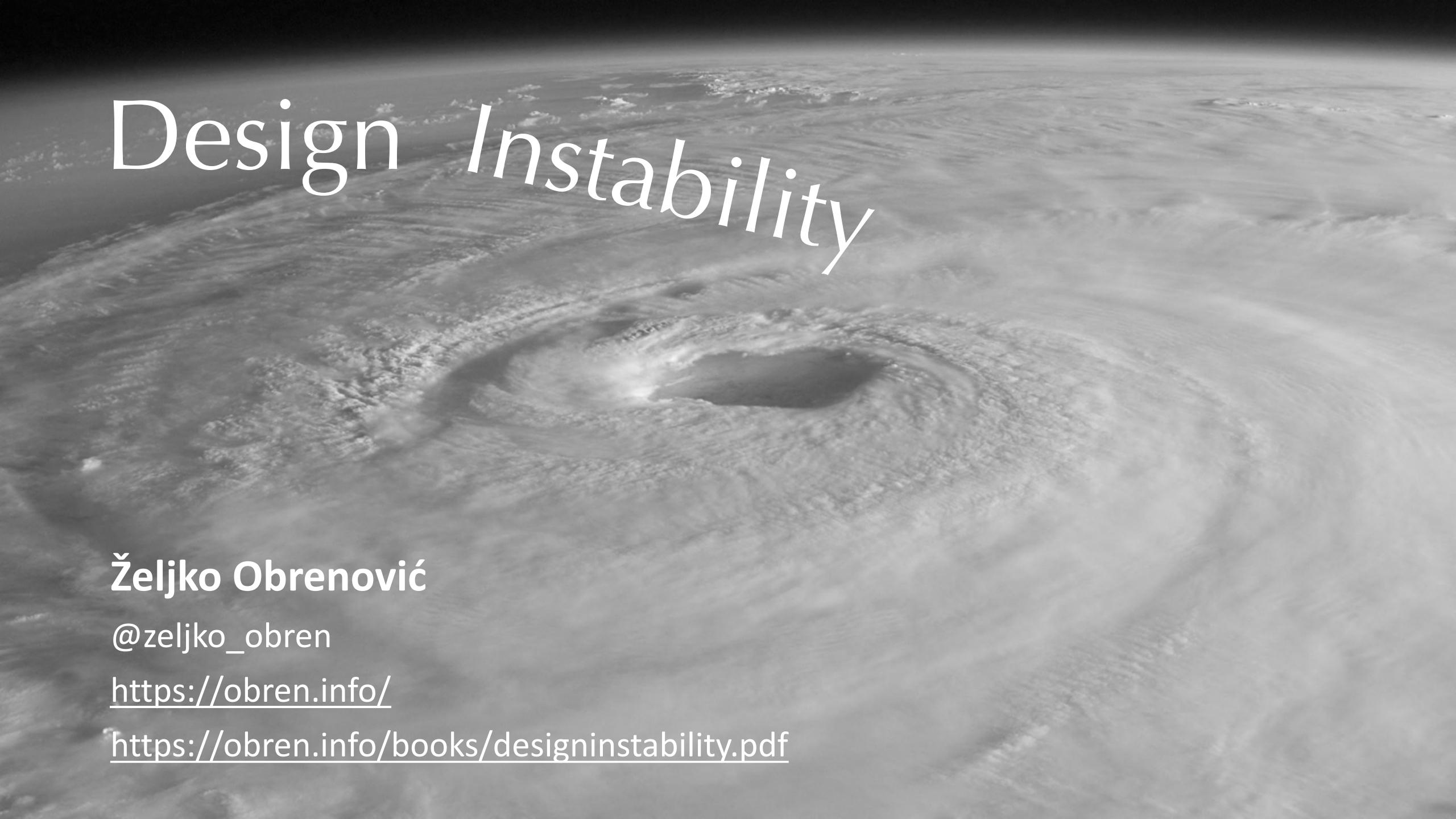


Design *Instability*



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<https://obren.info/>

<https://obren.info/books/designinstability.pdf>

Agenda

- Intro, definitions, model for analyzing design complexity
- Patterns of Dynamics of Design Activities
 - Between Design Situations and Design Outcomes
 - Between Design Outcomes and Resources
 - Between Design Situations and Design Resources
- Sources of Dynamics
- Discussion and Conclusions

What is Complexity?

