

## Engaged Research in Process Improvement

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# Engaged Research in Process Improvement

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*First Scandinavian Conference on IS  
Rebild Bakker, 22 AUG 2010*



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- This keynote initiates from an example of engaged research; a Danish software house that made it from maturity level 1 to 5 in eight years. The organizational change implied at each step is discussed and a **design theory** of process improvement and change derived

# Design Theory

# Scandinavia is known for Design

"...design, stripped to its essence, can be defined as the human capacity to shape and make our environment in ways without precedent in nature, to serve our needs and give meaning to our lives."

John Heskett (2002, p. 7). *Toothpicks & Logos: Design in Everyday Life*. Oxford University Press

# Participatory Design

- Came out of Scandinavia 20+ years ago
- Alive and kicking

## Last 5 years

- A renewed interest worldwide in Design Science Research
- DESRIST conference, 8.2+8.6 in Perth, MISQ & SJIS special issues

# Design Research

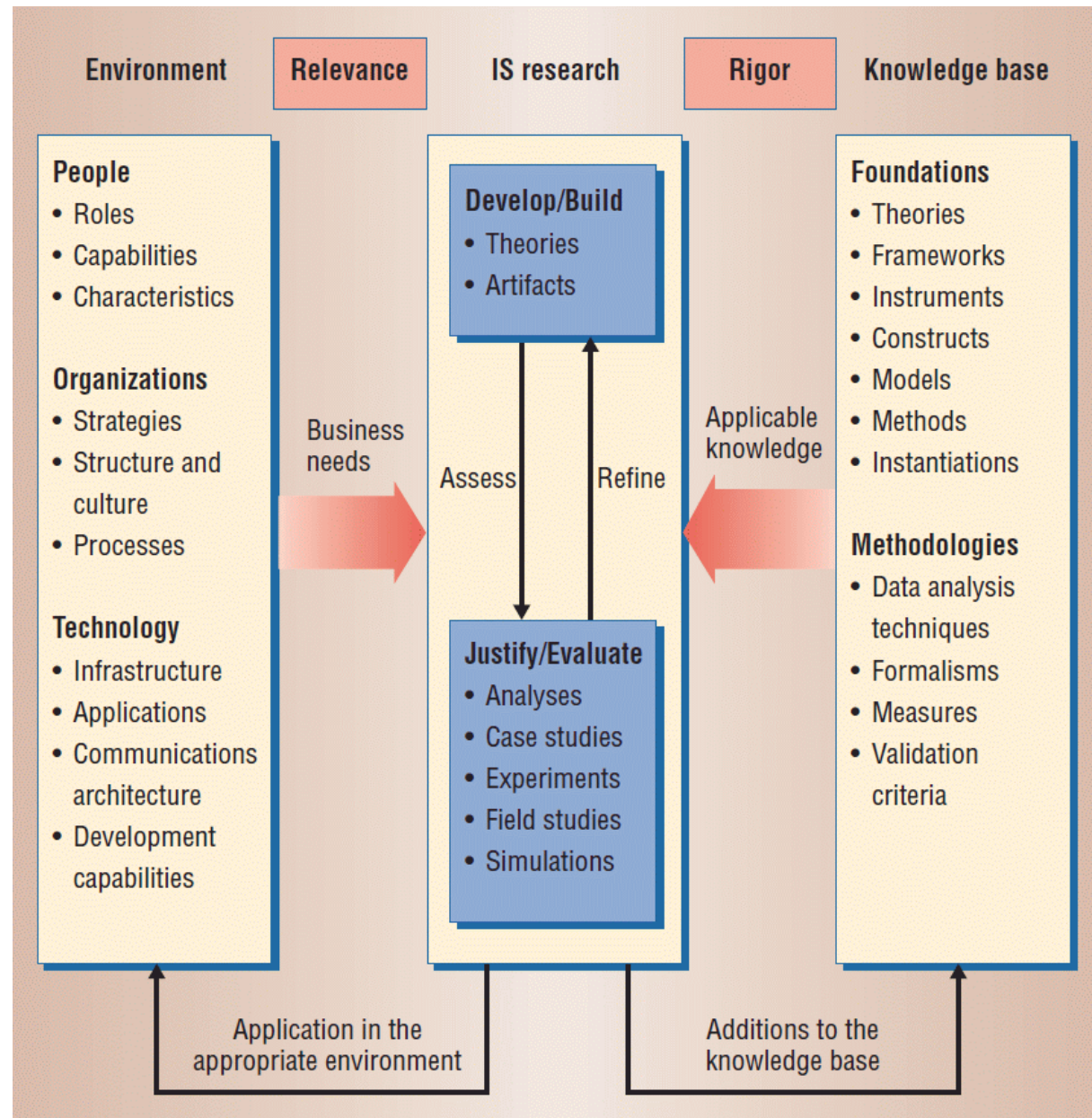
The design research society often uses Simon's definitions of "science of design" as a reference point for defining "design research".

"Science of design" = "design science" =  
"design research" (more or less)



# Most commonly used framework 1

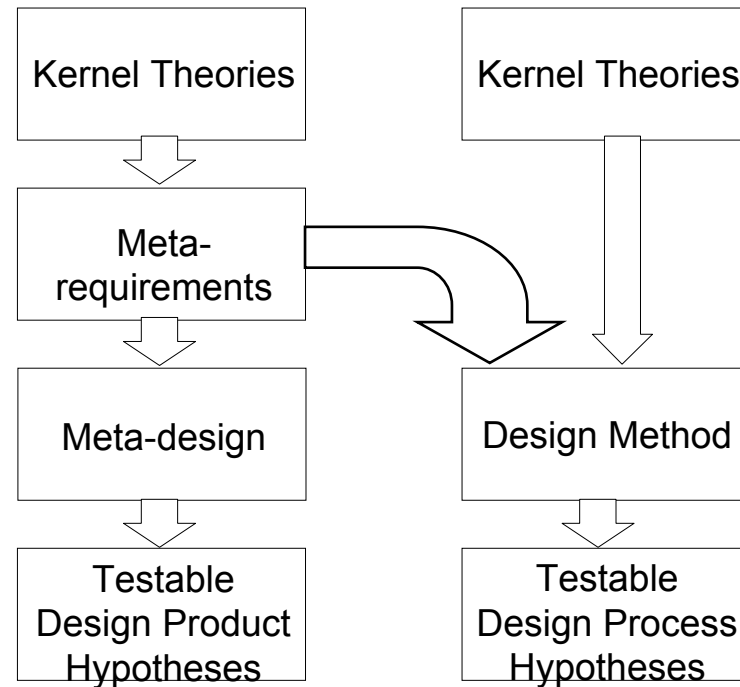
(Hevner & March 2003)



## Most commonly used framework #2

- Walls, J. G., Widmeyer, G. R., & El Sawy, O. A. (1992). Building an information system design theory for vigilant EIS. *Information Systems Research*, 3 (1), 36-59.
- Concisely delineated
- Served as a model for future studies
- Design theories have frequently been abstract (no implementation of the artifact).

# Design Theory Components



Design Product		
1	Kernel Theories	Natural or social science theories governing design rqmts
2	Meta-requirements	Applicable class of goals
3	Meta-design	Hypothetical class of artifacts meeting meta-rqm ts
4	Product Hypotheses	For testing meta-design against meta-requirements
Design Process		
1	Kernel Theories	Natural or social science theories governing design process
2	Design Method	Procedure for constructing the artifact
3	Process Hypotheses	For testing results against meta-design

# Complex Design Theory

- Many scholars assume that a design theory requires a complex and elaborate structure - as the one you have just seen by Walls et al.
- While this structure has appeal for its completeness and complexity, it has led scholars to criticize simplicity and elegance in design science theories that fail to demonstrate the "required" elements.
- Criticisms has even lead to questions about whether design theory can be considered theory at all.

# Ockham's Razor

- A Complex Design Theory perspective violates one of the oldest principles of scholarship, the fourteenth century Ockham's Razor (1964) (in Latin):
- "*Pluralitas non est ponenda sine neccesitate*",
- which can be translated to: "entities should not be multiplied unnecessarily."
- We seek the simplest possible delineation of a design theory.

# The essence of a Design Theory

- Based on a study of notable design writing in architecture, finance, management, cognitive psychology, computer science as well as information systems and the philosophy of science, I claim that design theory consists of two parts:
- A design practice theory, and an explanatory design theory.
- *An explanatory design theory provides a functional explanation as to why a solution has certain components in terms of the requirements stated in the design.*
- For explanatory design theory, only two elements are essentially necessary for a complete design theory: requirements and solution components.

# Philosophy of Science

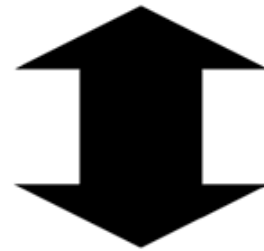
## give us 4 types of explanations

- **Deductive explanations** operate where the conclusions are logically necessary outcomes of the premises.
- **Probabilistic explanations** operate where conclusions about a member of a class are the outcome of statistical premises about the class.
- Deductive explanations are common in the natural sciences, and probabilistic explanations are common in the social sciences.
- **Genetic explanations** operate where conclusions about a phenomenon are the outcomes of the historical evolution of this phenomenon.
- **Functional explanations**, also called teleological explanations, indicate "one or more functions (or even dysfunctions) that a unit performs in maintaining or realizing certain traits of a system to which the unit belongs" (Nagel, 1961, p. 23).

# Explanatory Design Theory

## General Requirements

(condition or capability needed or possessed)



## General Components

(part of a whole)

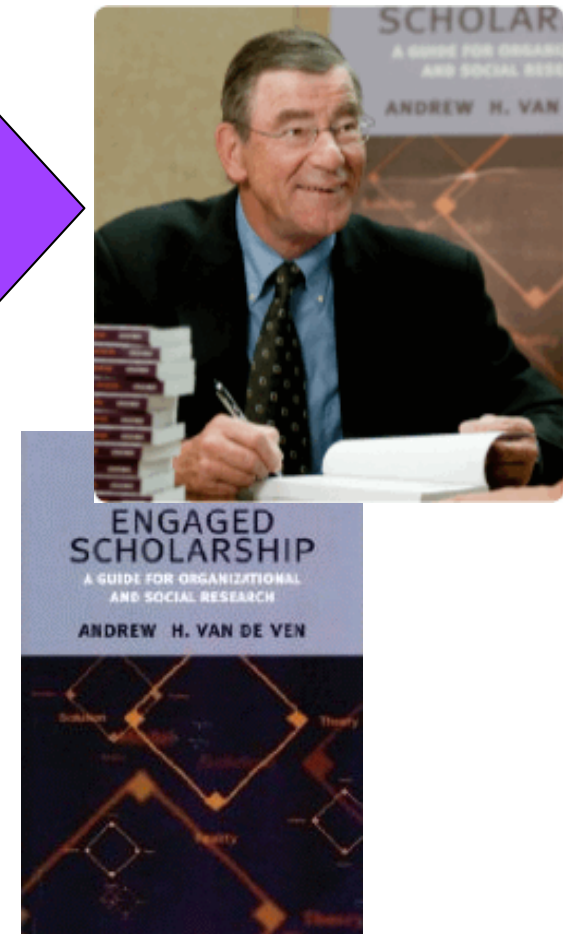
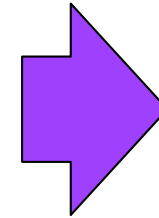
Baskerville & Pries-Heje (forthcoming) BISE & Wirtschaftsinformatik



# Engaged Research

# Engaged Scholarship according to Van de Ven

A participative form of research for obtaining the advice and perspectives of key stakeholders (researchers, users, clients, sponsors, and practitioners) to understand a complex social problem.



# An example of engaged research; a Danish software house

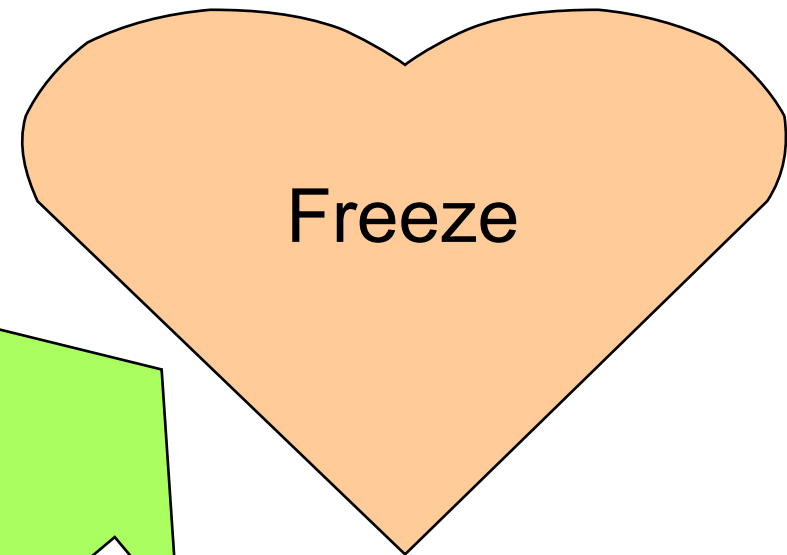
# Research Method

- Case Study in Danish company
- Longitudinal - followed for 10 years
- Data gathering: Participant observation, minutes, assessment reports, interviews and workshops
- Data analysis: Search Conference ("bring the whole system in"); follow-up interviews; Lewin's change model as **theoretical lens**

Assumption:

Basically Maturity is about  
organizational change

*New Status Quo*

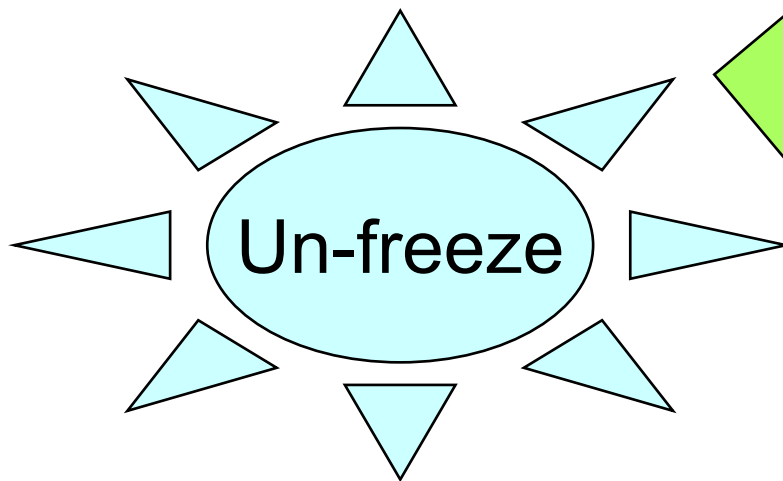


Freeze

Move

*Transition*

*Old Status Quo*



Un-freeze

# Analysis (using Lewin)

From level X to level X+1

- The history - Timeline
- The process - How did you work? How did you implement changes?
- The barriers - What were the main obstacles?
- The benefit - The main benefits? Successes?
- The effect - How was it measured?
- Experiences - What would you do different?

# Timeline

1992 Company receives ISO 9000 certification

1997 Company decides to use the CMM to improve

1997 and 1999 Bootstrap assessments at low levels

2000 A Bootstrap assessment shows that Company is at level 2

2001 Company uses a Balanced Score card first time -  
Use continues and becomes an integrated part of reaching level 4

2002 Company passes a formal CMM level 3 certification

2002 Company decides to change from CMM to CMMI

2003 Bootstrap assessment measures level 3,25

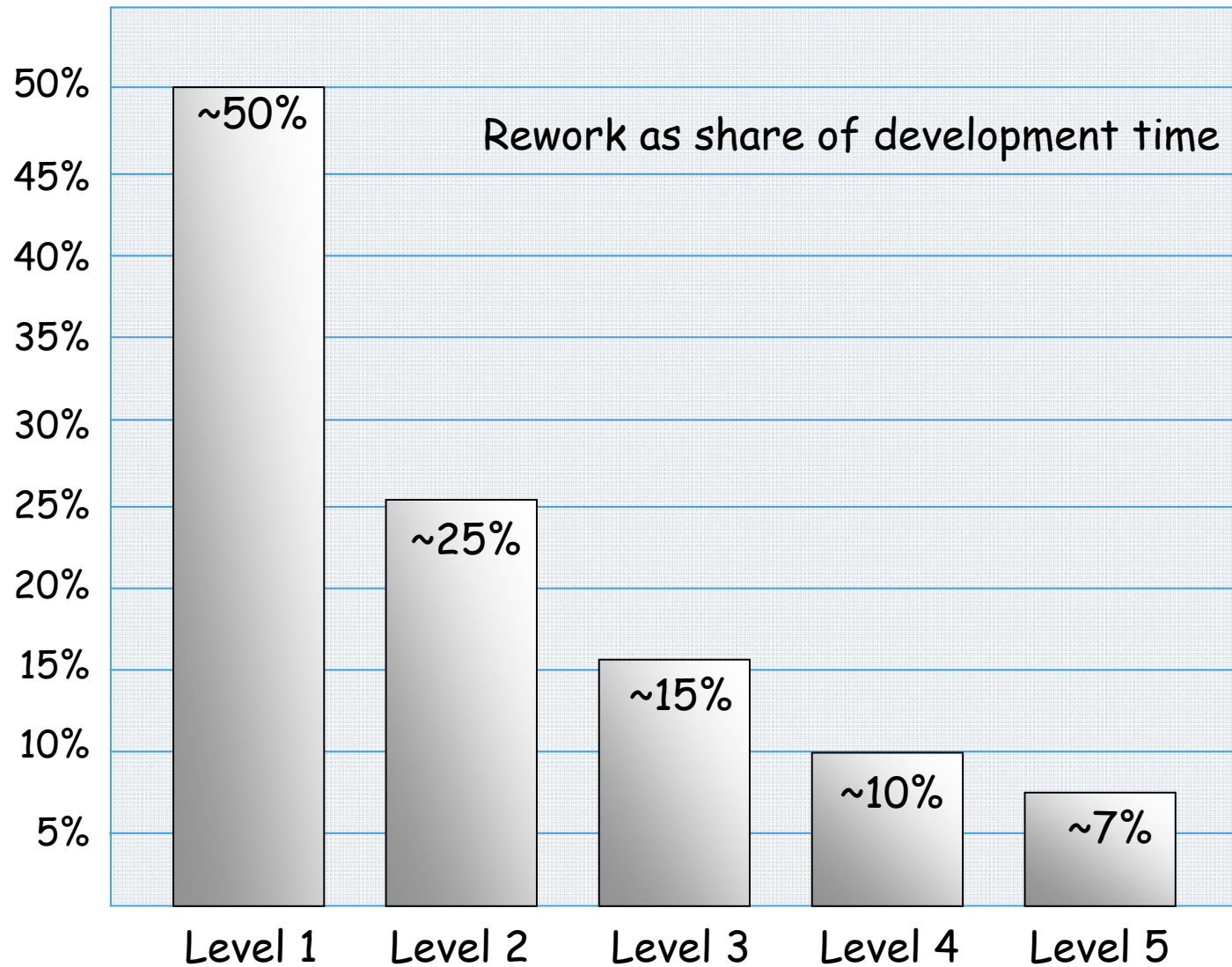
2004 Company passes a formal CMMI level 4 certification

2005 Company passes a formal CMMI level 5 certification

2009 Still at level 5 - Now looking at agile (SCRUM)



# Success



# Level 1-to-2 Challenges

- Key Idea: Defined; Stability; Repeatability
- Process Improvement (PI) seen as low status > High Staff Turnover
- Lack of necessary competence (too few with too little time)



- *"We learned the hard way that we had to add hours in the projects for improvement - but it was not until level 3 that we really became skilful in it" told the CEO*
- *"The QA manager at that time lacked respect in the organization and did not have the ability to communicate", said the CEO*

# Training Project Managers

- A major training program for project managers was initiated
- Experienced outside consultants were brought in to conduct the training



- Included in the training were new ways of working so that the training became instrumental for the rollout

Led to improved networking among project managers in the company.

# 1-2 Coping Strategies

- Socializing as Change
- Learning-driven change

# Socializing as Change

- Change in organizational capabilities is driven by working with social relationships.
- Diffusion of innovations happens through personal contacts rather than through plans and dictates.

## Fits well ...

- *Where* organizational skills and capabilities needs to be developed.
- *Where* no unhealthy power struggles occur (so people *can* talk). *Where* employees that can be exemplars are available.

## References:

(Cohen et al. 1972), and  
(Huy 2001), specifically the approach called  
Socializing.

# Learning driven change

- Driven by a focus on organizational learning, individual learning and what creates new attitudes and behavior.

## Fits well ...

- *Where* there is a need for change in attitudes and/or behavior.
- *Where* the organization is talented in learning.
- *Where* relationships between means and goals are unclear.

## References:

(Huy 2001), specifically the approach called Teaching.

Also the learning organization (Senge 1990)

# Level 2-to-3 Challenges

- Key Idea: Common Process
- Post-performance exhaustion
- Discipline
- Resistance



- Some months after the level 2 assessment in the early spring of 2000, the new SPI manager concluded *"Either we drive into a dead end, or we staff the SPI project with people that have the competence to lift this"*

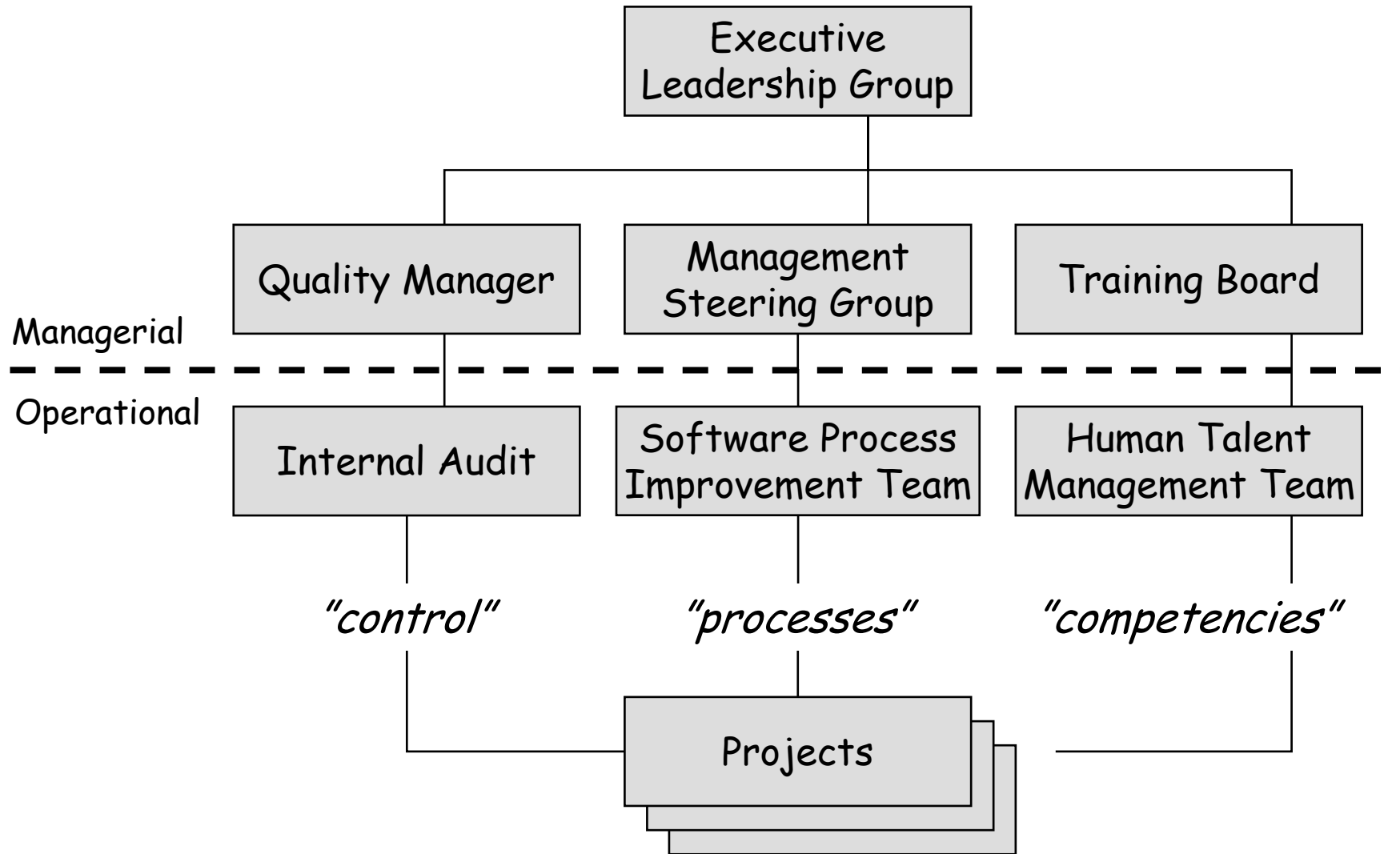
So ...

- New full-time SPI project manager was recruited internally in late 2000, and during the first half of 2001 *fourteen* additional full-time persons were allocated to the SPI group.
- By the end of 2000 the **Business Manual** included descriptions of all CMM level 3 processes

## 2-3 Coping Strategy

- New organization and new roles
- Commanding as change strategy

# The new improvement organization



# Commanding as change

- Change is driven and dictated by (top) management. Management takes on the roles as owner, sponsor and change agents.

## Fits well ...

- *Where* formal structures needs change.
- *Where* change is needed fast.

## References:

(Huy 2001), specifically the approach that is called Commanding.

The design and positioning schools as described by (Mintzberg et al. 2002)

# Level 3-to-4 Challenges

- Key Idea: Measurement
- Understanding model (CMMI)
- Aligning measures with organizational (business) goals
- Balanced ScoreCard (BSC) failed first time - but succeeded later

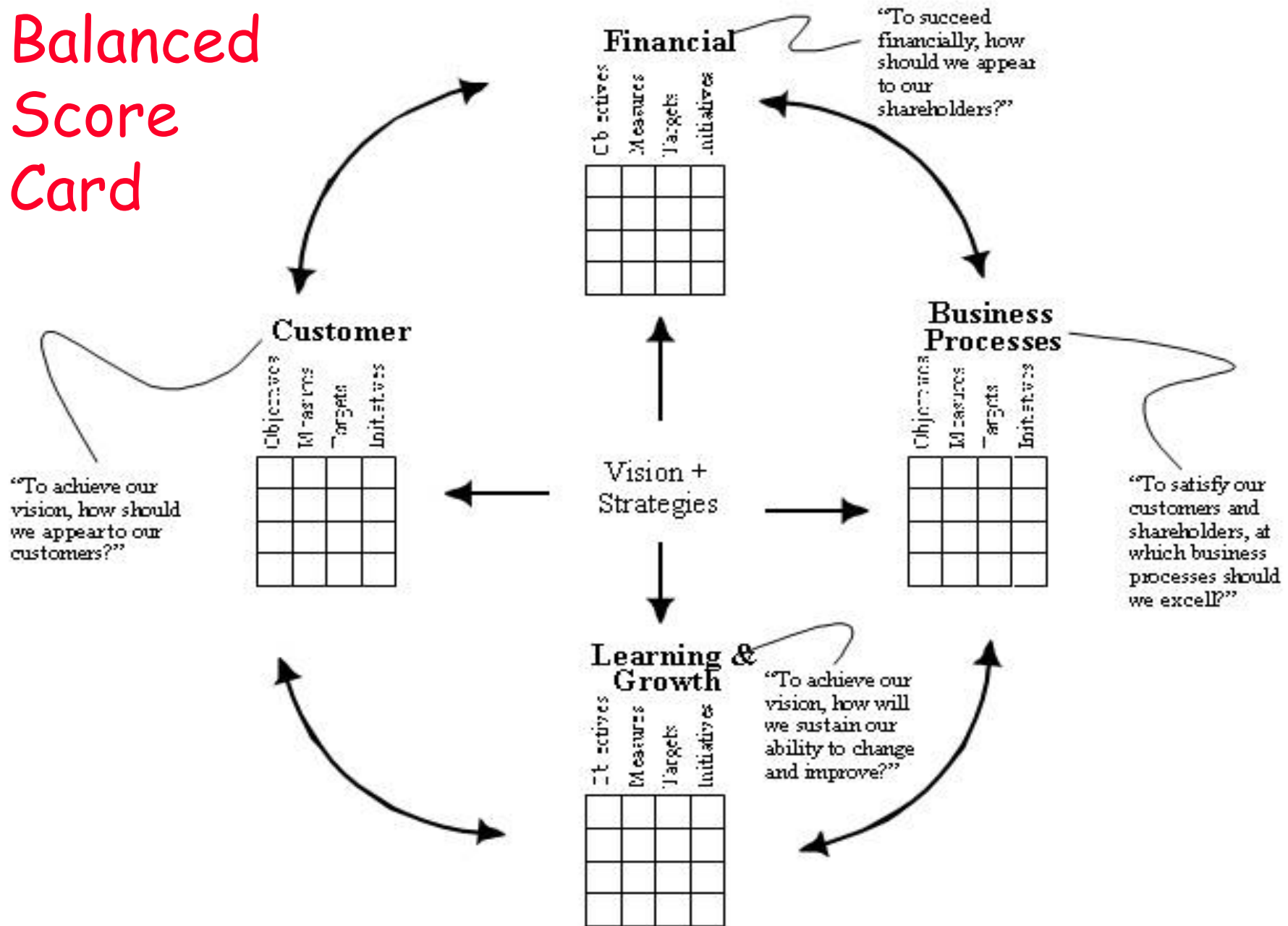
"What you measure is what  
you get"

"What gets measured gets  
done"

"Measure what matters"

*Cited from: Bukh et al. (2000). Balanced  
Scorecard på Dansk. Børsen. Page 13*

# Balanced Score Card



# Failing BSC > Later Success

- *"Today I don't think it was surprising that this first BSC effort in the projects failed,"* said the SPI project manager.
- *Because we didn't formulate requirements to the projects. We just gave them the company goals and asked how they supported that? So all in all this effort required hundreds of hours in each project but the investment did not pay off."*
- *So the SPI function took on the responsibility of facilitating the translation process. "We formulate what the organizational goals means for a typical project in the house; formulated as requirements,"*



*"There was, at the time, no measurement culture and no understanding of their potential value ... What to measure? If you measure, how do you ensure that you have measured correctly? And if you measure correctly, how do you interpret the results; what are the benefits? So it was a giant task, first to make [the SPI group] understand [this] and then for [the SPI group] to get the rest of the house to understand it" [SPI project manager].*



## 3-4 Coping Strategy

- Specialists brought in (University Professor and US Consulting Company)
- Specialist-driven change

# Specialist-driven change

- Change is driven by specialists, either with professional, technical, or domain knowledge.

## Fits well ...

- *Where* work has vast complexity and variety so there really is a need for special knowledge.
- *Where* there is access to necessary specialists, eventually by in- sourcing them .

## References:

(Ciborra 2000),

(Mintzberg 1983) especially professional bureaucracy,

(Simon 1973), (Simon 1983),

(Woods and Hollnagel 1987),

(Woods 1988)

# Level 4-to-5 Challenges

- Key Idea: Optimizing
- Certification fatigue
- Sparse empirical data (on level 5)
- Un-even maturity in relation to customers, partners, etceteras

- To overcome the certification fatigue in the organization, the SPI group maintained a low profile for a few months
- *"Our consultants are not able to help us in these matters. You have to come up with all the ideas yourself. Only sparse accessible empirical work exists targeting the higher maturity levels" [Overall SPI group manager].*

# 4-5 Coping Strategies

- Metrics-driven change
- Production-oriented change

# Metrics-driven change

- Change is driven by metrics and measurements.

## Fits well ...

- *Where* there are relatively stable surroundings so measurements from the past can be used to decide the future.
- *Where* the result of change is measurable..

## References:

Total Quality Management thinking, cf. (Oakland 2003).

Six Sigma thinking, cf. (Pande and Holpp 2000)

*"Now it is time for us to focus on how to capitalize on this investment. In practice this implies an optimization and increased efficiency of the existing processes"*



# Production-oriented change

- Change is driven by the need for optimization and/or cost reduction.

## Fits well ...

- *Where you have relatively stable surroundings.*
- *Where you have many homogeneous resources and workflows.*

## References:

Scientific Management,  
(Benner and Tushman 2003),  
(Huy 2001), specifically the approach called  
Engineering.

# Back to Design Theory

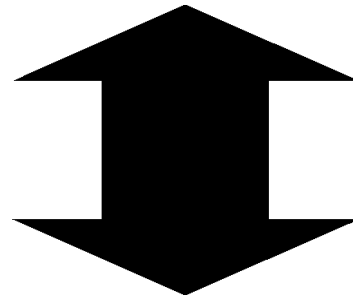
- What worked well at low levels (heroes and training) may not work well at higher levels
- What work at higher levels do not work at lower levels (measuring, production orientation)

Different situations at  
different maturity levels  
requires different change  
strategies

(in all companies?)

## **General Requirements**

- You need to take situation at hand into account
- You need to take maturity level into account

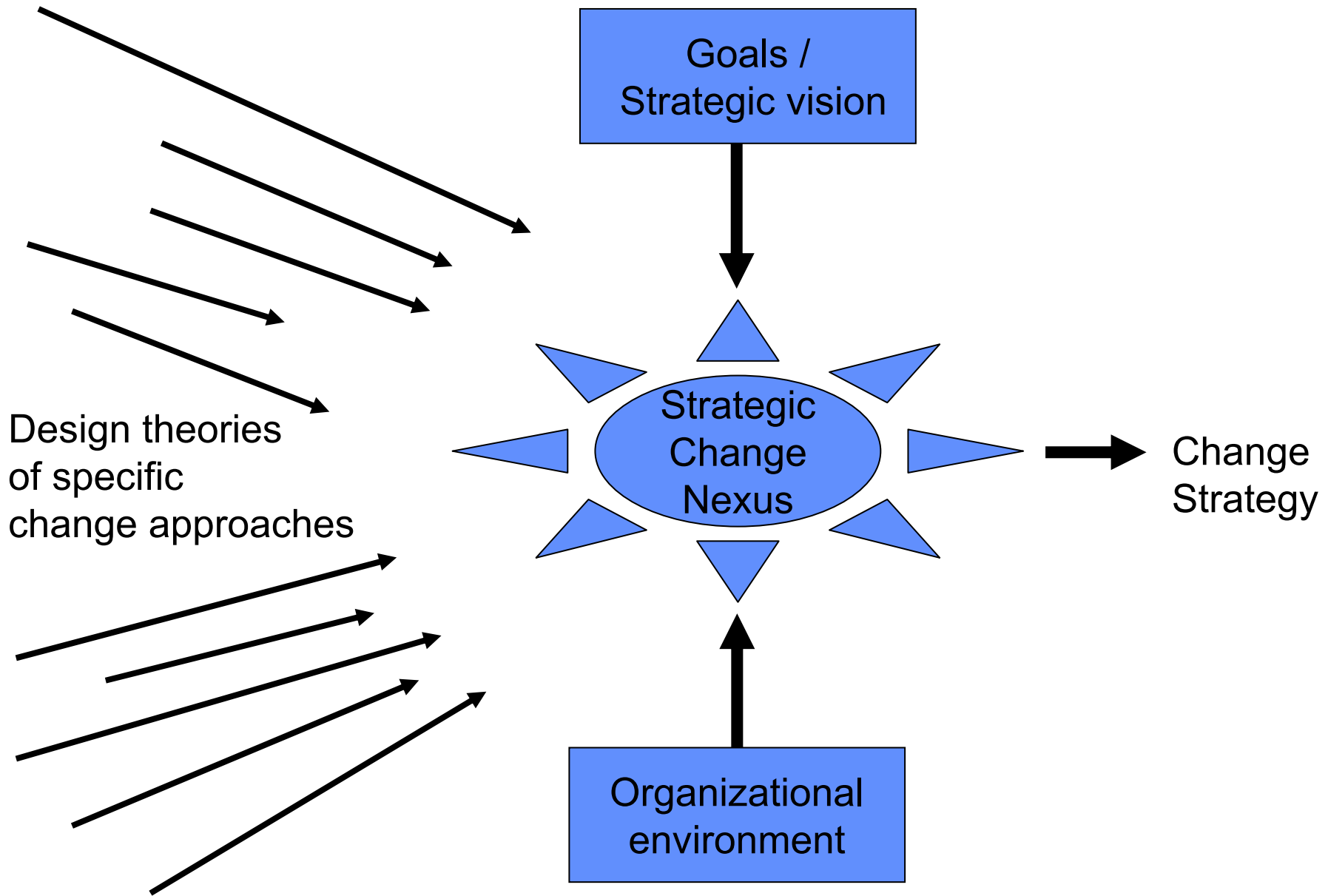


## **General Components**

- Different organizational change strategies

# Identified 10 strategies

- Optionality
- Commanding
- Socializing
- Production organized
- Specialist driven
- Metrics driven
- Learning driven
- Exploration
- Reengineering
- Employee driven

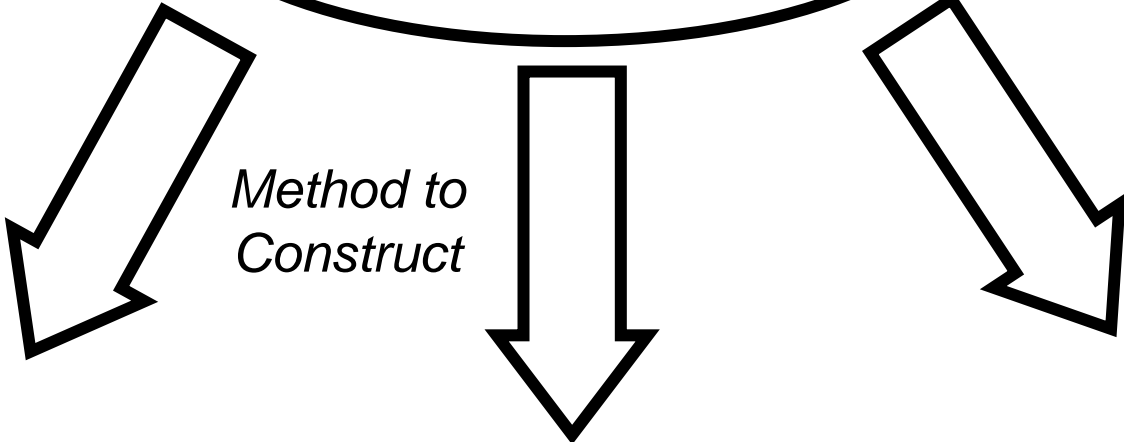


For example, if we take "Commanding," the conditions are:

1. Right now we need change to happen fast
  2. It is primarily organizational structures that need to be changed
  3. In the past we have had successes in requiring or dictating change
- The "fit" of these conditions can then be measured by the degree to which these conditions are present in the organization based on the assertions in the form.
  - The analysis depends on the exact wording of the conditions represented in the form.
  - Some items fit with agreement (the more they agree the better the fit) while others fit with disagreement (the more disagreement, the better the fit).
  - Fit is calculated on a scale from 0% to 100%



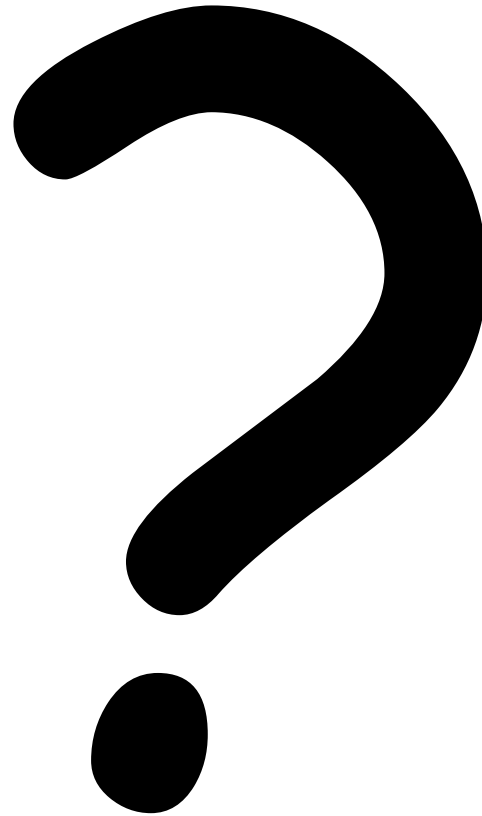
Design Theory Nexus



Organizational  
Change  
Nexus  
Instantiation

User  
Involvement  
Nexus  
Instantiation

N.N:  
Nexus  
Instantiation



# References

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