



Aalto University

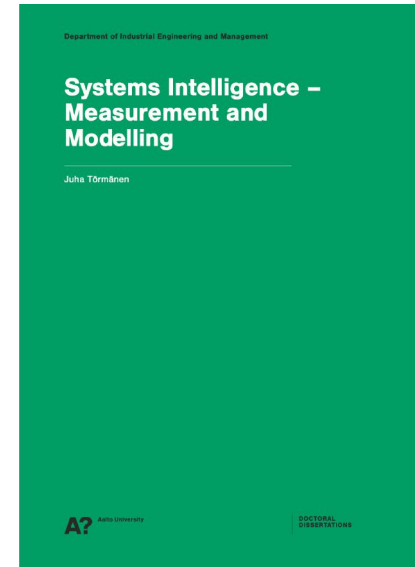
Systems Thinking & Systems Intelligence

Juha Törmänen, 29 March 2022

Startup Philosophy

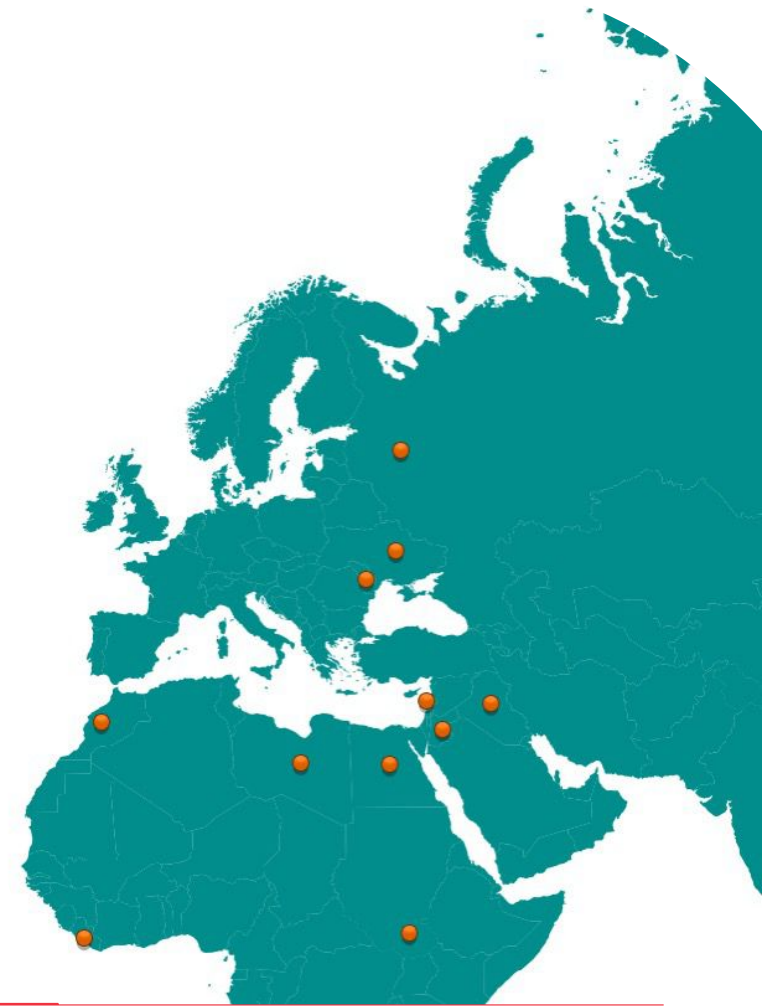
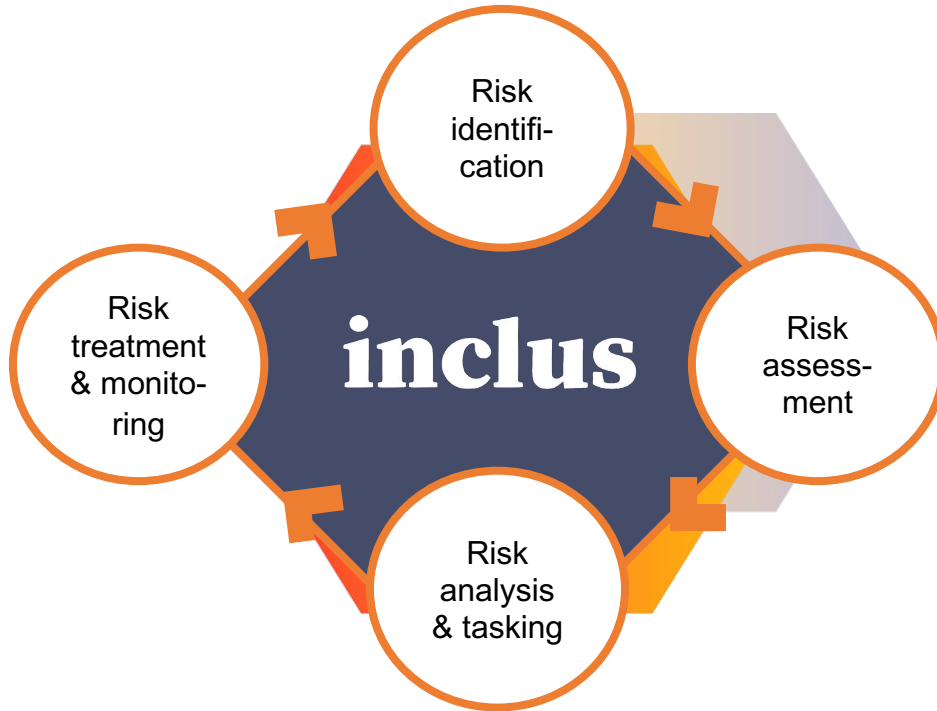
Juha Törmänen

