ActorWeb:

Unfolding the design spectrum

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Agenda

- Complexity & evolution
  - Software
  - Organisations
- From need to solution

- Software as organisation
- Research challenges

- Actorweb programme

Agenda

- **Complexity & evolution**
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- Software as organisation
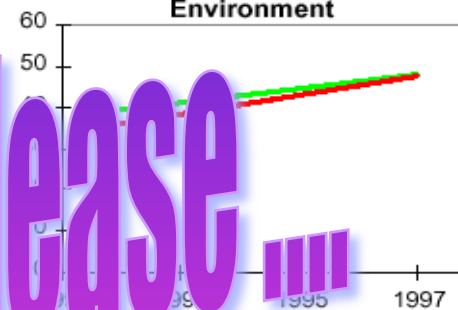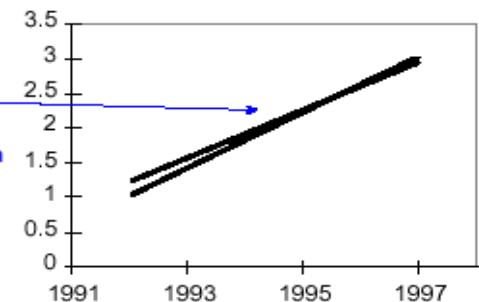- Research challenges

- Actorweb programme

Gartner said ...

- Through 2003, driven by increasing complexity levels for new development, support productivity will decline by 10 percent from current levels (0.7 probability).

Business & Technical Complexity

Complexity of Business Environment

Technical Complexity Indices Development

Update me please ....

Program Locations & Operational Platform

Modern software development

- Complexity increases
  - Richer functionality
  - Increased (need for) interoperability
  - Inter-organisational

- Drivers:
  - E-Business/E-Commerce
  - Virtual enterprises/Networked business
  - Ubiquitous/mobile/pervasive computing
  - …

Complexity versus gravity

- Is complexity to software architecture what gravity is to traditional architecture?

- If only we just had to deal with a few elementary forces …

Dr Dobb's Journal, Shannon Cochran, April 2001

What's the most important problem in computer science?
Languages, tools, programmers?
Well, according to a growing number of researchers and computer users, it's software complexity.

"We've known about this problem for 40 years," says Alfred Spector, vice-president at IBM Research.
"This is probably the number one problem ... It can't go on."

Complexity in software

- Complexity is handled:
  - At design-/development-time
  - By software architect/developer

and …

if we manage to get it right at all, then …

oh dear … the requirements evolve …

But one wonders ...

- Software is not the only area where we have to deal with complexity & evolution

- How about organisations in general?

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Complexity in organisations

- Dealt with at design/development time?
  - Industrial age!
  - Taylor!
  - Evolvability/Agility!?

- New approaches emerge

Different ways of organising

- Images of Organization, G. Morgan, Sage Publications, 1998

- Organisational metaphors:
  - Organisations as Machines
  - Organisations as Organisms
  - Organisations as Brains
  - …

Organisations as Machines

- Organising is engineering
- Military style of organisation
- Fixed division of tasks
- Hierarchical supervision
- Detailed rules & regulations

Organisations as Organisms

- Open systems
- Homeostasis
- Requisite variety
- Evolution

Organisations as Brains

- Learning abilities
- Distribution of intelligence
- Learning organisations

Complexity in organisations

- Which metaphor is best?
  - Depends on situation at hand!
  - What factors?

- Areas of further inspiration
  - Cybernetics
  - Complex adaptive systems
  - Biological systems
  - Sociological systems
  - …

One wonders …

Applicable to software?

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From need to solution

Software Need

Engineering →

Software Solution

- The problem
- Requirements
- Domain model
- ...

