems are often portrayed as producing. In the beer game described in *The Fifth Discipline*, for example, the individual can never fully succeed. He cannot flourish. He can improve his game performance somewhat, but ultimately the system structure forces him to acknowledge failure.

Insight, knowledge acquisition, judgment, and analysis must have had prominent roles in the success story of the human race.

Similarly, the “system archetypes” of systems thinking focus on describing how things can go wrong when systems structures are not acknowledged. “Limits to growth,” “shifting the burden,” “eroding goals,” “tragedy of the commons,” and “fixes that backfire” all highlight the negative traps people can fall into as a result of not appreciating the relevant systems structures.

The systems intelligence approach, in contrast, focuses on *what people do right and could improve upon in systemic settings*. It assumes that people possess a kind of inherent pre-rational and pre-reflective systems thinking capability. The key idea is what we call *flourishment*, a capacity for flourishing, as opposed to simply avoiding pitfalls. Systems intelligence thus calls for a positive systems scholarship, and sides with “positive organizational scholarship”⁴ and “positive psychology”⁵ movements in its focus on human flourishing, in contrast to human malfunctions. Systems intelligence also reflects the approach of “action research.”⁶

Since we proposed the idea of systems intelligence in 2002, it has been applied to avoiding conflicts in environmental management, merger and acquisition issues, classroom pedagogy, themes of rewards and compensation, the theory of constraints, Sun Tzu’s writings, and management and leadership coaching, to name a few applications.⁷ During the past few years, the systems intelligence approach has become something of a movement in organizational life in Finland, discussed even on the chief editorial page of our major national newspaper.⁸

It Works in Practice, but Does It Work in Theory?

We began with the idea that it is essential to combine several perspectives that have traditionally remained isolated in academics and intellectual life:

1. *Philosophy of life* as an everyday activity reaching out to people irrespective of their background
2. *Systems perspective* with its emphasis on the whole and the complexity of the essential phenomena of human life
3. Human-centered *leadership for change* that builds on the hidden dimensions of human subjectivity, existential situation, and interaction
4. Appreciation for *humanly rich activities* such as sports, music, performing arts, and successful conduct of the everyday

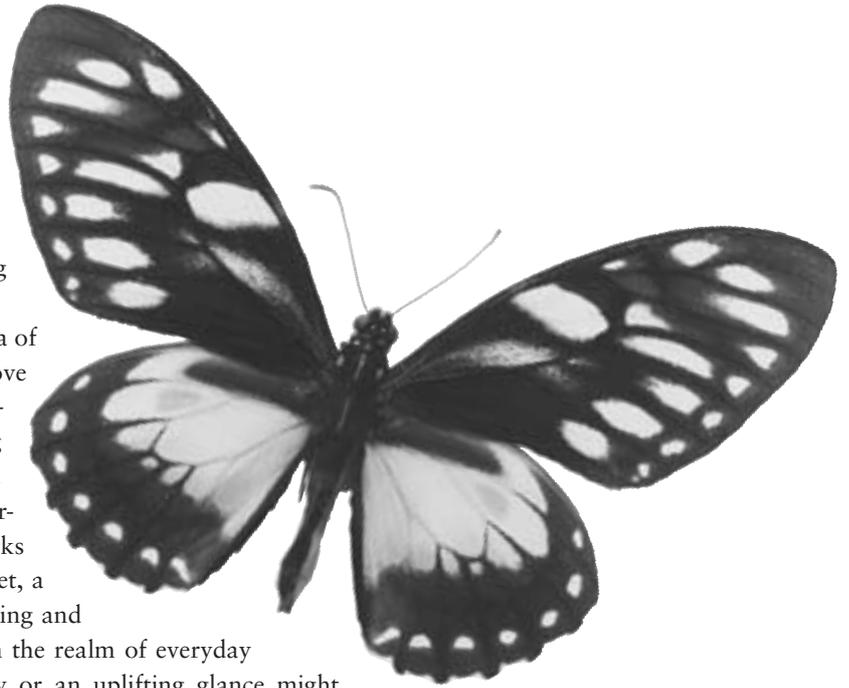
We were interested in human activities that worked, even when there was no theory to explain why they worked, or even a recognized need for a theory.

