THE SCIENCE OF ORGANIZATIONAL DESIGN

Rich Burton
Duke University
September 8, 2016
Aarhus University
Børge Obel
Dorthe Døjbak Håkonsson
Jacob Kjær Eskildsen
Dan Mønster
Panos Mitkidis
Many others: ICOA, MindLab, Management
Science & Organizational Design
Organization Theory, Design & Multicontingency
Information processing: the basis of our science
The triangle: experimentation, model & question
Two studies: one old, one new
Design rules
Quick Summary
Challenges
Can there be a Science of Design??

- **Science**: explanation, understanding of what is or what has been
  - **Definition**: knowledge about or study of the natural world based on facts learned through experiments and observation
  - **The state of knowing**: knowledge as distinguished from ignorance or misunderstanding

- **Design**: imagine and create what might be or what should be
  - **Definition**:
    - to conceive and plan out in the mind <em>he designed the perfect crime</em>
    - to have as a purpose: intend <em>she designed to excel in her studies</em>

- **Experiment**: a test, trial, or tentative procedure; an act or operation for the purpose of discovering something unknown or of testing a principle, supposition, etc. An **experiment** is a procedure carried out to verify, refute, or validate an **hypothesis**. Experiments provide insight into **cause-and-effect** by demonstrating what outcome occurs when a particular factor is manipulated. (Wikipedia)

- **Empirical studies** are evaluating what is; while **simulation** & **experimentation** can help in finding what might be and what should be.
Organization theory vs. Organizational design

- **Organization theory**: explanation and understanding of organizational structure *writ large* focusing on what is and what has been i.e., what we observe: focus on the past and present

- **Organizational design**: imagination and creation of organizational structure *writ large* focusing on what might be and what should be i.e., what we have not seen yet, but could: future oriented

- N.B. organization = organizational
Georges Romme (2003: 558), building upon Simon (1996), argues that the ‘idea of a design involves inquiry into systems that do not yet exist – either complete new systems or new states of existing systems’. 
Organization studies encompass two areas: organization theory as a positive science to explain and understand the structure, behavior, and effectiveness of an organization; and organizational design as a normative science to recommend better designs for increased effectiveness and efficiency. Organization theory attempts to understand and explain; organizational design creates and constructs an organization.

Information Processing

- Jacob Marschak and Roy Radner, 1972, Economic Theory of Teams
  “Who talks to whom about what, who makes which decisions based upon what information”

- Kenneth Arrow, 1974, The Limits of Organization
  Uncertainty, costs and imperfectness of information, decisions and imperfect information, information channels, organizational agendas, efficiency of codes, coordination, value of authority

- Jay Galbraith, 1973, Designing Complex Organizations
  “greater task uncertainty, greater information processing demands by decision makers” organizational strategies: reduce need for information by creating semi-independent units; or increase capacity with greater communications, hierarchical or lateral communications
Uncertainty has been defined as an incomplete description of the world (Arrow 1974), unpredictability, or perhaps more precisely as Knightian uncertainty where the probability distribution is not well defined; and further uncertainty has included complexity or the number of variables in the environmental space (Burton & Obel 2004).

Interdependency can be defined as the correlation among the variables in the environmental space or task space. Simon (1996) examined interdependencies as the degree of decomposability using a matrix representation of the connections: the more connected or dense the matrix, the more interdependent the tasks; and the sparser the matrix entries, the less connected and the more decomposable the tasks.
"The division of labor is quite as important in organizing decision making as in organizing production, but what is being divided is different in the two cases. From the information-processing point of view, division of labor means factoring the total system of decisions that need to be made into relatively independent subsystems, each one of which can be designed with only minimal concern for its interactions with the others. The division is necessary because the processors that are available to organizations, whether humans or computers, are very limited in their processing capacity in comparison with the magnitude of the decision problems that organizations face. The number of alternatives that can be considered, the intricacy of the chains of consequences that can be traced -- all these are severely restricted by the limited capacities of the available processors."

Simon, 1947: 293
What is the organizational design problem?

Herbert Simon, 1996, The Sciences of the Artificial Design “is concerned with things ought to be, with devising structures to attain goals.”

