

Supporting Awareness in Complex Adaptive Systems

UCPA Conference 2010

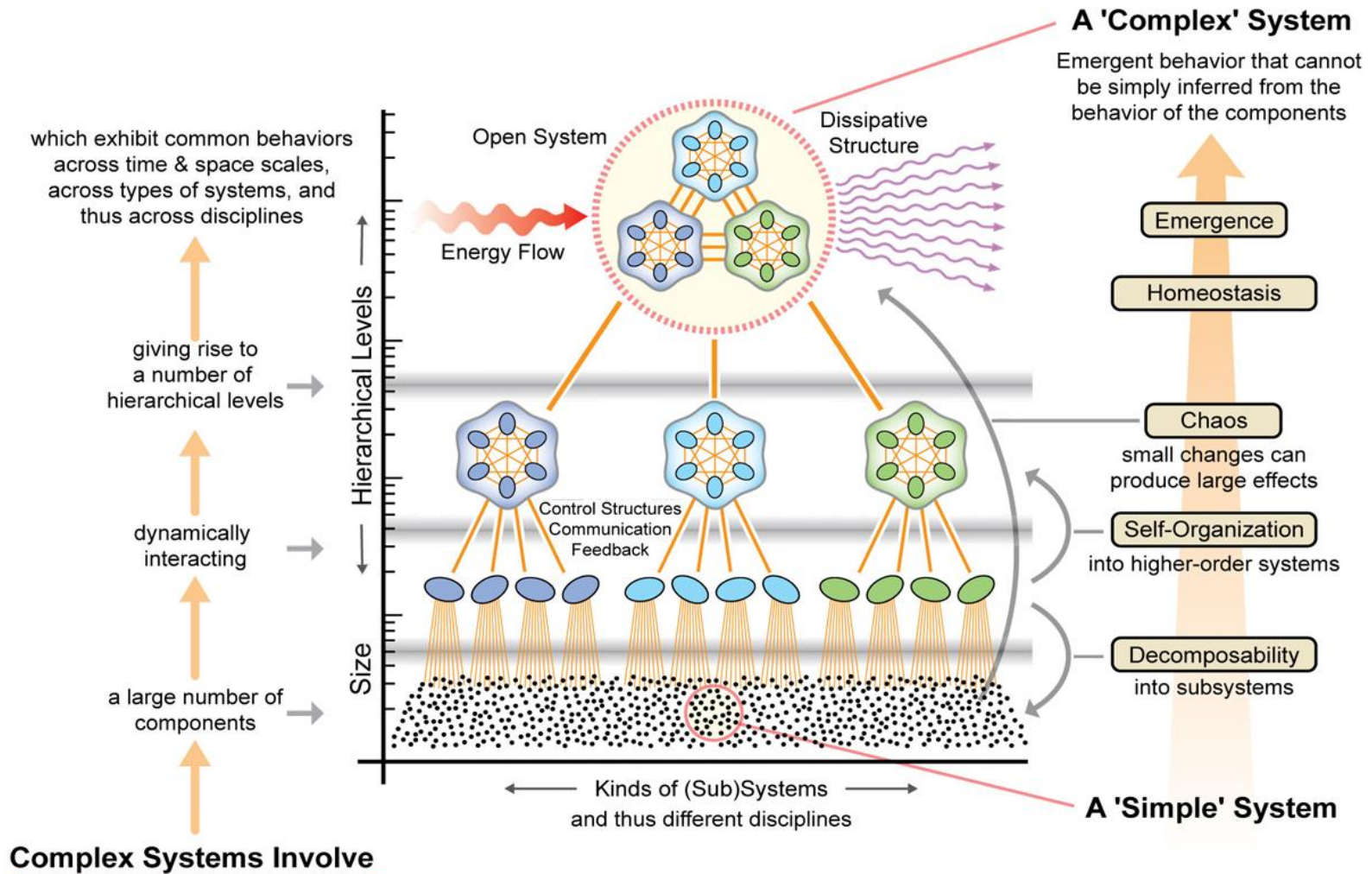
Shiva Mir

University Technology Sydney

Overview

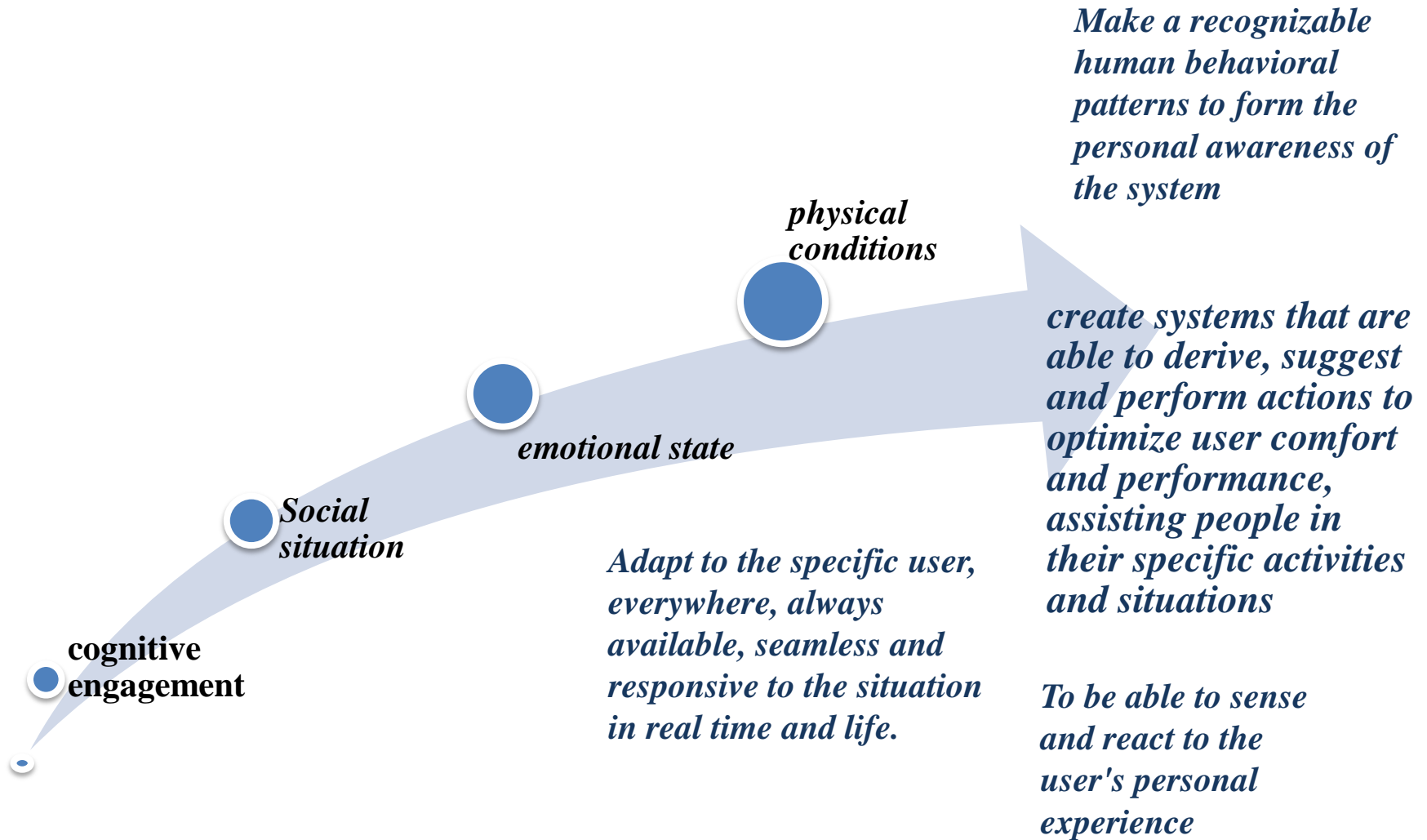
- *What are complex systems?*
- *What are user-centric pervasive systems?*
- *What is the problem?*
- *What is the new idea?*
- *What are the technical objectives?*
- *What is the challenge?*
- *Who benefits?*

What are complex systems?



Marshall lemens, 2008

User-centric pervasive adaptive system



What is the problem?

