Forum Safran 2024: Where Theory meets Practice

THE NATURE OF VALUE-CREATING DESIGN PROCESSES: CHALLENGES FOR PLANNING AND CONTROL

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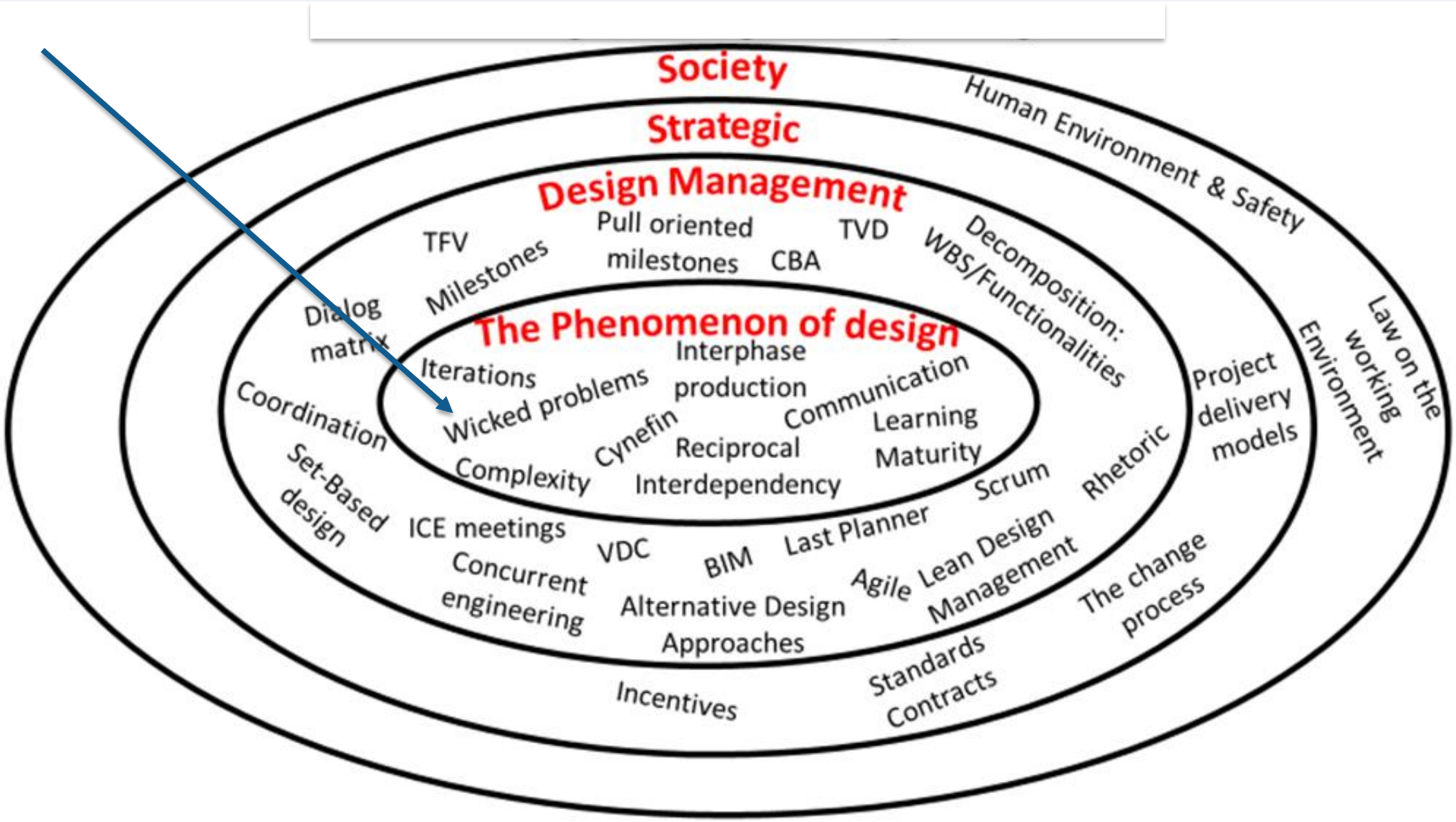
Some design experiences from relatively large complex construction projects

- Muddling through
- Organic growth – it will be as it will be
- Reactive trouble shooting
- The designers manage, however. Skilled people who know their discipline. Coordination by institusjonalised practice.
- Challenge: New solutions/innovation, value creation; and maybe buildability and cost

My background in design/engineering management

- Lecturing master and PhD courses; research; and some practise
- One of five authors of the textbook which title page you can see to the right. Published January 2024 by Fagbokforlaget


Society
Human Environment & Safety
Strategic
Design Management
TFV
Milestones
Pull oriented
milestones
CBA
TVD
Decomposition:
WBS/Functionalities
Dialog
matrix
The Phenomenon of design
Iterations
Wicked problems
Interphase
production
Communication
Learning
Maturity
Cynefin
Reciprocal
Interdependency
Complexity
Coordination
Set-Based
design
ICE meetings
Concurrent
engineering
VDC
BIM
Last Planner
Scrum
Agile
Lean Design
Management
Alternative Design
Approaches
Rhetoric
Project
delivery
models
The change
process
Law on the
working
Environment
Standards
Contracts
Incentives

Design (e.g. architectural design, engineering design)

- To design is to create a foundation for some kind of artefact
- Interactions with other disciplines, the client, users, general contractor, MEP-companies, other suppliers; and public authorities

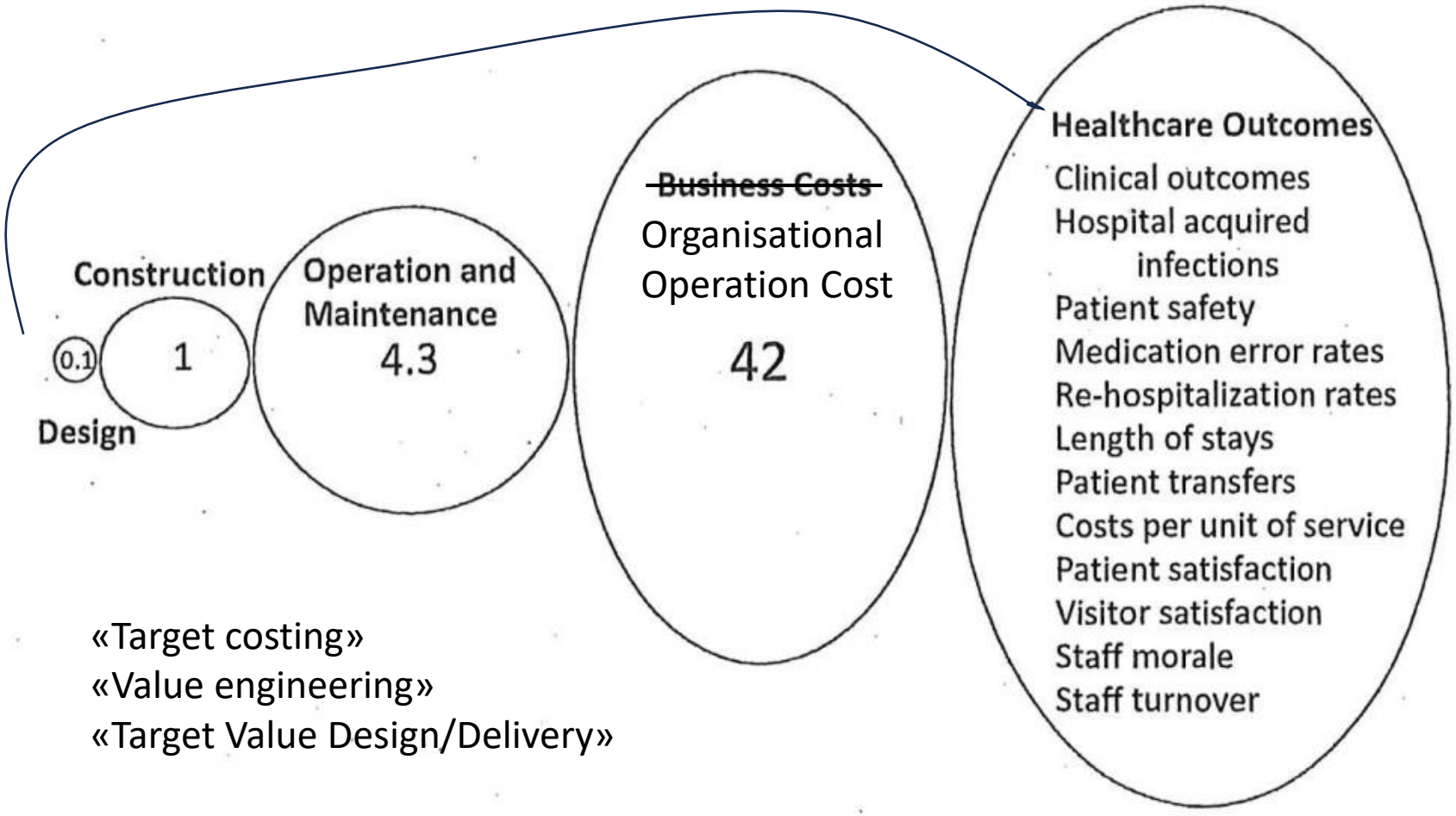
Output:

- Foundation for work, drawing, BIM
- Constructability/buildability
- Usefulness (end users, operation, maintenance, etc.)
- Foundation for procurement
- Symbol, art

Design management

- Organize **value** creating processes for the client and society
- Adapt to the project goals, client requirements and public regulations (e.g. The Planning and Building Act)
- Planning
- Progress
- Decision making
- Cost control
- Risk and opportunity
- Deliver **agreed** documentation for buildable artefacts

Perspective of value creation (relative cost – 20 years)



«Target costing»
«Value engineering»
«Target Value Design/Delivery»

by Ballard, 2020,

Whole Life Costs & Benefits (developed from Evans et al., 1998)

Ballard, G. (2020). Target Value Delivery. In, *Tzortzopoulos*, P., Kagioglon, M. and Koskela, L. (Eds), Lean Construction. Core Concepts and New Frontiers, (pp. 149-161). Huddersfield: Routledge.

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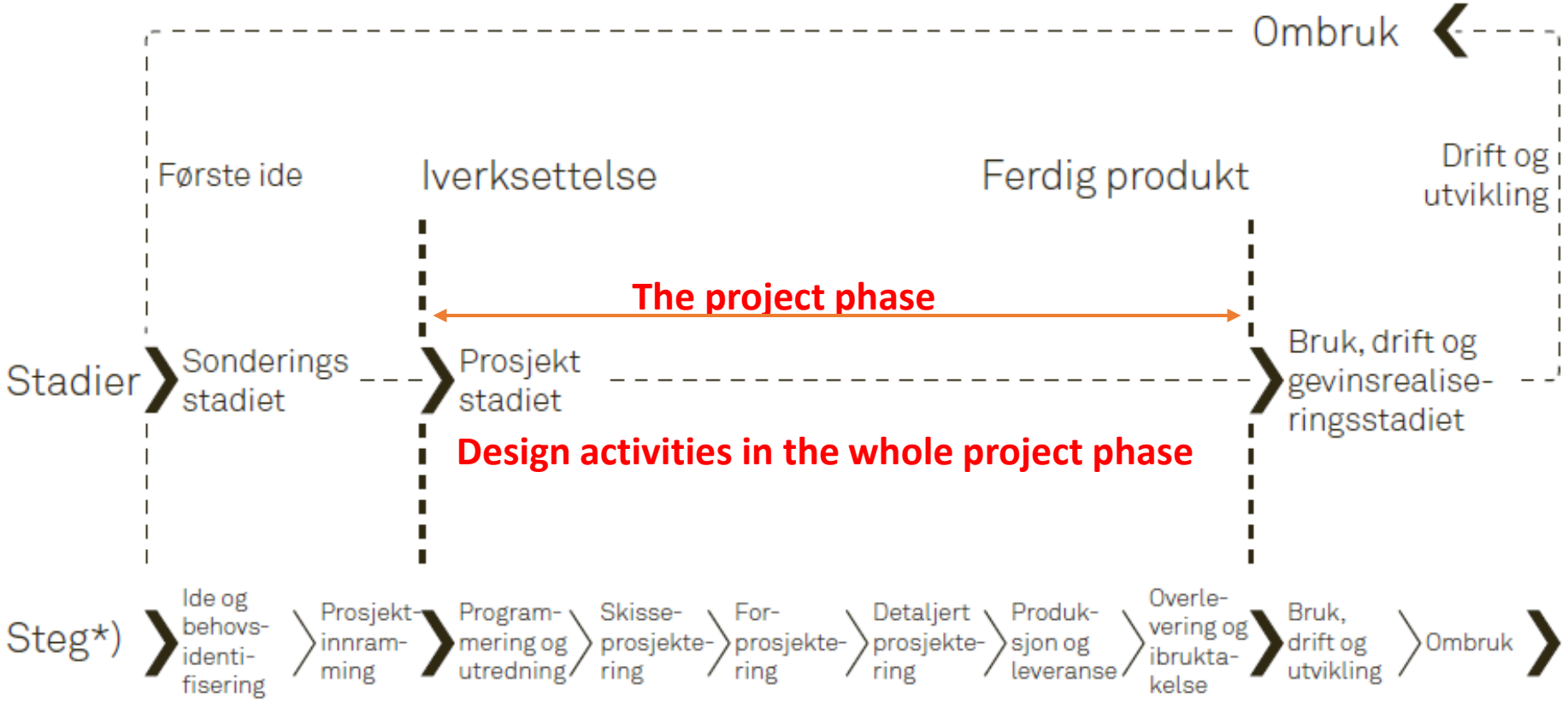
Accpording to phase design change characteristics



Figur 06-2 Stadier og steg i BAE-prosjekter gyldig for denne boken, basert på NS 3467 (2023) og Rolstadås mfl. (2020).

Source: (Kalsaas et al. 2024)

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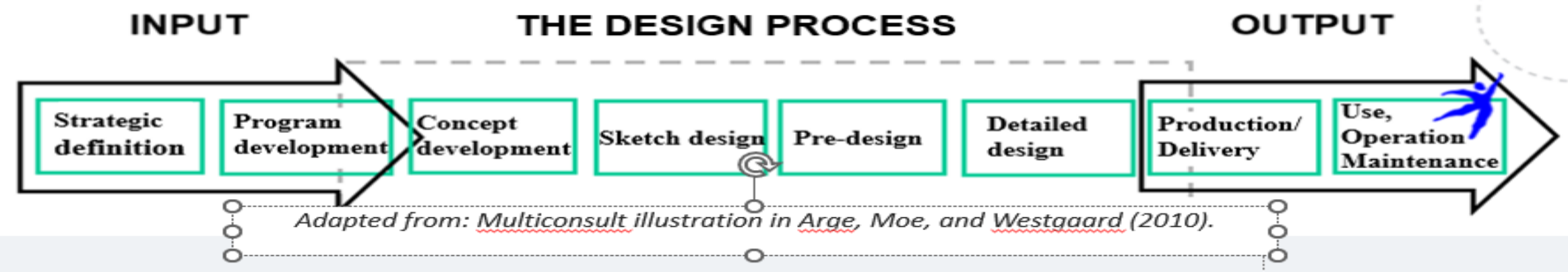
To control we divide construction processes in phases /stages



…however, design in construction follow a different sequential logic than production

Sometimes designers need to create detailed design for some topics in the pre-design phase or sketch design

Example:

The staircase geometry most be early decided, due to bracing of the construction (structural engineering), technical regulations (slope), escape routes (fire engineering)

Interdependency and coordination in design

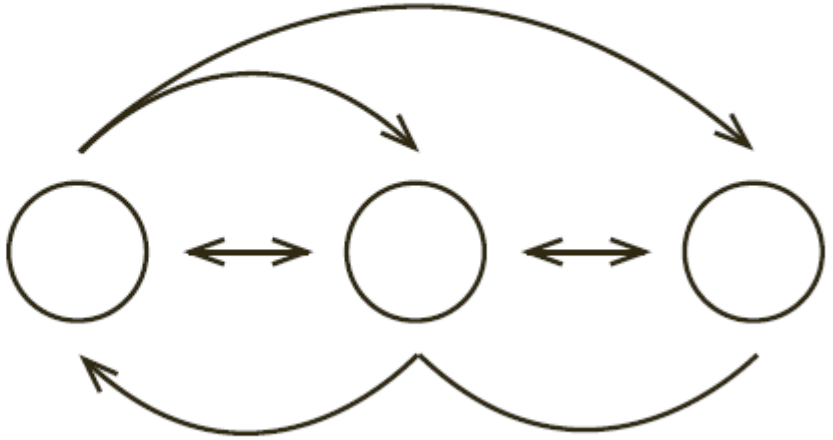
Sekvensiell avhengighet

Sequential interdependency

Coordination by plan

Reciprocal interdependency

Resiprok avhengighet

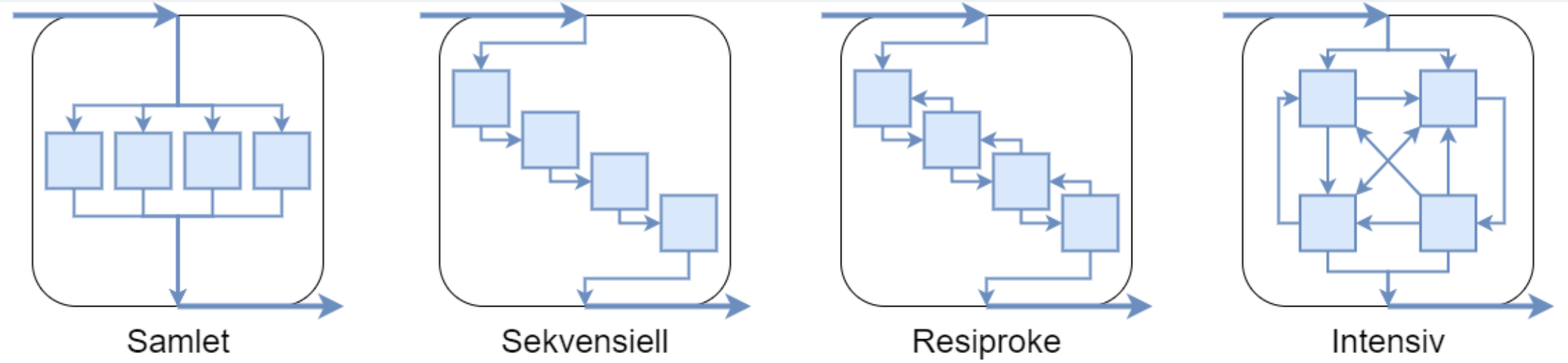


Coordination by mutual adjustment

Definition:
Several disciplines work on the same object,
and it is the status of the object that decide
which discipline to take the next action.
The disciplines create uncertainty for each
other

Source: Thompson, 1967

Interdependencies – alternative conceptualization which builds on Thompson



Pooled (work in parallel) Sequential Reciprocal Intensive

Bell, B. S., & Kozlowski, S. W. (2002). A typology of virtual teams: Implications for effective leadership. Group & organization management, 27(1), 14-49.

Wicked problems vs. “tame problems”

(Churchman, 1967).

- The phrase was originally used in social planning
- Stolterman (2008) and Rittel (1988), argue that **design is a wicked problem**.

Conklin (2006):

- 1) The problem will not be fully understood until after the formulation of a solution;
- 2) Wicked problems have no stopping rule;
- 3) Solutions to wicked problems are neither right nor wrong;
- 3) Every wicked problem is essentially novel and unique;
- 4) Every solution to a wicked problem is a “one shot operation”;
- 5) Wicked problems have no given alternative solutions

Example

wicked problems

- Reinertsen (1997) indirectly refers to wicked problems, arguing that designers are primarily driven by the desire to design best-in-class solutions, **and that these tasks are therefore rarely delivered ahead of time because the solutions can always be improved upon**.

wicked problems - complexity

- Skaburskis (2008) refers to a conversation with Horst Rittel (e.g. Rittel, 1988) during which they discuss whether or not wicked problems can be solved.
- Rittel argued that they could be solved and that he did so every day. However, he also pointed out the fact that “We can’t solve them by reference to the logic inherent in the problem.”
- This citation corresponds well with the complex domain referred to in CYNEFIN (Snowden, 2000), where cause and effect is not known beforehand but emerges after actions have taken place.

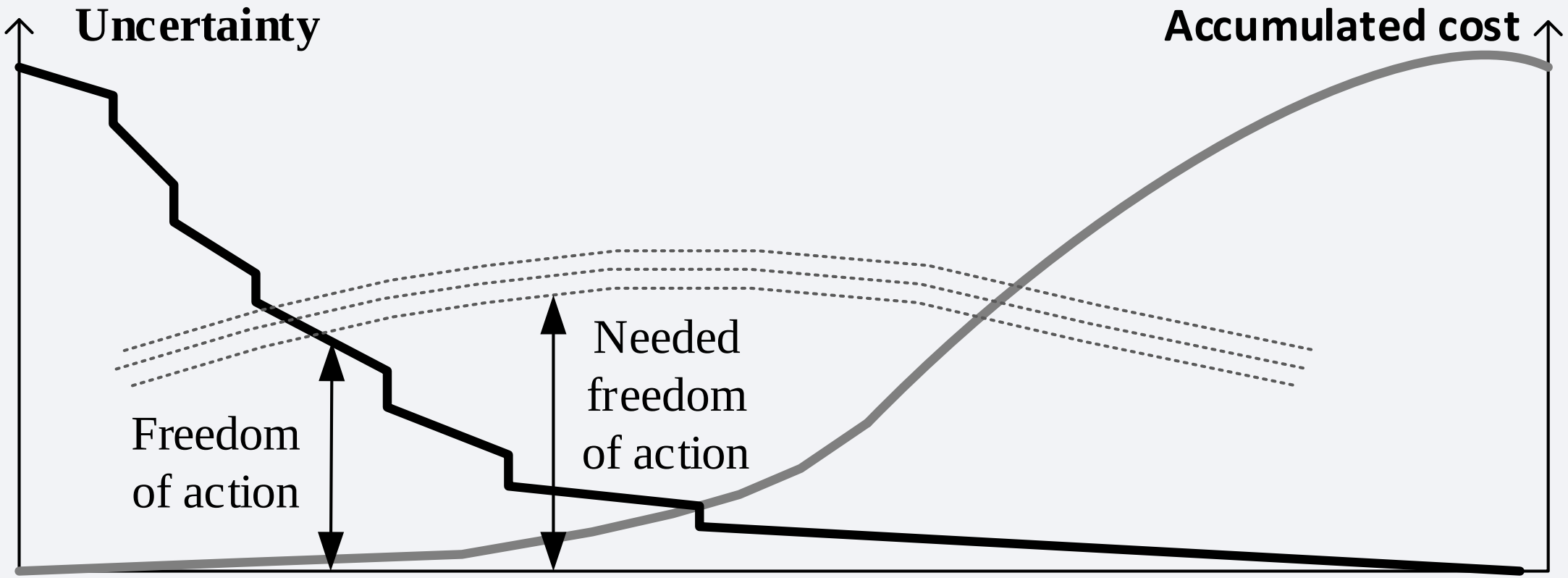
Cynefin (habitat)

Source: Snowden, 2000

To the right: “order”
To the left: “disorder”

Maturity/learning creates the paradox between freedom of action and needed freedom in design (and production)

The users, the client, the different disciplines and the contractors all learn during the project period



Eikeland, P. T. (1998). Teoretisk analyse av byggeprosesser. Report from the Norwegian RandD-project Samspill i byggeprosessen. Oslo.

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Four types of problems (Smalley, Lean Enterprise Institute, 2018)

1. Trouble shooting (reactive)
2. Gap from standard (“)
3. Target condition (created problems, proactive responses)
4. Open ended (“)

Open ended problem solving

We often cannot draw a clear or detailed picture of the desired end state. Unknowns-open ended

Specific to innovation (May, 2012), 3 key points: (1) Linear standard processes - out of the window, (2) “Extreme empathy” toward the user environment, and (3) “Extreme experimentation” (rapidly repeating the learning loop multiple times is essential for open ended innovation)

- **Set based innovation/design** as an alternative to the traditional engineering approach with point-based design

Why set-based is different and effective?

- The agony of late-stage changes
- Experiment early in the development cycle to accelerate early learning
- To create robust alternatives: Elimination process rather than making selections based on subjective evaluation using experience and judgement

Conclusion: Challenges for Planning and Control

The methods we apply for handling design processes in **complex** projects needs to cope with:

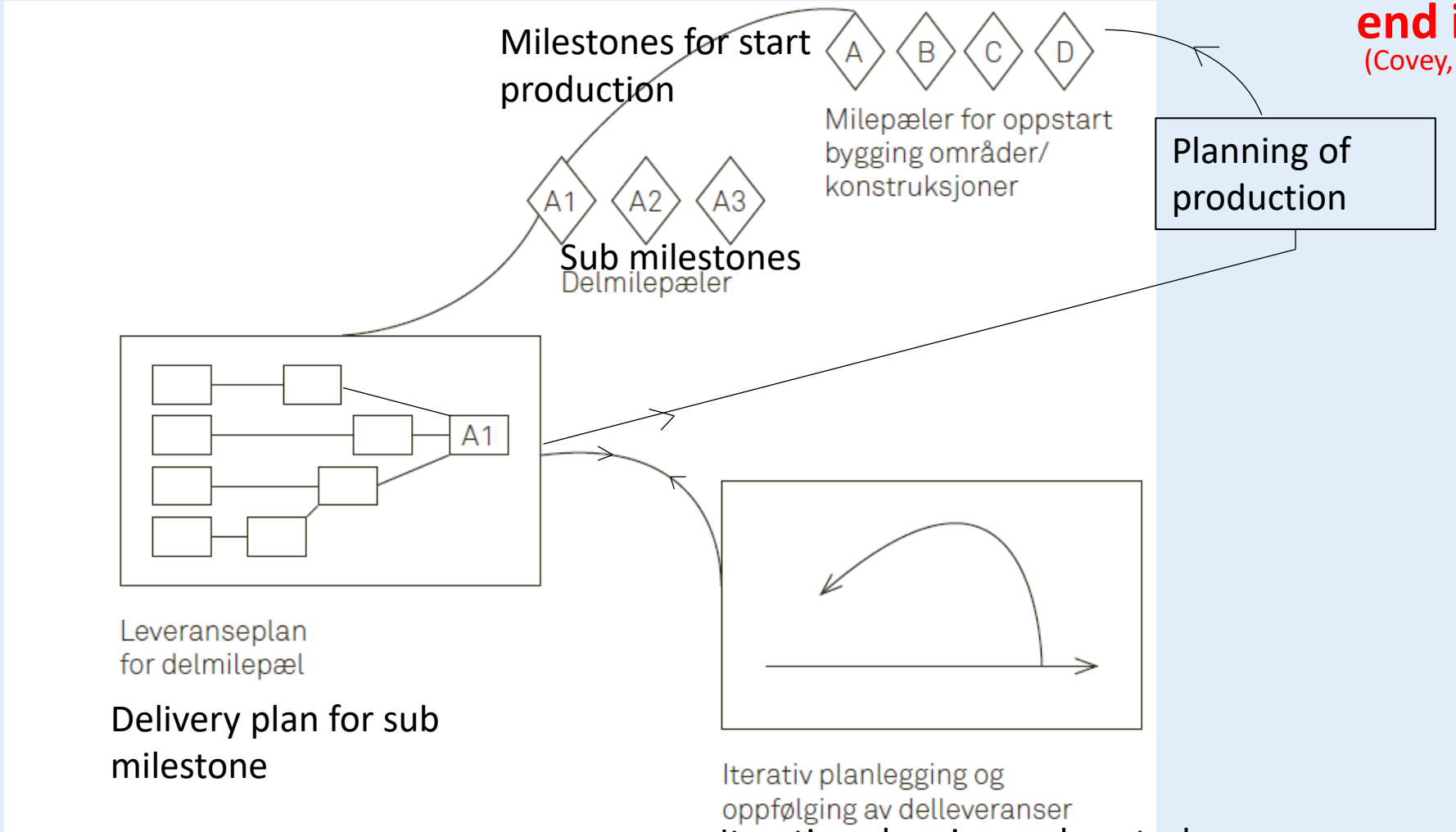
- Different sequential logic compared to production
- Reciprocal interdependencies
- Gradual maturity (MMI, but also in term of user and client involvement)
- Iterations
- Wicked problems
- Complexity in Snowden's meaning
- Open ended problem solutions
- Innovation and sustainable development issues
- The creative and aesthetical issues
- Opportunity and risk
- Subcontractor design and engineering

And of course

- The aspects of progress and cost control
- Building organization with capability to handle the complexity at hand

Possible approach to plan and control design at pre-design and detailed design level (collaborative planning)

Start with the end in mind!
(Covey, 2014)



Source:
(Kalsaas et al. 2024)

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Thank you!

Any question or remark is welcome