- **Doctor of Science (Tech.)
Aalto Industrial Engineering and
Management (2021)**
- **Startup entrepreneur, co-founder and
CTO of Inclus Oy (since 2016)**



inclus

Inclus



Lecture contents

1. **Systems thinking – what is it?**
2. **Five Disciplines of a Learning Organization**
3. **How to approach systems in practice?**
4. **Eight Dimensions of Systems Intelligence**
5. **Systems Intelligence in practice**

Discussion

- What comes to your mind from the words **systems thinking**?
- Or/additionally, **systems sciences**?

Systems sciences (as categorised by Wikipedia)

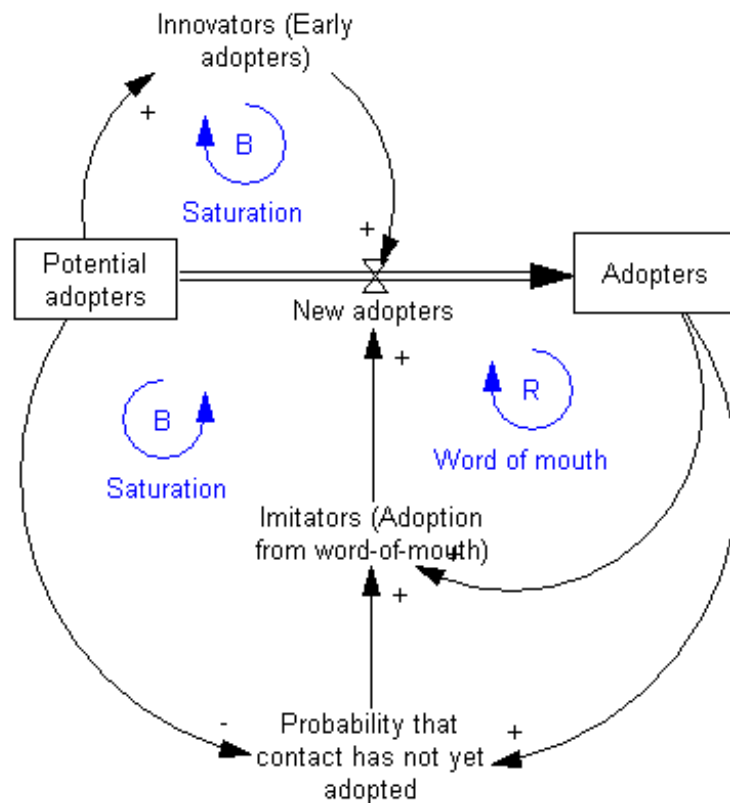
Theoretical fields

- Chaos and dynamical systems
- Complexity
- Control theory
- Cybernetics
- Information theory
- General systems theory
- Hierarchy Theory

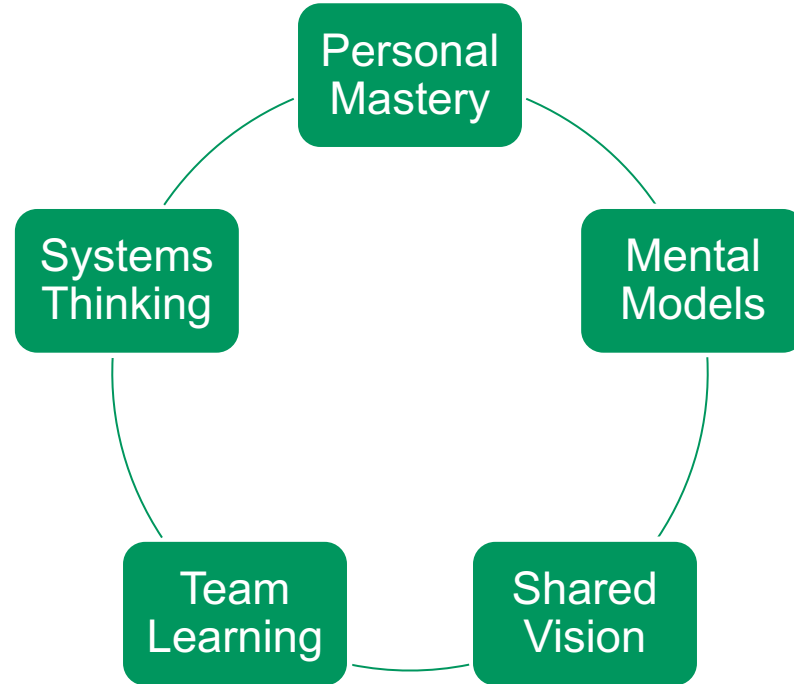
Practical fields

- Critical systems heuristics
- Critical systems thinking
- Operations research and management science
- Soft systems methodology
- Systems analysis
- Systemic design
- Systems dynamics
- Systems engineering

Systems dynamics



Five disciplines of the learning organization (Peter Senge)



Systems Thinking

**“Today’s problems come
from yesterday’s solutions”**

**“Cause and effect are not
closely related in time and
space”**

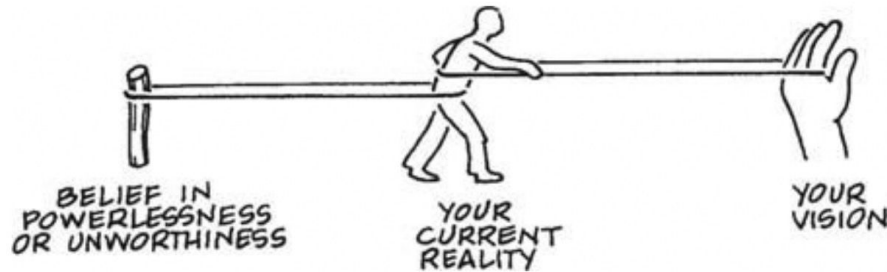
**“The harder you push, the
harder the system pushes
back”**

**“Small changes can produce
big results”**

**“Dividing an elephant in half does
not produce two elephants”**

Personal Mastery

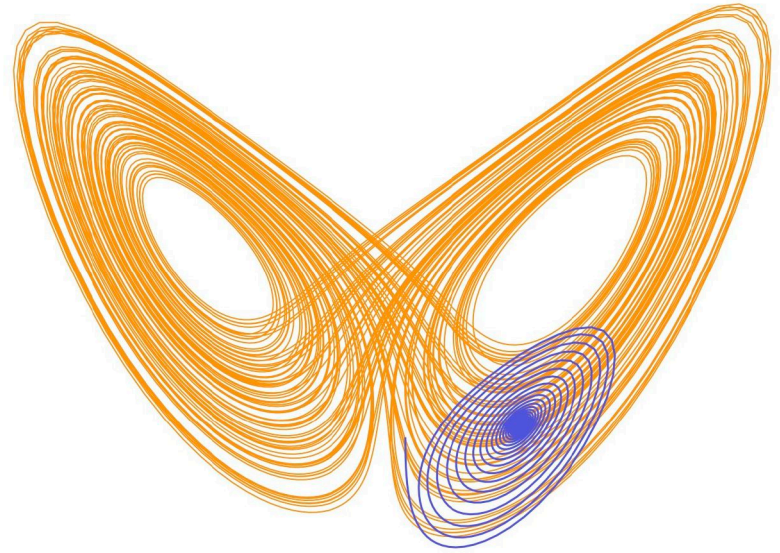
- Organizations learn through individuals
- Full personal development vs instrumental development
- Personal vision



Peter Senge / The Fifth Discipline

Mental Models

- **Challenging theories and revealing hidden assumptions**
- **What I'm thinking vs what I'm saying**
- **Inquiry and advocacy**



Shared Vision

Commitment

Enrollment

Genuine compliance

Formal compliance

Grudging compliance

Noncompliance

Apathy

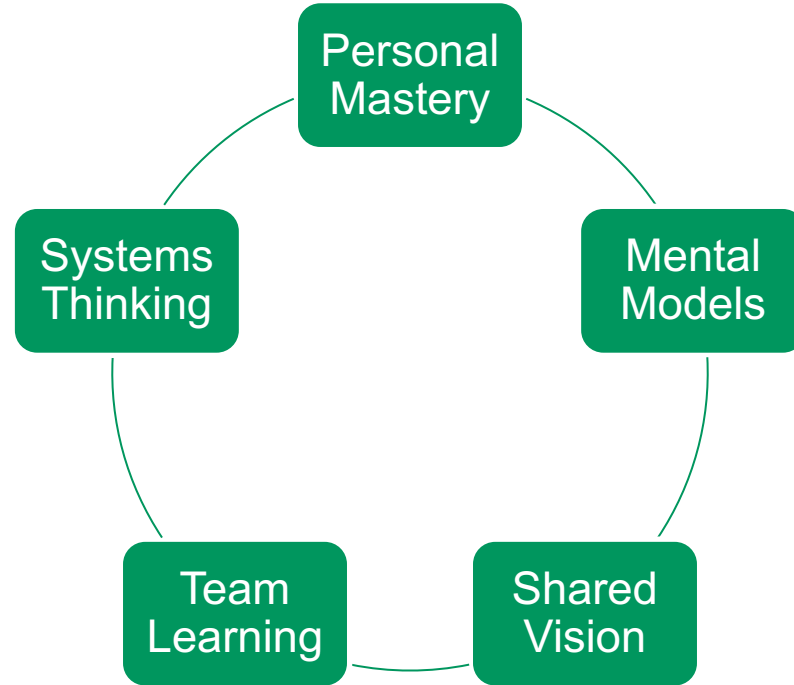
Team Learning

Dialogue and discussion

Promoting diverse opinions

Common understanding

Discussion: Has the world gotten anywhere in the five disciplines since 1990?



Systems thinking: strengths and weaknesses

Strengths

- Powerful tools
- Helps tackle difficult and unintuitive concepts
- Decades worth of research and practice available