The starting point was pragmatic and emerged from an engineering mind-set. Raimo Hämmäläinen’s background is in engineering sciences and operations research (often referred to as the science of making things better⁹); Esa Saarinen is a philosopher whose interest has

been in bringing philosophy to everyday contexts and to organizational life. Like Hämäläinen in the decades of his tenure at Helsinki University of Technology, Saarinen has worked extensively with engineering organizations such as Nokia.

Engineering thinking is based on the idea of change. Make X work, it says, and improve upon what doesn't work. One uses rationality and creativity in order to bring workable solutions to a concrete reality. One celebrates success even when not understanding exactly why something that works does work. Thus, for an engineer's mind-set, a system that works comes first; understanding and explaining why it works comes second. In the realm of everyday life, a kiss or warm laughter, an apology or an uplifting glance might resolve a tricky situation in a relationship. For the mind-set of a "master of the everyday," what works comes first; understanding why it works comes second.

Such was our starting point. We were saying: Let's allow *the system's working* to guide us; let's focus primarily on the actual emergence of a human system instead of focusing on our cognitive maps of that emergence. And we assumed that human beings do just that, as part of their inherent orientation toward living intelligently.



Thinking* Pitfalls of Systems Intelligence

The systems intelligence perspective is radical because:

- It wishes to account for an individual's fundamental ability (intelligence) in a way that does not conceptually presuppose the subject-object distinction, but seeks to connect her with a situation, a context, and other people's realities – a system – considered as primary as the subject herself
- It wishes to account for an individual's nonrational, nonpropositional and noncognitive capabilities, such as instinctual awareness, touch, "feel," and sensibilities at large, as capabilities that relate the subject intelligently to a system (the situation, context, other people)
- It explicitly seeks out the positive dimension of life, assuming humans will flourish; assuming magnificent success, uplift, and growth to be fundamental human realities rather than mere positive exceptions

A key contrast between systems thinking and systems intelligence lies in our *refusal to take the outsider's view* of the systems being addressed. Causal loop diagrams, for instance, are not as useful in systems intelligence as they are in systems thinking. The systems intelligence approach says the primary situation is one in which the individual already identifies himself as being in the loop and does not step outside the loop to reflect on it in isolation. He does not necessarily know and perhaps will never know exactly what the loop is, and yet that is the context of his actions and of potential flourishing. How can he behave intelligently?

How can a human act intelligently (indeed, act magnificently) in contexts, in environments, and among other people – in systems – when *a veil of uncertainty is always present*? What can intelligent choice mean when one cannot step aside and sort out the options and their systemic impact? These are the key questions of the systems intelligence approach.

Our conviction is that human beings *do* possess such systemic intelligence. We believe people do own an almost miraculous means of access to the realm of flourishing. People are intelligent creatures, more so than is sometimes appreciated. Positive reciprocity works: It can bring about wonders, and its dynamics are intuitively appreciated by all of us. Let's focus on that! The point is not so much to teach people something new but to awaken a competence they already have. The systems intelligence movement helps people excel in something they have exercised already, often with considerable success.

Optimism for Change

Change starts somewhere. It might emerge from something trivial. And yet it might amount to a huge restructuring of the fundamental aspects of the entire system – because of the leverage created by:

- Change in the way people experience other agents of the system as a result of a small but significant change in others' behavior
- Change in the way people experience their own possibilities of acting within the system as a result of a small but significant change somewhere in the system
- Change in the way people experience the likely structure of the system in the long run

When 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 the bus system a technical matter, did not perceive the city of Montgomery as being particularly significant, and would have considered irrelevant the question of a particular bus seat on a particular bus leg. But as Rosa Parks was arrested, the marginal incident snowballed, creating an avalanche that eventually reached epic proportions. Change was going to reshape the entire system of race distinction in the most powerful country in the world.

Our philosophy of change is optimistic because of our view of people's beliefs and the functioning of their internal system. Our conviction is that many of the core beliefs of the

A Systems-Intelligent Organization

- Empowers people to share their mental models of the organization and to consider the effects of their own actions on the whole
- Fosters and sustains inquiry mode and reduces advocacy
- Keeps down fear factors
- Helps people be responsive to flourishing initiatives
- Builds trust in the goodwill of others
- Sees that its production capacity is not restricted to the measurable variables but is extended to the world of emotions and well-being
- Elevates innovation within an environment where emotional variables do not limit performance



people around us do not show up in their actions. The actions reflect the assumed nature of the current system. People have adjusted to *what they believe is the system* – e.g., to the way whites regard blacks. But when the system is shaken, the latent beliefs might trigger a revolution. Given a small but critical change in the system, deeply held aspirations might suddenly surface, adding exponentially to the momentum.