- Strategy
- Architecture
- Design
- System
- ...
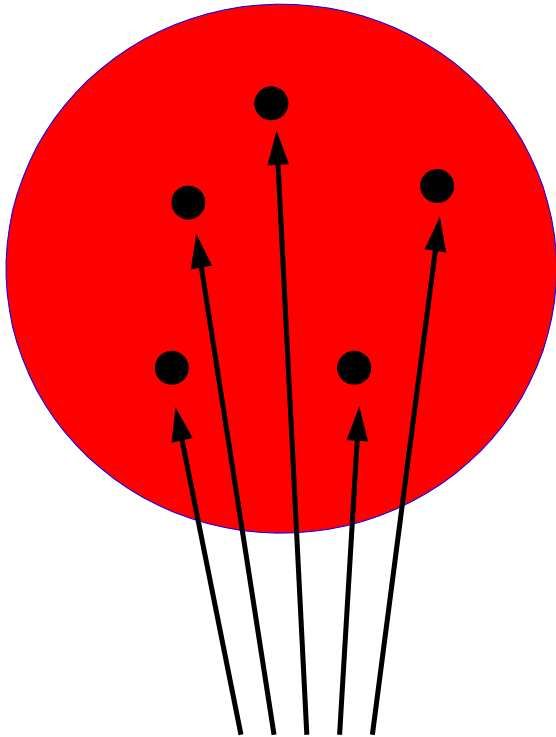
From need to solution
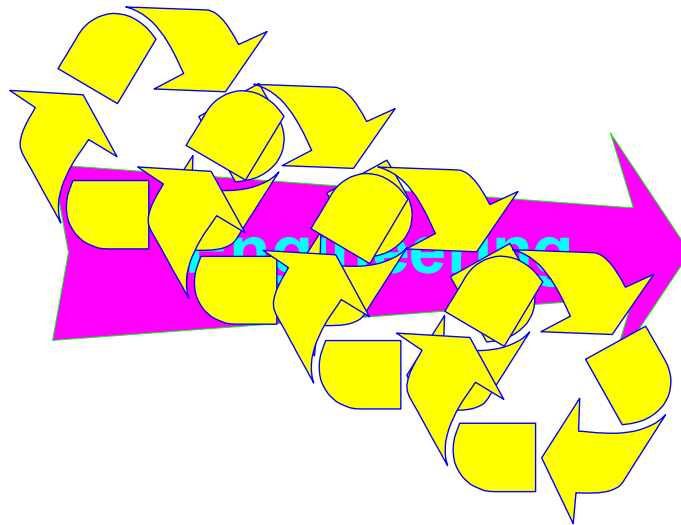
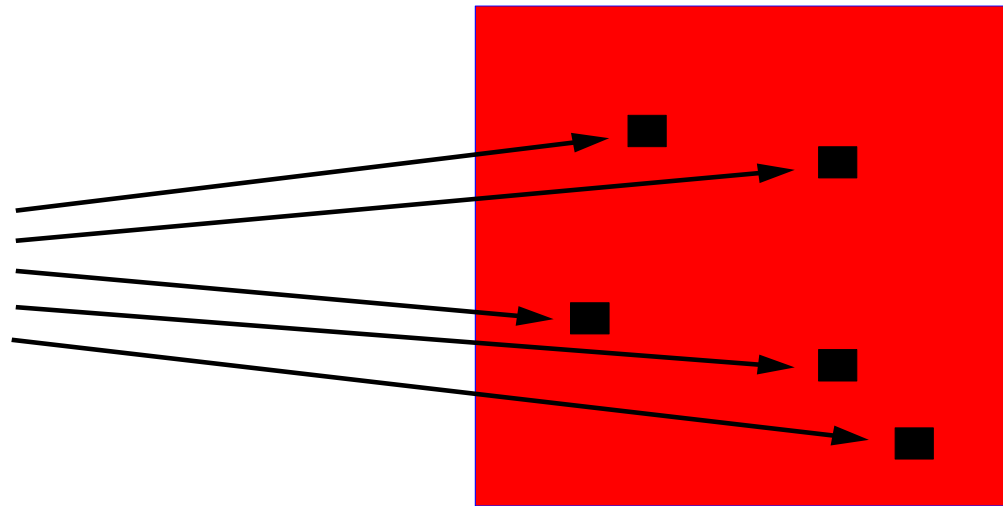Software
Need

Software
Solution
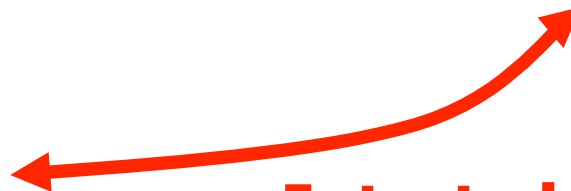
Not a linear process!

From need to solution

Need space

Solution space
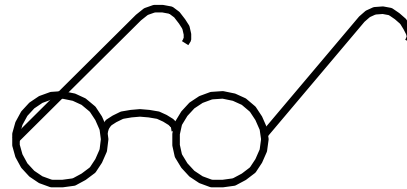
Which solution?