Decomposing, partitioning a big task into a set of smaller tasks (not unique)

This decomposition creates interdependencies which creates the need for a “System of consciously coordinated activities of two or more persons” - integration

Coordination mechanisms require: information, communications, cooperation, decisions, rules, routines, trust, cooperation, incentives, leadership, among others.
Multi Contingency Model
Burton, Obel & Håkonsson 2015
Strategic Organizational Diagnosis & Design Fit

**Diagnosis and Strategic Fit**
- Leadership and Management Style
- Organizational Climate
- Size and Skill Capabilities
- The Environment
- Technology
- Strategy

**Design Fit**
- Organizational Configurations
- Organizational Complexity
- Formalization
- Centralization
- Incentives
- Coordination and Control

**Contingency Fit**

**Fit Criteria**
- Effectiveness
- Efficiency
- Viability

Aarhus University 2016 Copyright by Rich Burton
Table 10.1  Fit and misfit table for incentive alignments

<table>
<thead>
<tr>
<th>Corresponding quadrant in organizational design space</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentives</td>
<td>Personal pay</td>
<td>Skill pay</td>
<td>Bonus-based</td>
<td>Profit-sharing/gain-sharing</td>
</tr>
<tr>
<td>Information and knowledge systems</td>
<td>Event-driven</td>
<td>Data-driven</td>
<td>People-driven</td>
<td>Relationship-driven</td>
</tr>
<tr>
<td>Coordination and control</td>
<td>Family</td>
<td>Machine</td>
<td>Market</td>
<td>Clan/mosaic</td>
</tr>
<tr>
<td>Organizational climate</td>
<td>Group</td>
<td>Internal process</td>
<td>Developmental</td>
<td>Rational goal</td>
</tr>
<tr>
<td>Leadership</td>
<td>Maestro</td>
<td>Manager</td>
<td>Leader</td>
<td>Producer</td>
</tr>
<tr>
<td>People</td>
<td>Shop</td>
<td>Factory</td>
<td>Laboratory</td>
<td>Office</td>
</tr>
<tr>
<td>Task design</td>
<td>Orderly</td>
<td>Complicated</td>
<td>Fragmented</td>
<td>Knotty</td>
</tr>
<tr>
<td>Agreements</td>
<td>Self-contained</td>
<td>Provider</td>
<td>Collaborative community</td>
<td>Confederation</td>
</tr>
<tr>
<td>Geographic distribution</td>
<td>Global</td>
<td>International</td>
<td>Multi-domestic</td>
<td>Transnational</td>
</tr>
<tr>
<td>Configuration</td>
<td>Simple</td>
<td>Functional</td>
<td>Divisional</td>
<td>Matrix</td>
</tr>
<tr>
<td>Environment</td>
<td>Calm</td>
<td>Varied</td>
<td>Locally stormy</td>
<td>Turbulent</td>
</tr>
<tr>
<td>Strategy types</td>
<td>Reactor</td>
<td>Defender</td>
<td>Prospector</td>
<td>Analyzer with innovation</td>
</tr>
<tr>
<td>Dimensions of strategy</td>
<td>Neither</td>
<td>Exploit</td>
<td>Explore</td>
<td>Exploit</td>
</tr>
<tr>
<td>Organizational goals</td>
<td>Neither</td>
<td>Efficiency</td>
<td>Effectiveness</td>
<td>Efficiency and effectiveness</td>
</tr>
</tbody>
</table>
A Design Tool

- Burton, Obel and Håkonsson, Organizational Design: A step by step Approach, 2015
- Information processing view: Integrating what we know from these classic studies (and others) what should be a good design – using both what is and what might be
- Approach or model: questions, analysis, misfits, possible actions
concerns in devising a computational model. Occam’s razor applies to computational models and we seek parsimonious explanations.

In developing a computational model, we propose a balance among the following considerations:

- purpose,
- model and computation, and,
- experimental design and data analysis.

In Figure 2, these considerations are placed in a triangle to suggest that a balance of all three is required.¹

The purpose of the computational model provides the anchor. Usually, we are trying to answer some question. Before the model is devised and results analyzed, we should be able to say that whatever results are obtained, we will have answered, at least in part, the question and met the purpose. Criterion-related validity is a similar concern. Cyert’s computational models were clear in purpose: describe the organization and its decision making processes, or to train managers. Each purpose suggested a different computational model.