Beliefs are distinctive in having a fundamentally ephemeral essence: They can be changed dramatically, massively, and instantaneously. People might get excited, might start believing in the future, might start to trust and respect one another as a result of something relatively small and mundane. For systems intelligence, this is the key: small changes that transform something major; a kind of “butterfly effect” in the context of our life systems.

Systems intelligence focuses on changes as leveraged by the dual force fields of the systemic and movable nature of the human mental world and the systemic nature of the context, situation, and behaviors around us. It takes the idea of people’s internal and malleable world utterly seriously. We do not fear the subjective or the emotional, the experiential or the phenomenological – indeed, we embrace those things. Therein lies the source of emergence.

One might be terribly misguided regarding what others truly believe and what might move them toward flourishing. Our patterns of interaction, our tactics, might be utterly misplaced. There might be a systematic flaw in the way a group experiences the subjective worlds of others. The “reality” we form together might be a castle built on quicksand, destroying the higher possibilities of life.

Systems intelligence is based on humility and optimism. It acknowledges that one’s perspective of others might be drastically mistaken, particularly regarding what others’ true aspirations might be. An incremental and seemingly trivial change in my behavior might be a significant change for the better in the eyes of another, might intervene with her beliefs regarding me, might lead her to appreciate suddenly what life is all about, and might thus trigger a chain of changes in the actual behaviors of each of us and in the system we form together.

People thrive on meaning. As a result, the most forceful forms of systems intelligence intervention are likely to be those that touch basic human aspirations.

To the extent that we are ignorant regarding the aspirations of others in the system, there is also a hidden possibility of cumulative enrichment and improvement through reciprocity. Fresh possibilities of flourishing are always there, simply because most forms of interaction have *not been tried*. Our patterns of interaction are highly standardized, are often low in emotional energy,¹⁰ and typically hide the positive options. Systems intelligence is an approach of realistic hands-on optimism, based on acknowledging the possibility of upward-spiraling change through human reciprocity.

This sort of thinking is often dismissed as wishful idealism. Yet it amounts to an appreciation of some of the most powerful moments of most people's lives – those moments when their actions flow with the situation, when people are in synch, when positivity rules, when the system flies and we fly with the system.

Adapting terminology from “systems archetypes,” one could reconstruct many of one's best moments in life – or, for example, the history of the civil rights movement in the United States – in terms of systems intelligence archetypes: “fixes that fire,” “sharing the burden,” and “miracle of the commons.”

Marshall Mannerheim Enters the Stage

As Finland was fighting for its (eventually successful) independence against Stalin's Red Army during World War II, the Finnish commander-in-chief Marshall Mannerheim sometimes visited the front. A tall, cultivated man in his 80s in excellent physical shape, Mannerheim was a towering figure, respected by all Finns.

Mannerheim's junior adjutant at the time was Colonel Rafael Bäckman. According to Bäckman, Mannerheim would sometimes stop while walking in a trench and take out a cigarette. This, Bäckman explained, offered a possibility for a soldier standing nearby to approach and offer a light for the commander-in-chief. After the cigarette was lit, Mannerheim would talk informally with the soldier, typically about his home and loved ones.

Consider this an example of systems intelligence. Suppose you are a soldier out there in a trench and observe your charismatic commander-in-chief approaching with his entourage. How are you to strike a sufficiently impressive pose? You are trapped in a system that hardly allows you to breathe. And yet a small intervention – a cigarette lighting – can change it all. Being attuned to opportunities to make similar interventions is key to systems intelligence.

Systemic Leverage

Our assumption is that people experience and interpret situations from a systemic point of view. Then they adapt to the system and operate within the system. But as we have said, the system could be different from what people believe it to be. There is tremendous leverage built into any human context, if only people would interpret the system as having changed. Even if it hasn't yet changed, it will change, when enough people believe it has changed. Here lies the opportunity of systemic intervention. In human contexts, almost anything has the potential to signal a *change for hope*. A clean subway car, completely free of graffiti, can become a powerful symbol of an entirely new era.