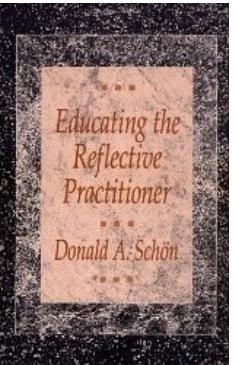
- Herbert Simon's a complex system is “*one made up of a large number of parts that interact in a non-simple way*” ([Simon 1996](#), page 183).
- Looking at complexity from **two sides**:
 - a **structural, quantitative**, objective and measurable side, reflects number and organization of **elements** of objects
 - a **cognitive, qualitative**, more subjective side, indicates challenges of **human cognition** to understand and manage
- **Representation** is crucial in human’s understanding of complexity
 - discovery as a change in representation:
 - “*mathematical derivation ... as a change in representation, making evident what was previously true but obscure.*”



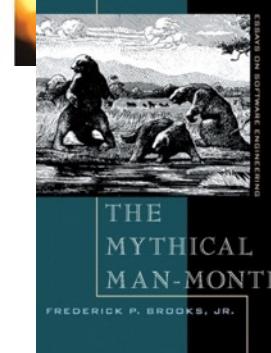
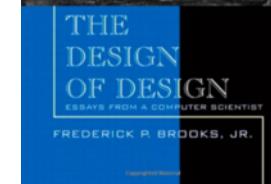
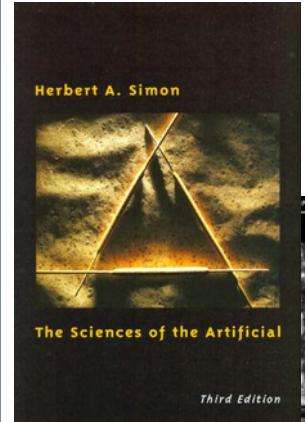
Intro

- Design **complexity** is a difficult and vague topic but complexity is essential for design
- **Hype**: design thinking, digital transformation, Conway's Law...
- “A pact of **ignorance**” among disciplines: “Classical” Design (e.g. architecture), UX, IT, Software, Business, Digital Transformation...
- Design “*courses of action aimed at changing existing situations into preferred ones*” (H. Simon)
- Design = “*Intentional Change in Unpredictable World*” (E. Stolterman)

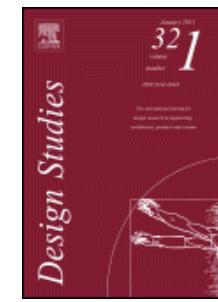
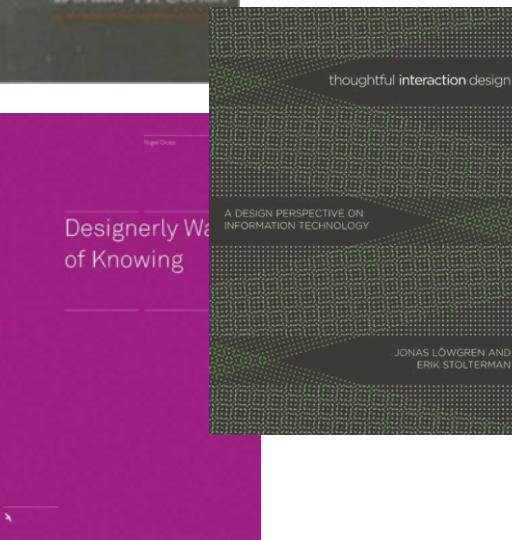
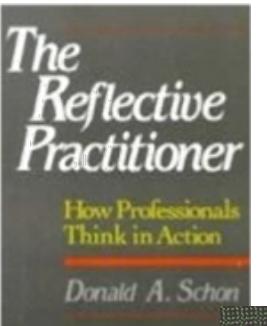
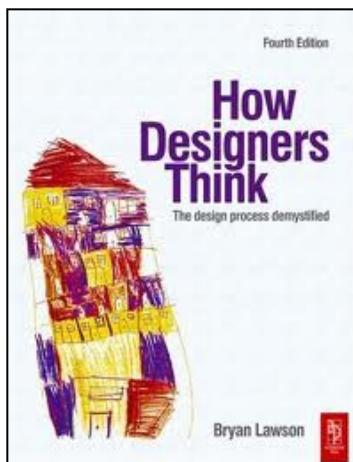
Education



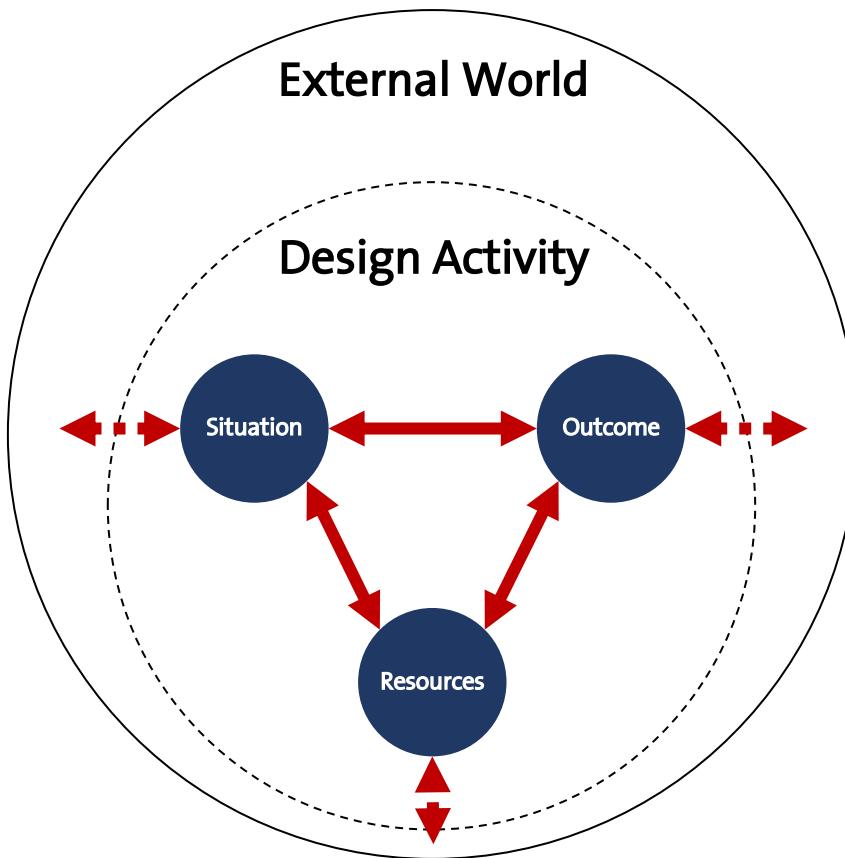
Computing Disciplines



Design

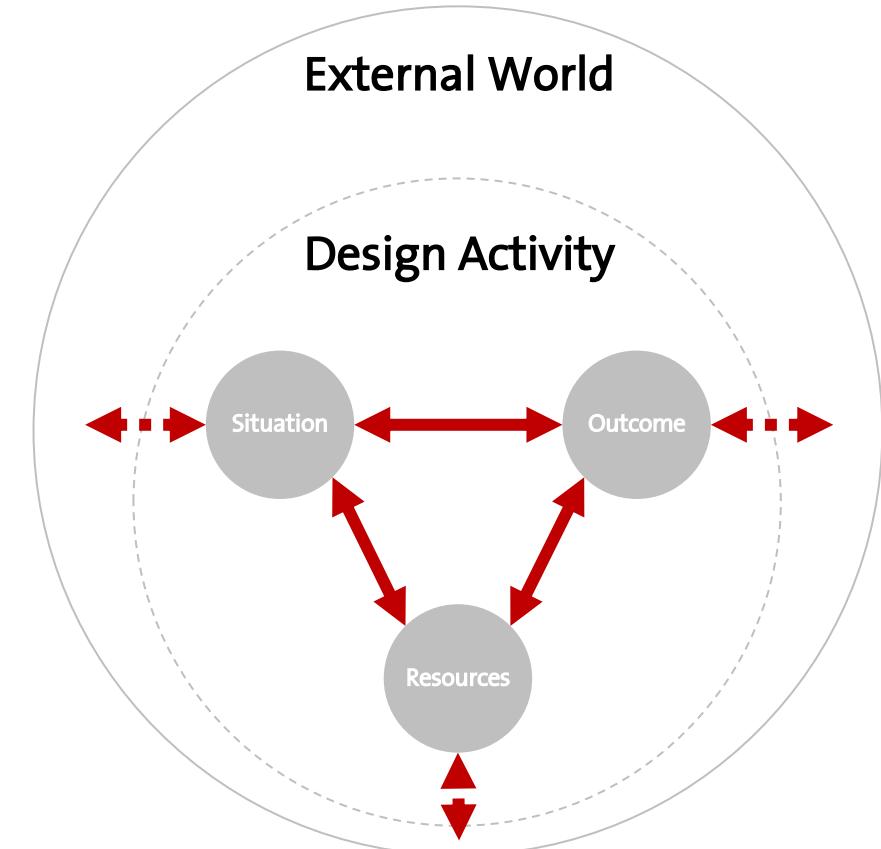


Looking at Design Complexity Structurally



Design Instability

- Structuring discussion using the axis of the model
- Complexity characteristic for design emerges from inherent *instability of design activities*
- Messy, dynamic, highly interdependent, unpredictable dynamics between design situations, design outcomes, and design resources
- Universal for all design disciplines



Agenda

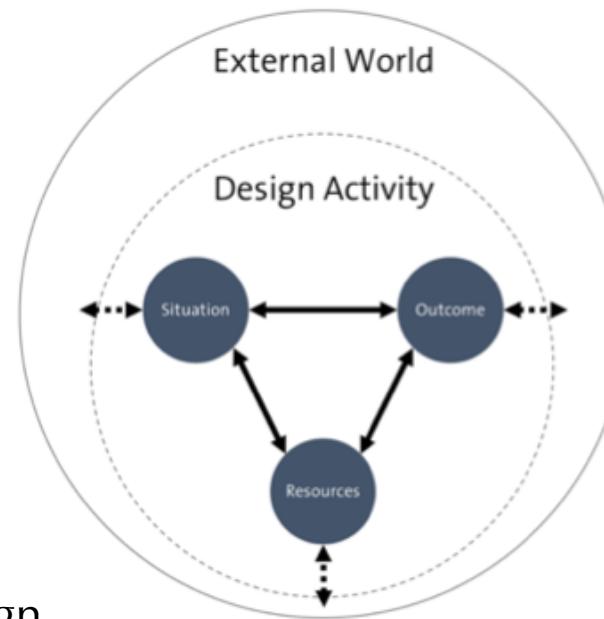
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- **Patterns of Dynamics of Design Activities**
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Pattern Language

- a brief descriptive **name**
- a “**motto**”
- optional **alternative names**
- a **summary**
- a short list of **topics** related to the pattern
- a brief description of when the pattern is **desirable** and **undesirable**
- a more detailed discussion based on examples from design literature

11 Patterns of Dynamics

1. Co-Evolution of Problem-Solution
2. Puzzle Solving
3. Solution Looking for a Problem
4. Problematic Solution
5. The Force Awakens