- How to represent the system components, their relationships and behaviors?
- How to measure, predict or control macroscopic behavior?
- How to deal with the critical dependence upon human cognitive abilities (e.g., creativity) to produce effective solutions?
- How to deal with the critical dependence upon human social abilities (e.g., teamwork) to produce effective solutions (Hevner et al. 2004)?



Changing individual requirements and constraints based upon unstable environmental contexts



Unpredictable and complex interactions related to individual needs

Costing billions of dollars

Complex interactions among subcomponents relative to ad hoc problems

Complexity theories, the new idea

- The origins (make mathematical model of weather system, Lorenz 1993)
- A new way of thinking about the systems

*Is it possible to:
change the behaviour of
the IS while preserving
the existing
structure/processes
Or
change the structure to
adapt to the individual
requirements
Or both*



*Does complexity
theory offers a
metaphorical device
which provides a
means of gaining new
insights into complex
information system?*

*Make models and
mathematics from the
physical/biological
sciences to define a
systematic method to
measure, understand,
predict and control
macroscopic behavior*

Why complexity theory?

A metaphorical device

*Why
?*

To get new insights for enriching traditional approaches of ISD

and

To test empirically the value of these insights

to

Supporting pervasive adaptation in complex environment
towards the phase of information system design

Technical objectives

Self-organizing
Learning
Co-evolution
Adaptation
Emergent
Attractors
chaos

Identifying criteria
from complexity
theory

Impact of the criteria
defined in the process
of information system
design and
development

How to be aware of
change?

Technical objectives

- *Improving the performance of the system to adapt to real time changes related to each individual needs*
- *Developing new techniques/tools, methodologies to deal with ISD processes*
- *Emergence of different frameworks to enhance system awareness of change*
- *Re-evaluation of the ISD processes which are directly related to the area of research*

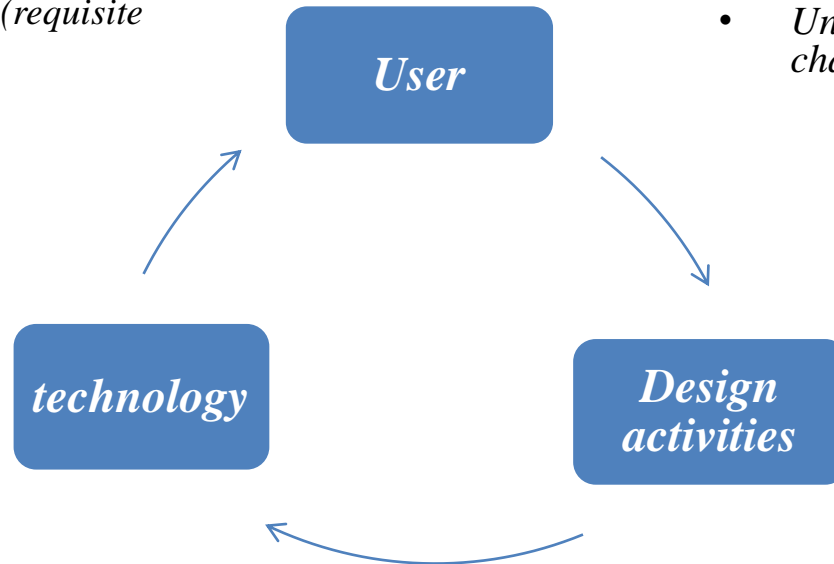
Practical Design Objectives

- Improve ways to design adaptive systems
- Developing infrastructures that support change
- Describing change to users in meaningful ways
- Systematic ways for managing change
- Provide ways for systems to adapt the change [environmental, design processes]

Hypothesis: Improve understanding of users and environment behaviour in complex adaptive systems

- *Observing the external environment*
- *Unique process in each systems*
- *Unique factors that influence changes in the behaviour*

Reorganize based on skills to model environment (requisite variety)



what technology people use to design activity

Expected Outcomes

- *Obtain insights of the user behaviors during the process of information system design*
- *A conceptual framework that allows predicting and managing general patterns of the user behavior during the changing and self-organizing process of design.*

Who benefits?

- Designers and users of *future* information systems
- Businesses and customers who *rely* on *today*'s information systems