The interpretation of a given incident as a symbol of change in the human context is

highly variable. Interpretation is everything; it defines the realm of possibility. And sometimes people grasp that possibility, personally and powerfully. The catch for a rationalist lies in the lack of clear-cut predictability. In the context of human change, the logic typically is not “if x , then y .” Instead, one needs to be sensitive, situation-conscious, emotionally alert, sufficiently distanced, and sufficiently connected; one needs to be fine-tuned to the nonrational undercurrents in the context in order to make things work and in order to flourish. It is such sensitivity that systems intelligence wants to elicit.

People thrive on meaning. As a result, the most forceful forms of systems intelligence intervention are likely to be those that touch basic human aspirations, especially:

1. A person’s sense of worth and desire to be respected
2. A person’s desire to feel connected in the company of others
3. A person’s desire to feel connected with something meaningful

An intervention that touches upon a person’s basic needs is likely to inspire change through the internal system of that person.

Rose-Buying Finns

Most Finnish husbands do not buy roses for their wives spontaneously on normal weekdays. A *non-rose-buying system* is in place, creating behaviors that generate the lack of rose buying. The system is invisible, as part of the accepted reality. A man who buys a rose is experienced as having made a choice, but a man who doesn’t is not experienced as having chosen not to buy a rose. It is almost as if some higher authority governs the rose-buying behaviors of all these non-rose-buying men.

The system, no doubt, is in place partly because of the experiences each particular man in his seasoned marriage has undergone over the course of years. His wife has changed, he feels, and is becoming increasingly negative. She is unenthusiastic about life. She never puts on lipstick at home just for him. His wife seems overly pragmatic. Not much of a spark left. He reacts to this, suppressing his more romantic ideas and gestures, a dimension in which he was never strong to begin with. But the same is true of the wife: The two are caught in *a system of mutually holding back*. The two have created a system, and now the system rules.

Consider the rose buying as a metaphor for small behavioral actions that could touch the



other positively. A husband who buys his wife roses will strengthen her faith in life, optimism, hope, and sense of worth.

Now consider the workplace. One would expect the workplace to be unconditionally alert to such systems of “rose buying,” i.e., to systems of generating faith, optimism, and strength in people, particularly as that will result in greater productivity for the business and because such systems can be created free of cost.

This turns out not to be the case. Instead, systems of holding back, in return and in advance, rule everywhere:

- Most managers want to support their team members more than they currently do. Most team members would like to get more support from their managers. Yet more support does not result. There seems to be a *lack-of-support system* in place.
- Most speakers would like to give their best in a presentation. People attending the presentation would benefit most if the speaker were at her best. But the speaker does not give her best, and the audience does not receive the best. There seems to be a *poor-presentation-generating system* in place.
- Most people would benefit from coworkers’ generosity in everyday situations (showing interest, being polite or considerate, expressing appreciation, giving credit to others, etc.) Most people would themselves like to provide such gestures more than they do. But generosity is scarce. There seems to be a *non-generosity-generating system* in place.

The sensitive, the instinctual, the contextual, the situational, the emotional, and the subjective elements and capabilities reside right there at the center of human individual and collective action, organizational behavior, and systemic change.

Holding back is a key form of human interaction. Systems of holding back trap us from everywhere – from within and from without. Such systems trivialize reciprocity, decrease vitality, and depress human life. It requires intelligence just to adjust to them. Higher intelligence is needed if you want to overcome the system – a possibility that the systems intelligence approach offers.

Five Levels of Systems Intelligence

1. Seeing oneself in the system: Ability to see oneself and one’s roles and behavior in the system, and also through the eyes of other people and with different framings of the system. Systems thinking awareness.
2. Thinking about systems intelligence: Ability to envision and identify productive ways of behavior for oneself in the system and cognitively understanding systemic possibilities emerging from one’s choices.
3. Managing systems intelligence: Ability to personally exercise productive ways of behaving within the system.
4. Sustaining systems intelligence: Ability to continue and foster systems-intelligent behavior in the long run.
5. Leadership with systems intelligence: Ability to initiate and create systems-intelligent organizations.

Window of Opportunity

Systems intelligence is based on the insight that *systems of holding back prevail everywhere, and yet do not tell the whole story*. Fear rules over courageousness, ingratitude over gratitude, taking over giving. And yet there is more to humans than meets the eye – more that is good.

An entirely different story is hiding beneath the surface, and it could be triggered to emerge by a marginal change. This is because people are not likely to reveal their discontent with what they believe is unchangeable. But suppose hope returns, excitement comes back, and someone realizes that a seemingly unchangeable system actually is a construction, an artifact from top to bottom, based entirely on human choice.