**Figure 2.** Computation model design—balance and simplicity.
A COMPUTER SIMULATION TEST OF THE M-FORM HYPOTHESIS
Building the Multicontingency Model

**The question:** The M form hypothesis; under what conditions can it be confirmed?

**The experiment:** 2X2 – structure and task interdependency

The **structure or form choices** are the M form and U form

The **task interdependency** of two levels: high and low

The **coordination process** is the Dantzig Wolf decomposition model which is a price based allocation or transfer price coordination scheme

**The goal** is to max profits.
concerns in devising a computational model. Occam’s razor applies to computational models and we seek parsimonious explanations.

In developing a computational model, we propose a balance among the following considerations:

• purpose,
• model and computation, and,
• experimental design and data analysis.

In Figure 2, these considerations are placed in a triangle to suggest that a balance of all three is required.¹

The purpose of the computational model provides the anchor. Usually, we are trying to answer some question. Before the model is devised and results analyzed, we should be able to say that whatever results are obtained, we will have answered, at least in part, the question and met the purpose. Criterion-related validity is a similar concern. Cyert’s computational models were clear in purpose: describe the organization and its decision making processes, or to train managers. Each purpose suggested a different computational model.
<table>
<thead>
<tr>
<th>Form or structure</th>
<th>U form Information processing: Coordination of departmental subunits</th>
<th>Less observed, possible, What might be, quite inefficient, Misfit,</th>
<th>Observed in real world with centralized decision making; what is, but here decentralized decision making slightly inefficient, misfit. This is a surprising result.</th>
</tr>
</thead>
<tbody>
<tr>
<td>M form Information processing: Allocation of resources to divisional subunits</td>
<td>Observed in real world: what is, efficient, fit, what should be Classic M form</td>
<td>Less observed, Possible, imagined what might be, marginally efficient, Fit. This is a surprising result. Bastardized M form</td>
<td></td>
</tr>
</tbody>
</table>
What we learned:

- M form hypothesis was confirmed under decentralization
- Coordination errors are more damaging than allocation errors
  or
- Good coordination is more important than good allocation
  or
- Good management is more important than good budgeting
- U form works well under a more centralized coordination approach
An expert system software with 400+ organizational relationships, e.g., a functional configuration and individual based incentives do not fit (as performance is likely to suffer)

Knowledge base from multicontingency model and validated by executives

Asks the user for same data as the five steps

Offers insights and recommendations as a decision aid – not a solution without thought
Design rules: If then design rules

from M form paper
if low interdependency, then the M form
if high interdependency, then the U form with centralization
decision making

Decision rules: Burton and Obel, 2004

400+ Decision rules and the OrgCon

Design rules are theory based and are developed using a
triangulation from many studies, including those mentioned
above
and Chandler, Lawrence and Lorsch, and Woodward

Empirical studies evaluating what is, simulation and
experiments assessing what might be
and

More generally what we know from the literature and our
experience.
Further studies:

Opportunism and cheating in the M form and U form organization, Laboratory Study
Burton and Obel, 1988

Media richness and its effect on Opportunism, 2016
DORTHE DØJBAK HÅKONSSON, JACOB KJÆR ESKILDSEN, PANOS MITKIDIS, RICHARD M. BURTON, and BØRGE OBEL
EXPLORATION VERSUS EXPLOITATION: EMOTIONS AND PERFORMANCE AS ANTECEDENTS AND CONSEQUENCES OF TEAM DECISIONS

Strategic Management Journal
Published online Early View 6 June 2015 in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/smj.2380

Received 1 March 2013; Final revision received 2 February 2015

DORTHE DØJBK AK HÅKONSSON,
JACOB KJÆR ESKILDSEN,
LINDA ARGOTE,
DAN MØNST ER,
RICHARD M. BURTON,
BØRGE OBEL
Beyond bounded rationality: *emotions*