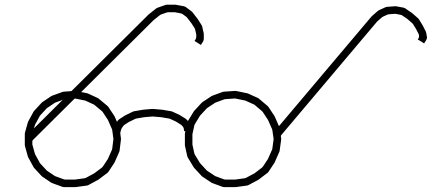**Which need?**

Intertwined issues

Understanding the need

- What aspects/facets/concepts are needed to understand the need well enough to engineer an optimal solution?

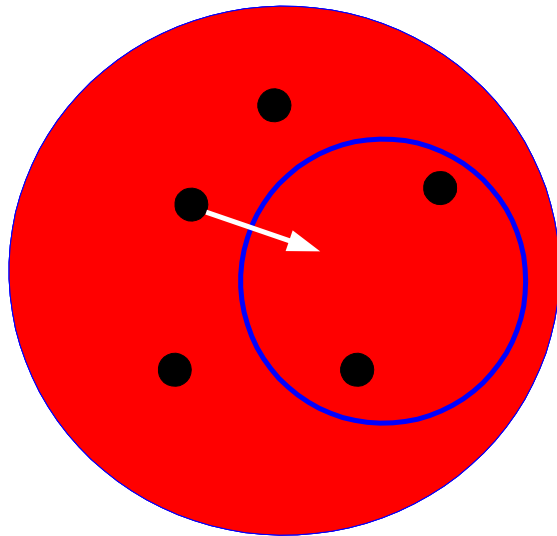- Which paradigm is needed to study the need?
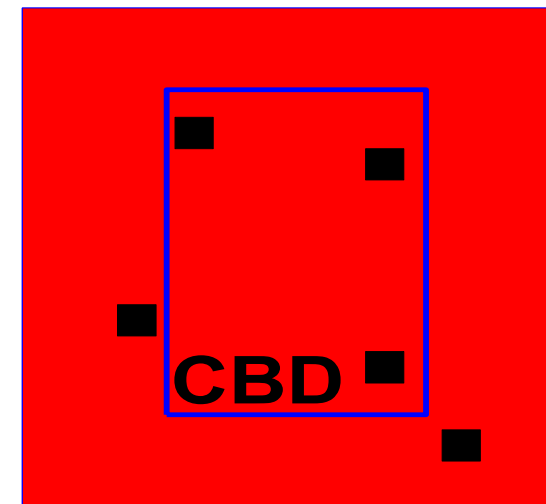
- Intertwined with solution paradigm
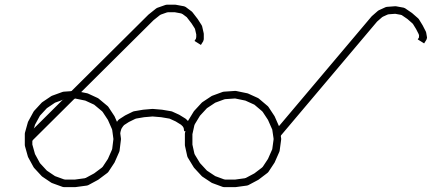
Which paradigm to choose?

Need space

Solution space

CBD?

CBD

Which paradigm to choose?
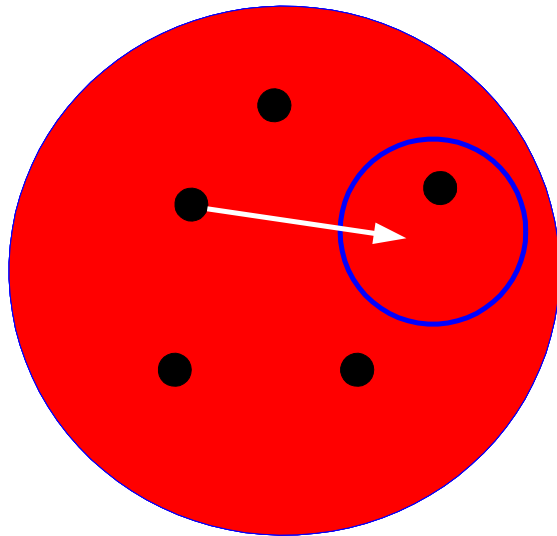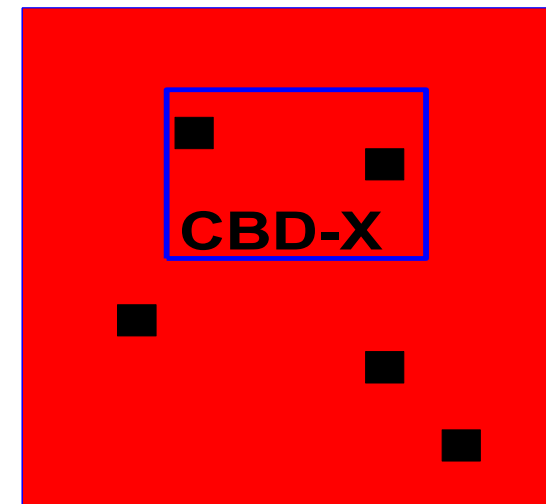
Need space　　　　　　　　**Solution space**

CBD?

Which CBD?
- **SUN**
- **IBM**
- **MicroSoft**
- **...**

CBD-X

Which paradigm to choose?

- CBD
- Object-oriented
- Agent-based
- Transaction-oriented
- Batch-oriented
- ...

Different forms of organising

One wonders ...

Software as organisation?

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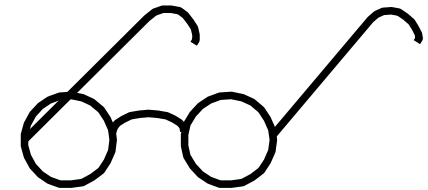
- Actorweb programme

ActorWeb

- Computational units (actors)
  - Human or ICT
  - (Autonomous, adaptive) behaviour
  - Different roles
  - Different purposes

- Communication (web)
  - Interaction
  - Coordination
  - Knowledge-/Information-/Dataflow
  - Contracts

ActorWeb is ...

- ... is a paradigm
- ... is a paradigm!
- But a very general one:
  - Actors
  - Communication

- CBD, Object-oriented, Agent-oriented, ...

Software as organisation

- The aim is not to say:
    - stop organising software as a "machine"

    but rather to:
    - unfold the design spectrum
    - there are more perspectives than a "machine" perspective

- The bad news is that one has to make choices …

Software and organisational metaphors

- Organisations as Machines
- Organisations as Organisms
- Organisations as Brains
- ...

Organisations as Machines

- Organizing is engineering
- Military style of organisation
- Fixed division of tasks
- Hierarchical supervision
- Detailed rules & regulations

- Traditional software designs
  - CBD
  - OO

Organisations as Organisms

- Open systems
- Homeostasis
- Requisite variety
- Evolution

- Agent technology
- Jini?

Organisations as Brains

- Learning abilities
- Distribution of intelligence
- Learning organisations

- Traditional AI
- Neural networks
- Agent technology

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Research Challenges

- What are the core concepts?
  - Actors
  - Communication
  - Levels of abstraction
  - Levels of granularity
  - …

More concepts may deepen the focus,
but may lead to a narrowing of the spectrum
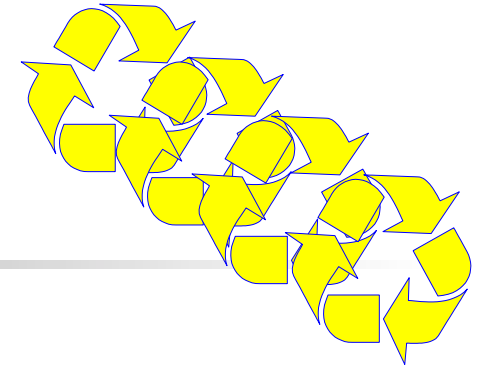
Research Challenges

- What additional concepts may be used?
  - Reflection/Intelligence
  - Information hiding
  - Services/contracts
  - Design aware components
  - …

- In which situations should they be used in?

More concepts may deepen the focus,
but may lead to a narrowing of the spectrum

Research Challenges

- From need to solution:
  - What should be known about the need?
  - How to express; how to measure?
  - Persistence over time?

  - What classes of ActorWebs exist?
  - When to use which class?
  - Additional concepts?
  - Patterns?

Research Challenges

- Relationships to:
  - General systems theory
  - Cybernetics
  - Complex Adaptive Systems
  - Agent technology
  - CBD
  - OO
  - ...

Research Challenges

- **Automated support**
  - Design space exploration
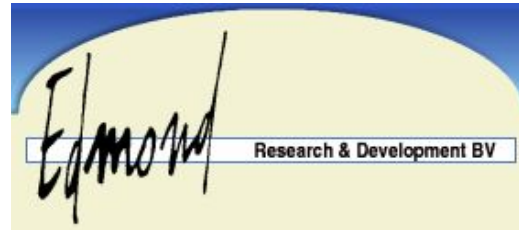 - Animation

- …

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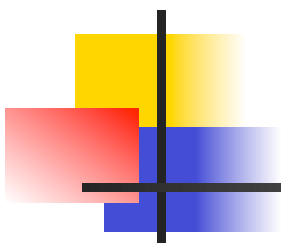- Research challenges

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Interested parties

Status

- Gathering interested parties

- Kick-off workshop by Mehmet Aksit

- Website: www.actorweb.org

- Contact person: E.Proper@actorweb.org

If at first an idea is not absurd, then there is no hope for it.

-- Albert Einstein