Saarinen's initial interest in systems of holding back grew out of his desire to find examples of choice that people could not deny. He was led to studying small behaviors that would benefit others, would not require any material resources, and yet failed to materialize. These included the failure of a longtime couple to hold hands in a shopping mall, or the failure of a professional to lean forward

and pay attention to a colleague giving a presentation, or the failure of a manager to start a meeting with a few informal, credit-giving words.

Why is there a universally accepted people's movement to, say, not give credit? Why a people's movement to not pay attention at meetings? The lack of positive small behaviors reveals a complement: the domain of small actions that could have been.

That domain is huge – and it is a source of tremendous leverage if perceived in systemic terms.

When people are shown examples drawn from marriage, it is remarkably easy regardless of their socioeconomic levels, age or education backgrounds, to gain insight into their own holding-back behaviors and to the unintended consequences created thereby. Systems of holding back are at the core of our everyday living, and of all organized life, in a way that is easy for people to comprehend intuitively and personally.

Systems of holding back are a route to appreciating the constructed nature of our everyday modes of being. As soon as that element is appreciated, the fundamental possibility of human choice enters the picture – choice conceived of as a personal possibility on the level of small everyday behaviors.

Personally perceived choice resulting in taking an action is a key idea in systems intelligence. The point is to highlight choice in order to pave the way to an empowered practice of change. It is essential to discuss behaviors in which the agent indisputably does have a choice, even when judged by his own perhaps distorted and biased internal belief system.



A Systems-Intelligent Leader

Strives to learn and reach Level 5 (See “Five Levels of Systems Intelligence,” page 24).

- Sees herself in the system with a mission to develop a systems-intelligent organization
- Is aware of the human perspective and of the possibilities of human reciprocity
- Operates within the visible system and manages the emotional system simultaneously
- Is not held captive by a mechanistic perspective
- Identifies and eliminates structural systems dictatorships that alienate people from their own choices
- Recognizes systems intelligence as a personal growth challenge and an asset to success

The intellectual complexity of the choice is rarely the issue. As a result, causal loop diagrams are not likely to be of much use. What is the bottleneck if not lack of knowledge? Our answer is: *human self-centeredness, lack of sensitivity, and lack of belief in the human potential in us and around us.*

An egoistical, cynical person views a system coldly from the outside, intending to find an objective reality. He might be effective in the short run in his efforts to manipulate the system from outside. But the alternative is to step inside, open up the system, and open up himself; working openly, sensitively, attentively, with systems intelligence. In short, the alternative is to make the system flourish. The sensitive, the instinctual, the contextual, the situational, the emotional, and the subjective elements and capabilities reside right there at the center of human individual and collective action, organizational behavior, and systemic change.

Thinking* Why Systems ~~Intelligence~~ Projects Fail

Senge, in the revised edition of *The Fifth Discipline* (2006), openly acknowledges that building learning organizations has turned out to be significantly more difficult than what he envisioned in 1990. Likewise Jeremy Seligman,¹¹ describing his experiences building a systems thinking (ST) culture at Ford, writes bluntly, “sometimes it seems doubtful that ST will ever gain the critical mass required to make it an integral part of how major corporations practice strategic thinking.” This is where we believe the systems intelligence approach points the way forward.

~~thinking*~~
First, observe why systems ~~intelligence~~ projects can easily fail. ST projects aim to increase people’s knowledge of an organization’s systemic structures by teaching people the use of systemic tools such as loop diagrams and stock-and-flow computer models. But none of that knowledge necessarily touches their everyday holding-back behaviors, or the holding-back systems generated by such behaviors.

It is clear that a learning organization can never flourish if it remains a system of holding back. But systems of holding back lurk at the human level, in the dimension of the mundane; they are in many cases intellectually trivial, often seemingly invisible, hiding as they do behind the curtain of custom and conformity, and generally not approachable from the outside.

ST projects fail because people need not change their *small, behaviorally relevant* modes of thinking, mental models, and dialogical patterns as a result of increased knowledge of various aspects of systems intelligence or of the systems structures involved. But small behav-

iors generate systems of holding back, creating a hidden, crushingly powerful counterforce to the systems thinker's well-intended and rationally sound effort to launch ST initiatives in order for the organization to "grasp the big picture" and to "understand the long-term effects."

Becoming More Systems Intelligent

The learning organization movement has struggled with the fact that as systems thinking programs are driven into organizations, surprisingly little changes. "Problems may get solved, but the organization will be no smarter," as Peter Senge puts it in the revised *Fifth Discipline*.¹²

We believe what is called for is a movement toward the individual, the subjective, and the emotional. This is what the systems intelligence perspective attempts to accomplish. We believe the systems intelligence approach offers a way forward from some of the traps the learning organization movement seems to have fallen into. At the same time, the systems intelligence approach builds upon Senge's original insight regarding the significance of the systems perspective.

The systems intelligence perspective has already proven its ability to stimulate learning. In the context of lectures and seminars, we have observed that people feel strongly encouraged to further develop a capability they already possess, more so than they might embrace cognitive learning of material they might feel is too abstract.

The concept itself points the way. It is heuristically energetic. In most cases only a few sentences of explanation are needed in order for people to feel ready to move ahead with the concept and apply it to their own situations. The word *system* encourages a hands-on attitude: It suggests something that is constructed, something that is working – and thus something that could work better. Learning together is important, but acting together for flourishing is even more so. That is the possibility the systems intelligence approach wishes to highlight.

We believe what is called for is a movement toward the individual, the subjectivity and the emotional. This is what the systems intelligence perspective attempts to accomplish.

Endnotes

- 1 The introduction of the systems intelligence concept and the seminal essays on it were first presented in Finnish in 2002, and they appeared in the report series of the Systems Analysis Laboratory. In 2004, the first essays in English were published in Raimo P. Hämmäläinen and Esa Saarinen, editors, *Systems Intelligence: Discovering a Hidden Competence in Human Action and Organisational Life* (Helsinki University of Technology: Systems Analysis Laboratory Research Reports A 88, 2004). The key texts therein are the introduction and chapter 1: "Systems Intelligence: Connecting Engineering Thinking with Human Sensitivity," by Esa Saarinen and Raimo P. Hämmäläinen.
- 2 For the MI theory, see Howard Gardner, *Frames of Mind: The Theory of Multiple Intelligences* (New York: Basic Books, 1983; 1993), and *Intelligence Reframed: Multiple Intelligences for the 21st Century* (New York: Basic Books, 1999).
- 3 Peter M. Senge, *The Fifth Discipline* (New York: Doubleday, 1990; 2006).

- 4 See, e.g., Kim S. Cameron, Jane E. Dutton, and Robert E. Quinn, editors, *Positive Organizational Scholarship* (San Francisco: Berrett-Koehler Publishers, 2003).
- 5 See, e.g., C.R. Snyder and Shane J. Lopez, editors, *Handbook of Positive Psychology* (New York: Oxford University Press, 2001).
- 6 See P. Reason and H. Bradbury, editors, *Handbook of Action Research: Participative Inquiry & Practice* (London: Sage Publications, 2001).
- 7 The related essays are in the publication in note 1. The home pages of our research group provide free access to all the materials, essays, and slides. www.systemsintelligence.hut.fi
- 8 The article by the editor-in-chief, Reetta Meriläinen, titled "There would be a standing order for systems intelligence" ("Systemiällylle olisi kestopilaus"), was published in the daily newspaper *Helsingin Sanomat* on July 16, 2006.)
- 9 See "Operations Research: The Science of Better" Web site, www.scienceofbetter.org
- 10 On emotional energy, see Randall Collins's important *Interaction Ritual Chains* (Princeton: Princeton University Press, 2004).
- 11 Jeremy Seligman, "Building a Systems Intelligence Culture at Ford Motor Company," *Reflections*, Vol. 6, No. 4/5.
- 12 Peter M. Senge, *The Fifth Discipline* (New York: Doubleday, 2006). Page 332.

ABOUT THE AUTHORS

Raimo P. Hämmäläinen is a professor of operations research and director at the Systems Analysis Laboratory, Helsinki University of Technology, Finland. His research interests range from systems intelligence to multi-criteria decision-making, negotiations and game theory. He also has extensive experience in the decision support and facilitation of environmental and energy policy studies.
raimo@cc.hut.fi

Esa Saarinen is a philosopher and professor of systems sciences at Helsinki University of Technology. A highly acclaimed lecturer who has brought philosophy to an interface with everyday life, Saarinen has worked extensively with Nokia and other Finnish businesses. He has authored *Imagologies: Media Philosophy* (with Mark. C. Taylor) and numerous books in Finnish.
esa@hut.fi