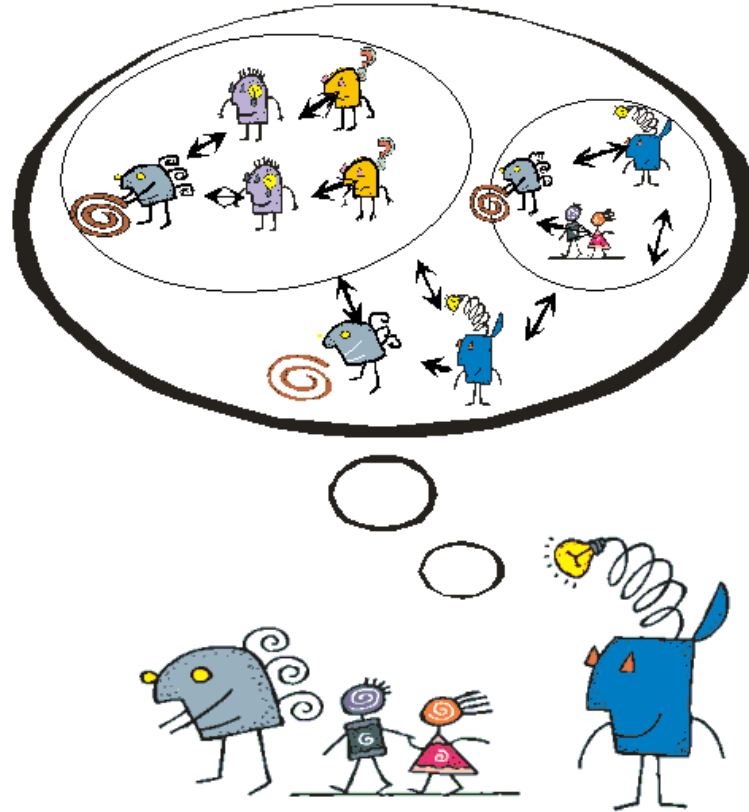
Weaknesses

- Tools require care, concentration, and time
- Published literature often focused on big corps and consultants
- Challenging to reach an intuitive understanding in

Burke's Serviceability

- **Language can be used purposively: what terms you use affects what results you get**
 - See e.g. Kenttä (2020): A Grammar of Interactional Wellbeing in Organizational Settings
- **Instead of making practitioners learn theory and tools, can we already achieve something by introducing useful terms?**
 - Systems Intelligence => “hey, maybe I could be smarter about these systems things and keep them in mind!”

Systems Intelligence



Systems Intelligence (SI)

- “Intelligent behaviour in the context of complex systems involving interaction and feedback”
- **Systems Intelligence Research Group**
<http://systemsintelligence.aalto.fi>



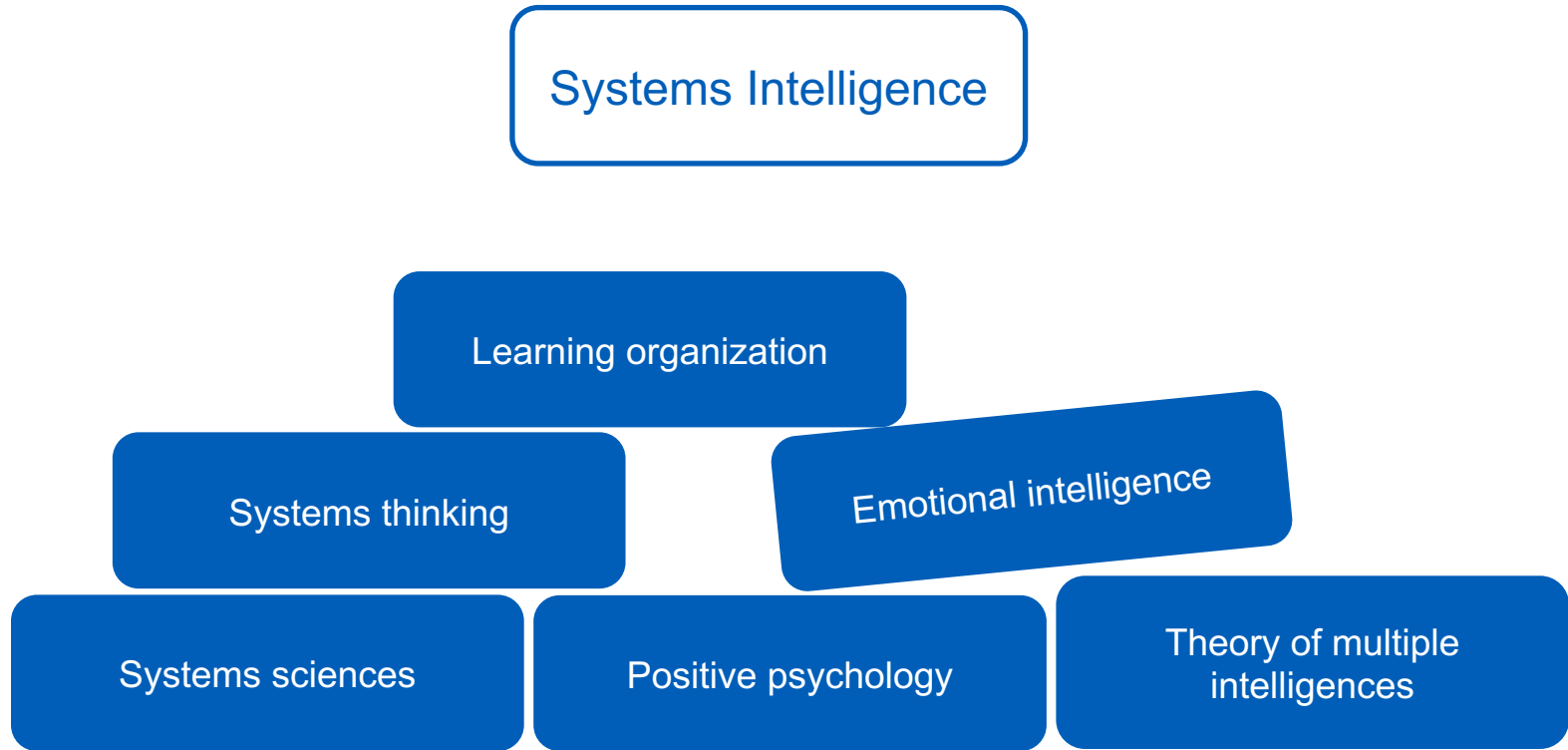
Raimo P.
Härmäläinen



Esa
Saarinen



Background of SI

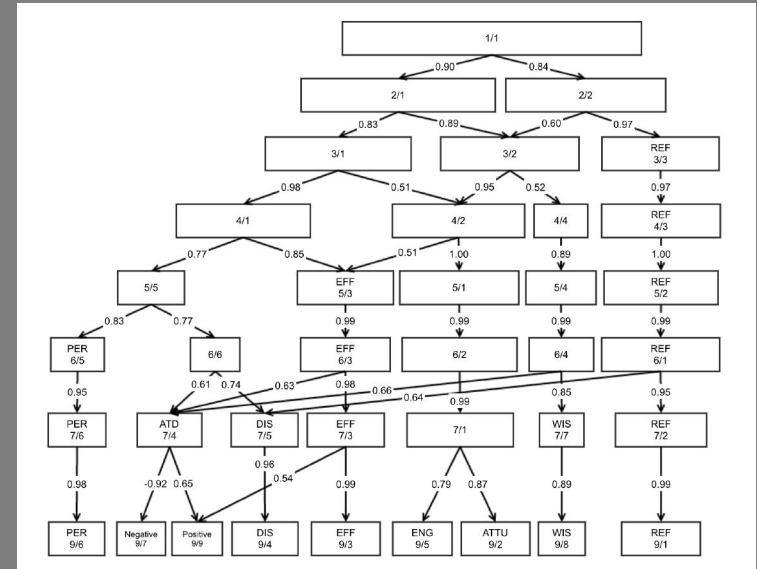


**Up from the
grassroots level,**

**from a practical
perspective**



- 100+ phrases describing SI
- Initial pilot studies within the laboratory (N=15-30), revising and rewriting
- Large-scale study with students, day-care and industrial workers (N=1600)
- Exploratory analysis for identifying factors of SI
- Confirmatory analysis analysis for validating the inventory structure



Eight dimensions of SI

perceiving	Systeeminen hahmotuskyky Systemic Perception	Sanaton yhteys Attunement
attitude	Positiivinen asenne Positive Attitude	Innostuva mieli Spirited Discovery
thinking	Ajattelevaisuus Reflection	Viisas toiminta Wise Action
acting	Rakentava toiminta Positive Engagement	Aikaansaavuus Effective Responsiveness

Systemic Perception

OVERALL PICTURE

We form a rich overall picture of situations

SITUATIONAL AWARENESS

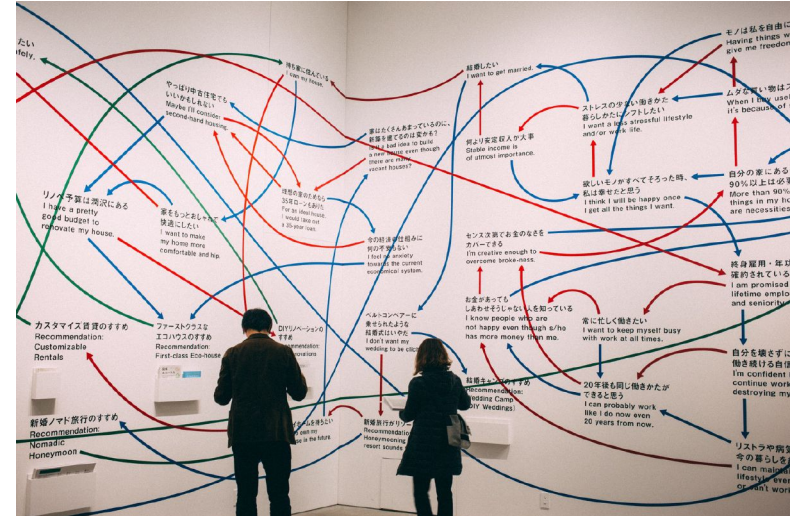
We easily grasp what is going on

DETAILS AND BIG
PICTURE

We keep both the details
and the big picture in mind

SEEING THE ESSENTIALS

We get a sense of what is essential to a given situation



Attunement



BEING CONSIDER- ATE

We take into account what others think of the situation



APPROVING

We approach people with warmth and acceptance



LISTENING

We let other people have a voice



BENEVOLENCE

We are fair and generous with people from all walks of life



Positive Attitude



EXPLAINING AWAY

We do not explain away our mistakes



OPTIMISM

We have a positive outlook on the future



RESILIENCE

We do not let problems in our surroundings get us down

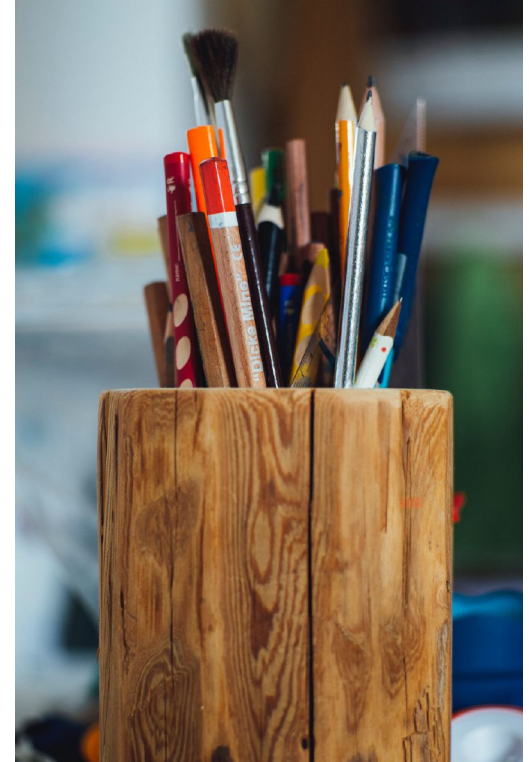


COMPLAINING

We do not easily complain about things



Spirited Discovery



Reflection

PERSPECTIVES

We view things from many different perspectives

SELF REFLECTION

We pay attention to what drives our behaviour

CONSEQUENCES

We think about the consequences of our actions

PERSONAL GROWTH

We make strong efforts to grow as persons



Wise Action

HUMBLENESS

We are willing to take advice

PATIENCE

We take into account that achieving good results can take time

WISDOM

We are wise in our judgements

SELF CONTROL

We keep our cool even when situations are not under control



Positive Engagement



Effective Responsiveness



BEING PREPARED

We prepare ourselves for situations to make things work



PERSEVERANCE

We do not easily give up when facing difficult problems



PRIORITISATION

We are able to put the first things first



TAKING INITIATIVE

When things don't work, we take action to fix them



Discussion:

How can the dimensions of SI support entrepreneurship?

perceiving

Systemic Perception

Attunement

attitude

Positive Attitude

Spirited Discovery

thinking

Reflection

Wise Action

acting

Positive Engagement

Effective Responsiveness

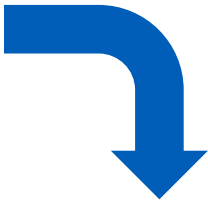
Systems Intelligence Self Evaluation

The following phrases refer to characteristic ways of thinking, feeling, and acting. Please indicate as honestly and truthfully as possible how often you think, feel, and behave the ways described. Think of your current everyday life and then indicate the frequency which you think suits best. Please choose the response that feels most "natural" to you if you are uncertain as to what to answer.

The questionnaire will take about 5 minutes to complete. Please answer all the 32 questions. After submitting your answers, you will immediately see an estimate of what factors of Systems Intelligence you are especially proficient with, and where you have the most possibilities for growth.

Acting and living in systems

	never	very seldom	seldom	some- times	often	very often	always
1. I contribute to the shared atmosphere in group situations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I easily grasp what is going on	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I approach people with warmth and acceptance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I think about the consequences of my actions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I am willing to take advice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I'm able to put the first things first	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I bring out the best in others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I have a positive outlook on the future	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I take into account that achieving good results can take time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I am wise in my judgments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. I keep both the details and the big picture in mind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. I let problems in my surroundings get me down	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. I am fair and generous with people from all walks of life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Self evaluation available at:
<http://salserver.org.aalto.fi/sitest/en/>

Thank you for your answers!

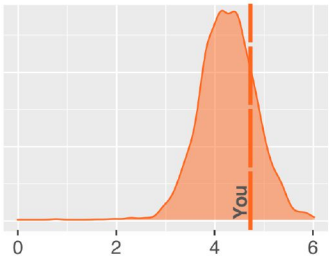
Based on your answers, we have estimated your strengths and possibilities for growth in the eight subfactors of Systems Intelligence:
Systemic Perception, Attunement, Attitude, Spirited Discovery, Reflection, Wise Action, Positive Engagement, Effective Responsiveness

Your strengths

- **Wise Action:** You can face things maturely and consider your actions. (92%)
- **Attitude:** Your positive attitude helps you to succeed and to open new doors in your life. (91%)
- **Attunement:** You have an open mind. You listen and understand other people. (81%)

Possibilities for growth

- **Reflection:** Think how you think! Try to see your activities honestly and sincerely. (34%)
- **Systemic Perception:** Question if you have seen the bigger picture or if you have focused on one narrow aspect only. Try to see how human and non-human factors interact with one another. (46%)



On average, your SI score was higher than 72% of all participants

Current inventories

Self-report

Systems Intelligence Inventory

The Learning Organization, 2016

Peer

Perceived Systems Intelligence
and Performance in
Organizations


The Learning Organization, 2021

Organization


On the Systems Intelligence of a
Learning Organization:
Introducing a New Measure

*Human Resource Development
Quarterly, 2021*


**I approach people with warmth
and acceptance**

 Lähestyn ihmisiä lämpimän
hyväksyvästi

**My colleague approaches
people with warmth and
acceptance**

 Kollegani lähestyy ihmisiä
lämpimän hyväksyvästi

**In my organization, people
approach each other with
warmth and acceptance**

 Organisaatiossani ihmiset
lähestyvät toisiaan lämpimän
hyväksyvästi

Practical applications

Organizational development

Entire organization evaluates how systems intelligent they are – results are studied to see how the organization can be improved

Training and education

Systems Intelligence can help students understand their skills better and learn modern work life skills

Coaching

Supervisor or employee evaluates themselves and asks for peer evaluations from others – coach supports development based on results

Everyday life

Learning SI concepts will hopefully help you be more systems intelligent in your personal and professional life!

More reading

- **Senge – The Fifth Discipline**
Doubleday/Currency, 1990
- **Meadows – Thinking in Systems: A Primer**
Chelsea Green Publishing, 2008
- **Hämäläinen, Jones, Saarinen – Being Better Better: Living with Systems Intelligence (free e-book)**
http://systemsintelligence.aalto.fi/being_better_better/
- **Törmänen – Systems Intelligence – Measurement and Modelling**
<http://urn.fi/URN:ISBN:978-952-64-0468-4>
- **SI essay collections**
<http://systemsintelligence.aalto.fi/publications.html#books>