Beyond self report black box measures: *psycho–physiological*

Order of things is important: *exploit or explore first for performance*

Teams as organizations
Question
Under what conditions do teams explore or exploit when they have succeeded or failed previously: teams not individuals; emotions and performance; longitudinal study, p.998;
Put in hypotheses: H1 H2 H3 H4
Model
Lab study using 3 person teams; 2 possible task designs or 2 ways to build a boat;
Holding constant: Incentives all teams are played using the same metrics, how many boats they build; information processing possibilities, i.e., teams can communicate as they like; see p. 989 and 990.
Experimental design and experimental task build a boat and choose explore or exploit.
emotions are manipulated – happy or sad by experimenter; relate to leadership style – happy to development style of leadership, sad to internal process manager of leadership;
Put in the timeline of the experiment, p. 990, Figure 1
Discuss the manipulation of task design possibilities: explore or exploit as a different way to build a boat. See trials 4 and 5 on the timeline:
EXPLORATION vs. EXPLOITATION

DORTHE HÅKONSSON

LINDA ARGOTE

J.

DIAGRAM
Relating to our hypotheses, we found, supportive of Hypothesis 1, that performance declines led to a higher likelihood that teams adopted an innovative routine and that performance increases led to a lower likelihood of adoption.
Contrary to Hypothesis 2, we did not find evidence that either self-reported emotions or the psychophysiological data in the period preceding adoption decisions (Q2)/(t3) affected the decision to adopt.

Interestingly however, we found some support of Hypothesis 2 for both self-reported and physiological emotions at Q1. This relationship, even if only marginally significant, suggests that people who reported higher valence and smiled more at the beginning of the experiment were more likely to adopt later on than those who did not report high valence and did not smile a lot at the beginning of the experiment.
Supportive of Hypothesis 3, we found that the adoption of the new routine led to an increase in the experience of self-reported positive emotions. In support of Hypothesis 4, this increase was due to improved performance associated with the new routine. Performance development mediated the effect of adopting the new routine on increases in positive, self-reported emotions. Teams that adopted the innovative routine experienced more positive emotions because their performance increased.

Thus, the successful adoption of the new routine caused teams to experience more positive emotions.
Thus, our experimental approach allows us to reveal insights into a long-standing debate as to whether or not happy workers are productive workers (e.g., Lawler and Porter, 1967).

Interestingly however, for the psycho-physiological data, successful implementation of the new routine did not lead to valence increases.

Hence, managers might influence explicit, self-reported, and more conscious emotional states by fostering the opportunity to explore and succeed, whereas implicit emotional states might not change as a result of such efforts.
A more powerful way for managers to foster exploration is to provide teams opportunities to explore a new routine and resources to use the routine successfully. Once a new routine has been successfully implemented, positive emotions at the team level ensue. Because emotional management is a key factor in strategic change and implementation (Huy, 2002), our findings add important insights for strategic management in terms of how to manage emotions. Our findings also provide important insights into how to foster exploration and improve performance.
If the goal is to explore, then performance failure is positive motivation.

If the goal is to exploit, then early performance success is positive motivation not to change.

If the goal is happy workers, then let them be successful or perform well.
Can you get it wrong?

Had we only looked at total productivity and the mean self-reported valence of the teams after the final stage of the experiment, we might have erroneously concluded that teams with higher self-reported valence would be more productive. Our longitudinal analysis revealed, however, that the causal sequence was that teams with higher productivity experienced more positive emotions rather than the reverse sequence.
Science of Organizational Design
What is, what might be, what should be
Information processing view
Multicontingency theory of organization
Experimentation – triangle
Two studies: M form and emotions in explore–exploit
Herbert Simon, The Sciences of the Artificial
(nearly) decomposable systems – a basis for
organizational design:
Decompose or partition a big task into smaller tasks,
which are interdependent,
requires coordination,
Through: information, decision rules,
communications, routines, incentives, trust, cooperation among others.
More exploration in our research of what might be and what should be; go beyond explaining what is and what has been
Embracing the counterfactual and the created possibility

Beyond bounded rationality: emotions and imagination or creation
Micro measures such as brain activity and continuous time measures
Are emotions based upon information; how are they enacted?

Organizational design for entrepreneurial ventures and startups: basic functions are still required; what is new
Loose confederations: neither market nor hierarchy
Temporary organization: startup and disband
New organizations; new boundaries beyond ownership
Agile organizations or dynamic fit: not static stability

Incentives and contracts in organizational design
Other??
References:


