

Systems ergonomics in productive workplaces – a Nordic outlook on who, how and why

NES 2019

| Keynote II

| Cecilia Berlin

A bit about me



- Cecilia Berlin
- cecilia.berlin@chalmers.se
- Chalmers University of Technology
- Industrial Design Engineer
- PhD, Associate Professor of ergonomics
- From Gothenburg, Sweden

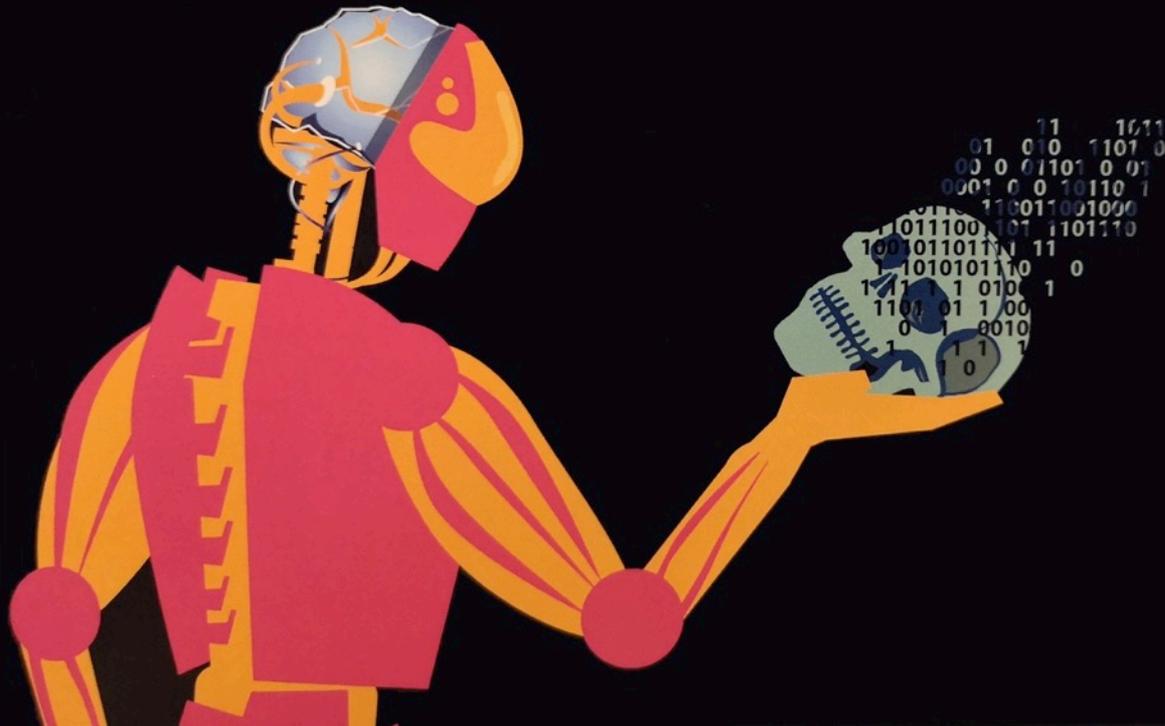
Researching and teaching ergonomics & human factors at Chalmers since 2006

Teaching Systems Theory to PhD students since 2013

27 years of tap dance and 17 years of jiu-jitsu

Local inspiration...

Future Work: Digitalisation and Innovation





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in productive workplaces
– a Nordic outlook
on who, how and why

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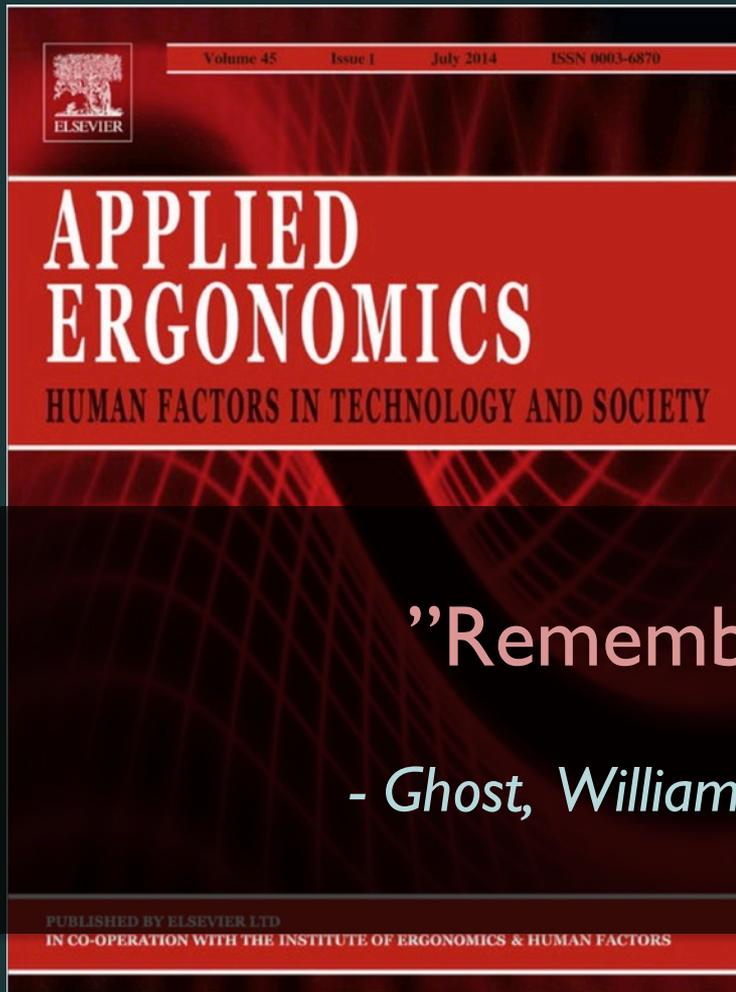
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“Words, words, words.”

- Hamlet, William Shakespeare

J.R.Wilson / Applied Ergonomics 45:1 (2014) p.6



The Systems
Ergonomics/
Human Factors
issue [45:1] of
Applied
Ergonomics,
2014

“Remember me.”

- *Ghost*, William Shakespeare

Eds:

J.R. Wilson, P. Carayon

According to Wilson (2014):

Systems Ergonomics / Human Factors

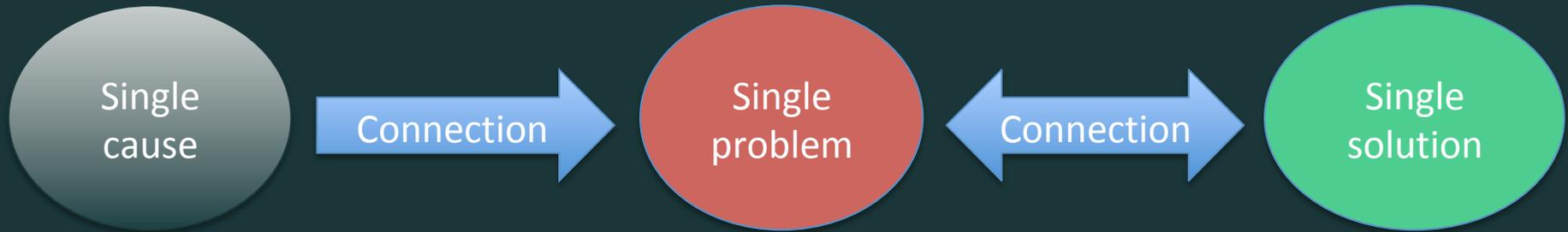
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Participatory Ergonomics / Design

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Macroergonomics

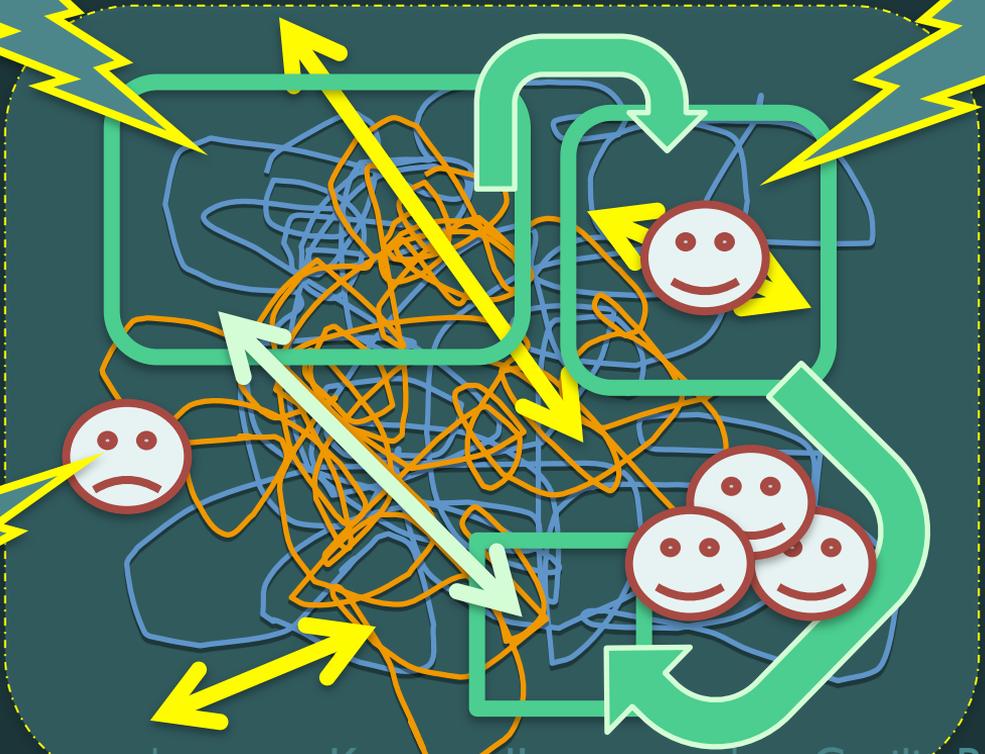
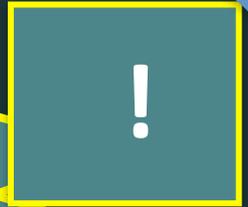
What systems ergonomics is NOT



Features of Systems E/HF:

1. systems focus
2. context
3. interactions (including complexity)
4. holism
5. emergence
6. embedding

Systems



Systems



“There are more things in Heaven and Earth, Horatio, than are dreamt of in your philosophy.”

- Hamlet, William Shakespeare



Systems

(using some ideas from
Donella Meadows)

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Thinking in Systems

A Primer

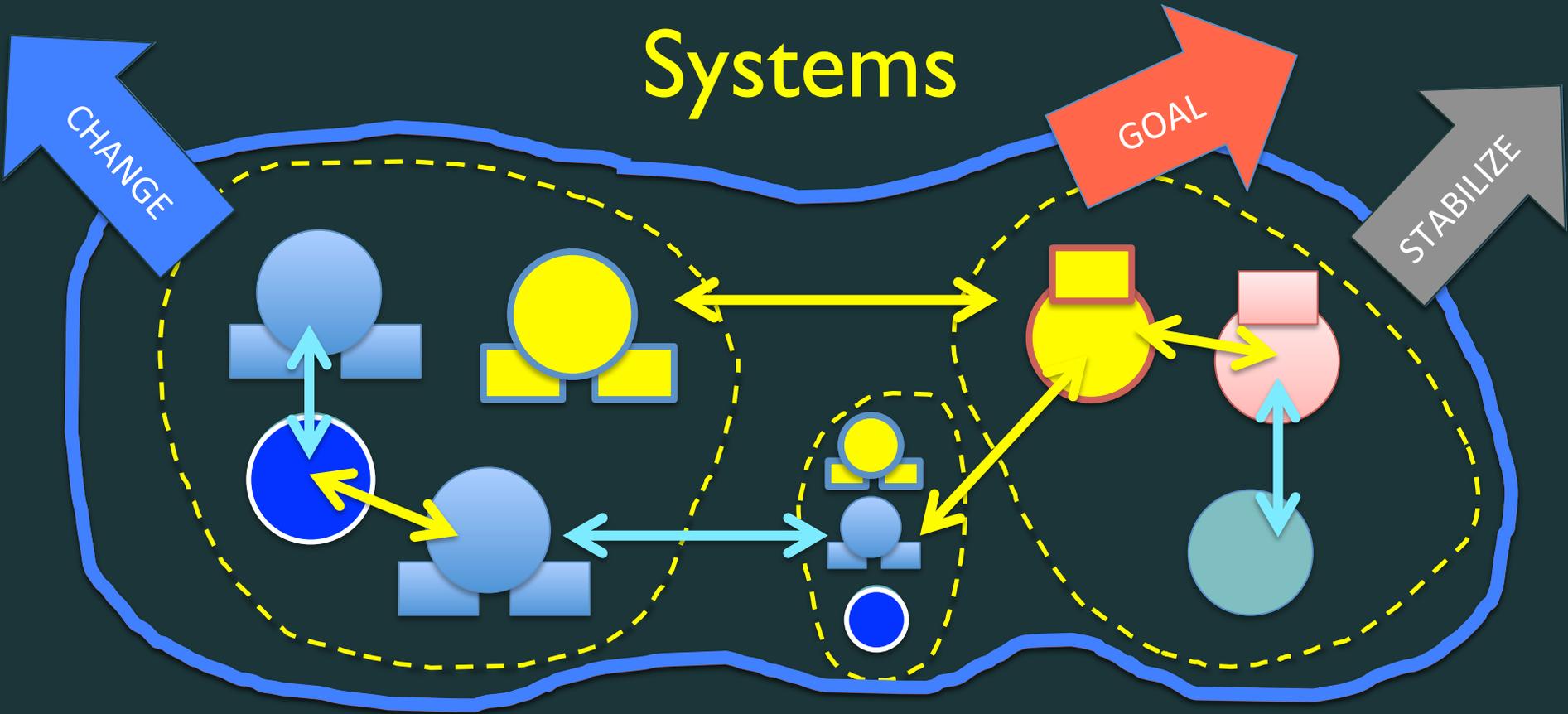
Donella H. Meadows

Edited by Diana Wright,

Sustainability Institute



Systems



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Systems

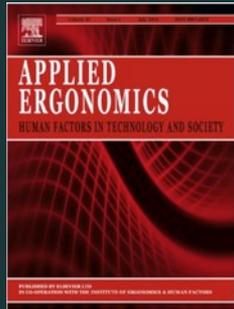
CHANGE

GOAL

STABILIZE

“Though this be madness,
yet there is method in’t.”

- Polonius, William Shakespeare



- Fundamentals of Systems Ergonomics
- The HTO (Human-Technology-Organization) concept*
- Systems approach for healthcare quality
- Design of systems for productivity & well-being*
- Integrating the human body and mind
- "The human use of human beings"*
- Designing sustainable work systems
- ...

Model of Systems Ergonomics by Wilson

(NB: railway context)

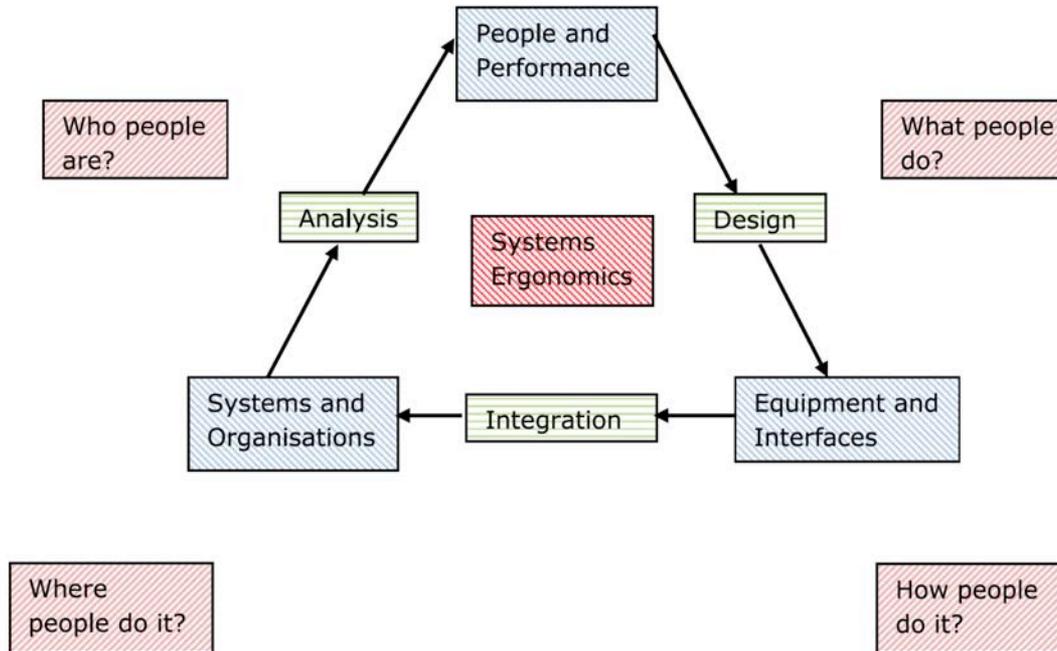


Fig. 1. Representation of rail systems ergonomics/human factors.

Systems ergonomics in productive workplaces – a **Nordic outlook** on who, how and **why**

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What are some modern-day Nordic systemic ergonomics challenges?

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The place of Ergonomics /Human Factors in...?

Autonomous vehicles

Activity-based offices, remote work

Digitalizing “all services”

Internet of things, Industrie 4.0

Human-robot collaborations

Exoskeletons

VR / AR technologies

The place of Ergonomics /Human Factors in...?

Activity-based offices, remote work

Autonomous vehicles

Digitalizing “all services”

”Rich gifts wax poor when givers
prove unkind.”

- Ophelia, William Shakespeare

Human-robot collaborations

VR / AR technologies



Exoskeletons

Contemporary Nordic efforts within Systems Ergonomics

The Human-Technology-Organization (HTO) concept

University students' work
systems

Participatory design of control
rooms

Human-robot collaboration
design in Industrie 4.0

The ACD³ framework for
Activity-centered design**

Participation in Activity-Based
Flexible Offices

Maritime Ergonomics and
resilience

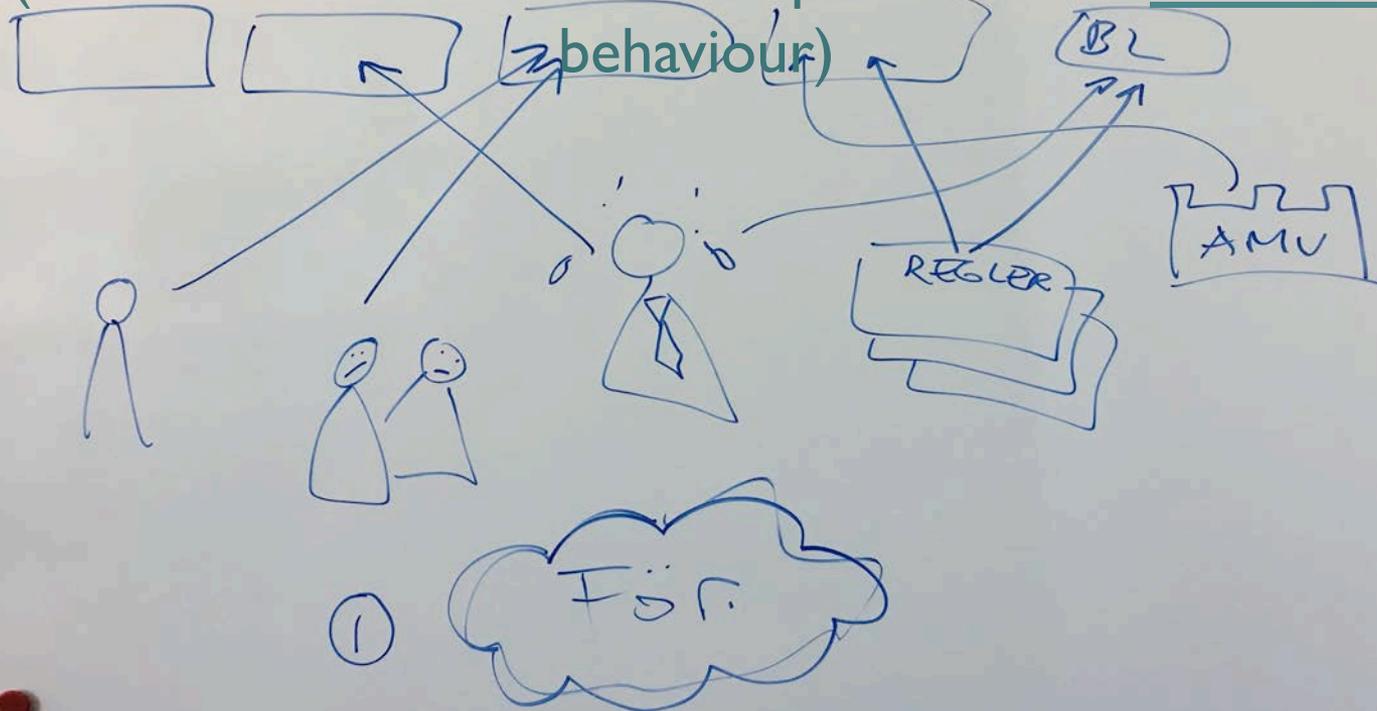
Emerging work in IT changes

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– a Nordic outlook on who, how and why

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Productivity = Goal-oriented behaviour

(also includes more or less explicit ideas of desirable



Productivity = Goal-oriented behaviour

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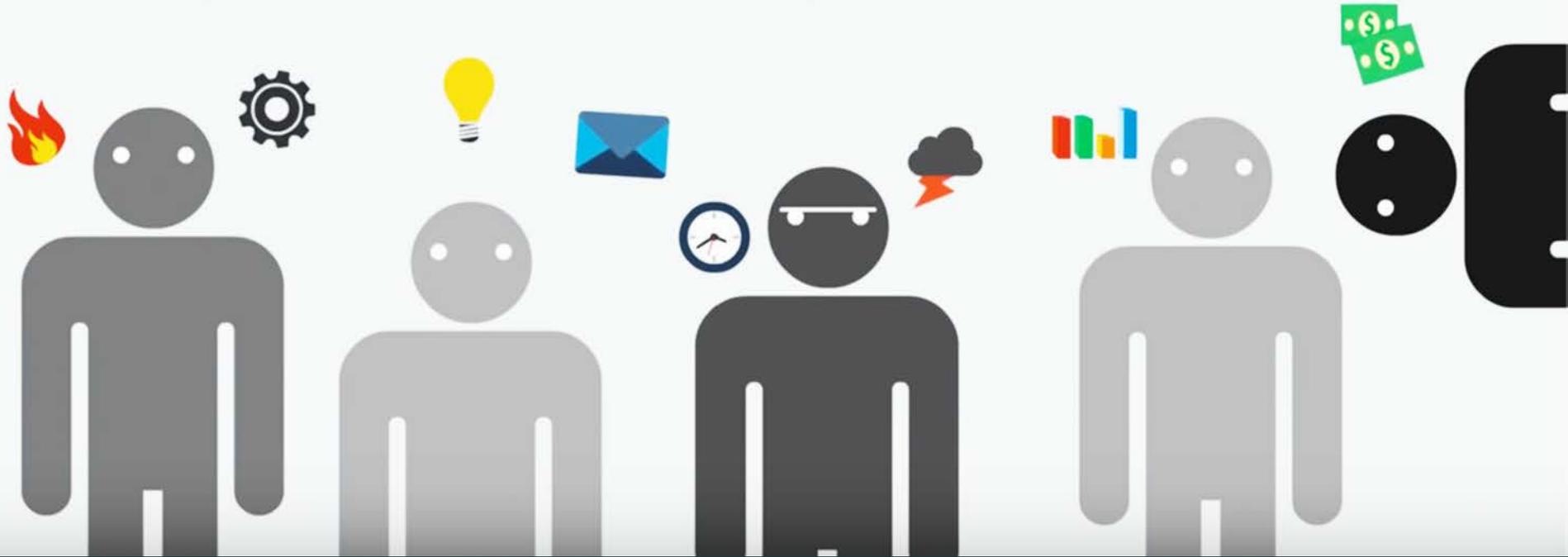
“There is nothing either good or bad, but thinking makes it so.”

- *Hamlet, William Shakespeare*

Systems ergonomics in productive workplaces – a Nordic outlook on **who, how** and why

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Challenges when workplaces change...



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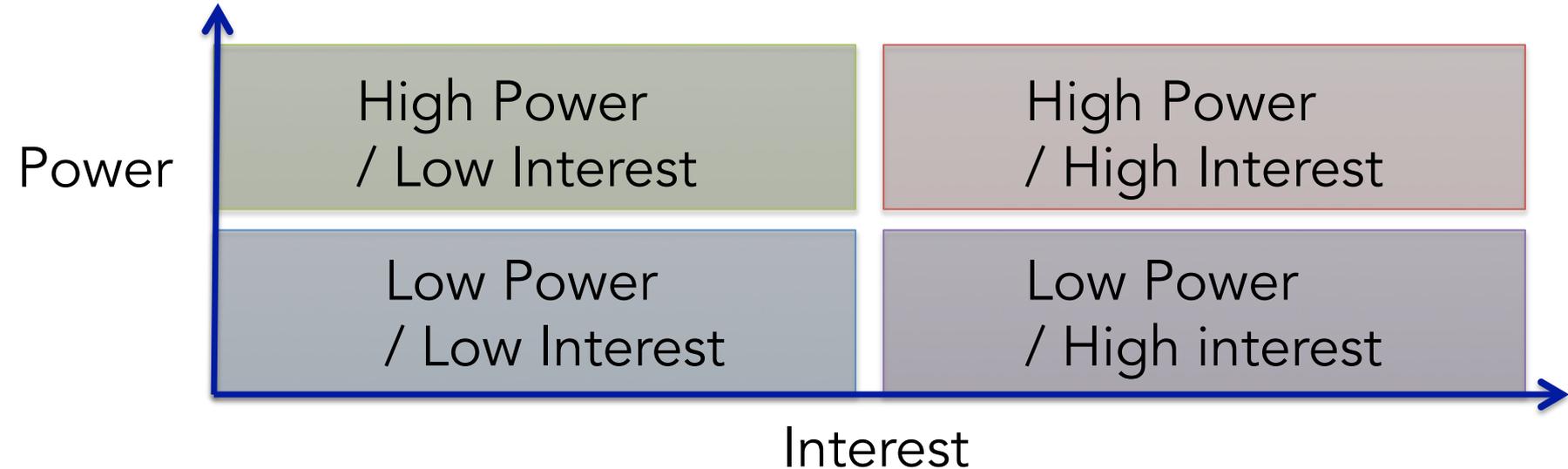
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Change Agent Infrastructure (CHAI)

- A stakeholder analysis method for identifying actors and roles in an ergonomics change process
- Any work system is defined by human ideals about what the system should be doing
- The humans create and uphold (several!) **goals** for the system
- Rather than define users, consider stakeholders

Stakeholder analysis in general

- Often a “four-fielder” principle is used:



Actors and their roles...

- Actors = any defined individual or group in the change environment who act to influence the change
 - Actors can be non-human! (Laws, checklists, softwares)
- Roles = 8 specific behaviour patterns in relation to a proposed change
 - Think of roles as different “hats” that the actors wear
 - One actor can have several roles

Actors and their 8 roles in a changing system...

- Initiators
- Change Owners
- Sponsors
- Convincers
- Solution builders
- Subjects
- Documenters
- Blockers

(Stakeholder analysis method emerging from
my studies of ergonomics change agents)

8 roles

Initiators

Bring attention to the problem and place the change project on the agenda to be dealt with

8 roles

Convincers

Convince others that the underlying problem is legitimate, using measurements, statistics and quantification

8 roles

Sponsors

Not directly affected or active in the change project, but support keeping it on the agenda

8 roles

"Receivers" Subjects

Actors whose operations are directly affected by the underlying problem and/or the change project's outcomes

8 roles

Change owners

Are given the legitimate ownership of the change, the mission to solve it, and the mandate to determine when it is sufficiently addressed

8 roles

Solution builders

Partially or completely contribute to the solution that is implemented

8 roles

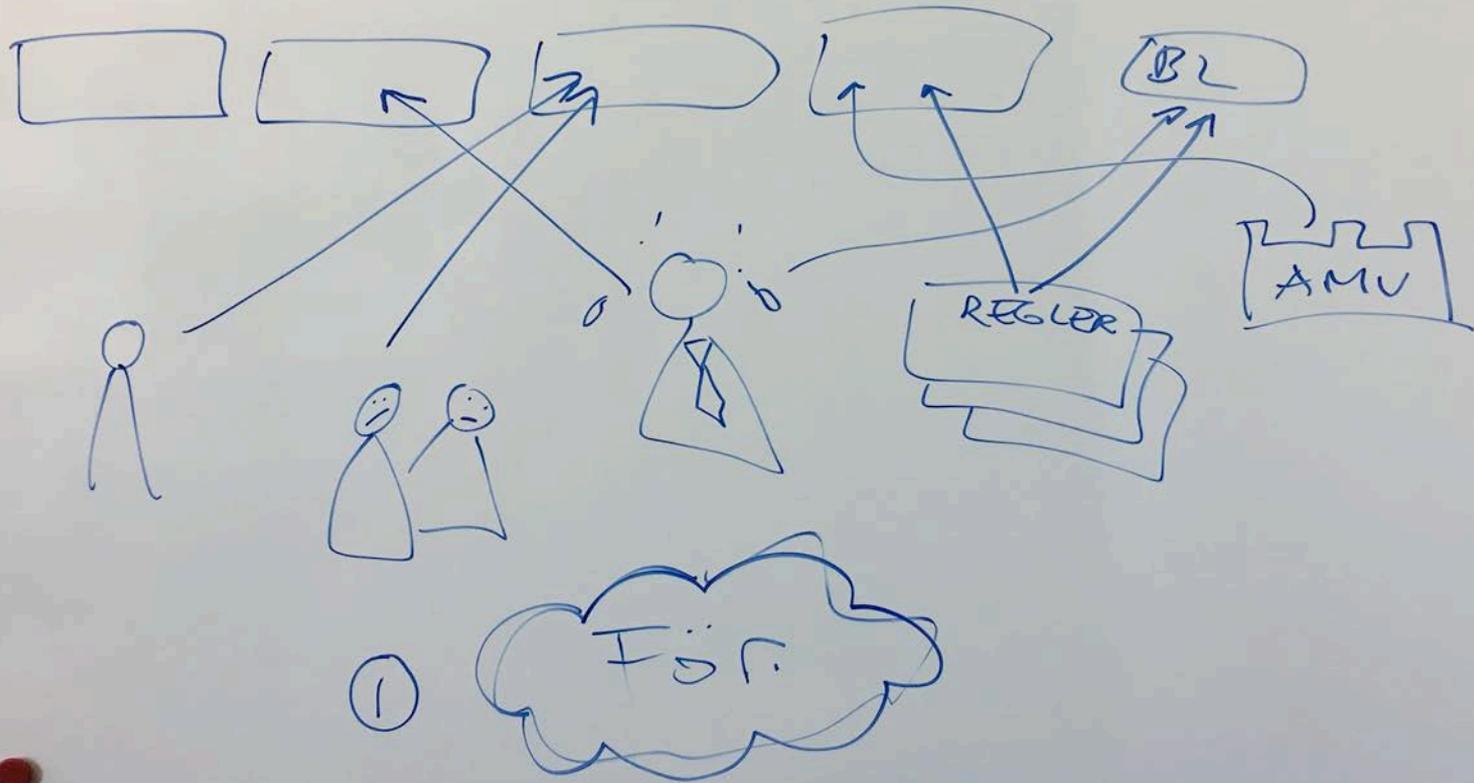
Documenters

Document the problem, requirements, quality demands/criteria, decisions made and the solution's design and implementation

8 roles

Blockers

Have reasons to stop, shift focus and/or resources from, or hinder the progression of the change project



Relationships and goals can be found...

	Initiators	Sponsors	Convincers	Change owners	Subjects	Blockers	Solution builders	Documenters
Manager	WHY?		WHY?					
Government		WHY?						
Workers					WHY?	WHY?	WHY?	
Financial officer						WHY?		WHY?
IoT supplier							WHY?	

More: www.bit.ly/CHAImaterial

Relationships and goals can be found...

	Initiators	Sponsors	Convincers	Change owners	Subjects	Blockers	Solution builders	Documenters
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“...an excellent play, well digested in the scenes, set down with as much modesty as cunning.”

- Hamlet, William Shakespeare

More: www.bit.ly/CHAImaterial



Manager

Government

W

Finance

IoT supplier

WHY?

WHY?

WHY?

WHY?

WHY?

WHY?

WHY?

WHY?

WHY?

What to do with this

Critical actors

- large number of roles ($r > 3$),
- being a sole significant power in that role ($r = 1$) or
- having inappropriate roles – complexity and/or dominance

Critical roles

- Defined in CHAI as having large number of actors (e.g. $a > 4$)
OR having none at all ($a = 0$)

More: www.bit.ly/CHAImaterial

Avoid system pitfalls!

- No change owner = the change project is never completed, due to lack of ownership and decisions
- Subjects as blockers = may refuse to accept a change made to help them
- No sponsors = the project may seem unpopular or unfounded
- No documenters = the effects of the change process may be lost; no use of “lessons learned”
- One actor with too many roles = changes may stall due to lack of time and commitment

A transition of system goals?

(depending on how we choose to see it)

Work systems
(and professions)

Trying to stay
as they are

Work systems
being unavoidably,
radically changed

Work systems
trying to change and
adapt to survive

Systems Ergonomics resources

www.bit.ly/systems_ergo_resources

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