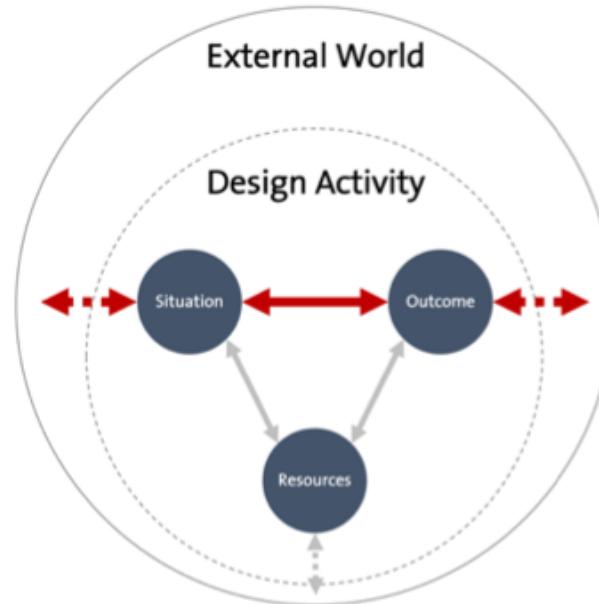


6. Your Design Is Your Reflection
7. You Are Reflection Of Your Design
8. Design-by-Buzzword

9. Conformity
10. Commitment
11. Cherry Picking

Patterns of Dynamics – Situation ↔ Outcome

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1. Co-Evolution of Problem-Solution

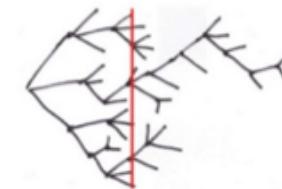
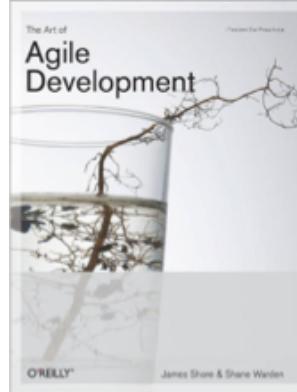
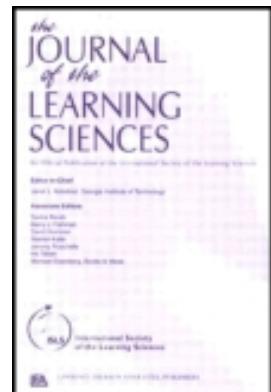
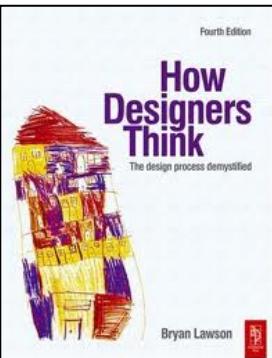
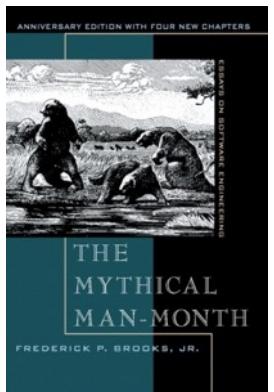
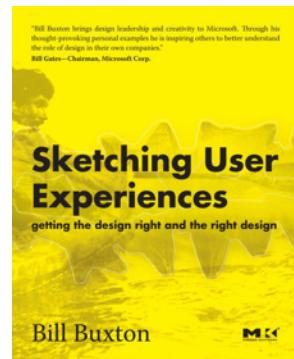
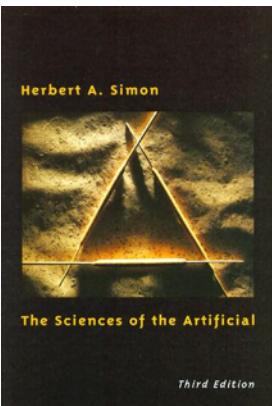
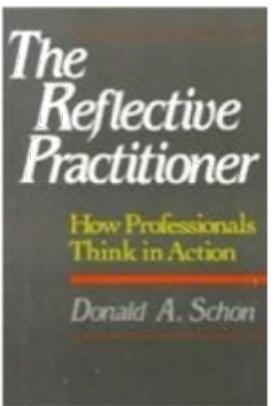
"If you want to change something, you need to understand it, if you want to understand something you need to change it." (Gravemeijer and Cobb 2006)

Summary: A design situation and designer's **understanding of the design situation** (problem definition) changes and evolves **in parallel** and under the influence of **design outcome** and designer's understating of potential design outcomes (design solutions).

Alternative name: Problem–Solution Flux

1. Co-Evolution of Problem-Solution

Topics: problems solving, problem setting, prototyping, iterative development, agile software development



Design
"Branching Exploration"



Prototyping
"Incremental iterative refinement"

Bill Buxton, Sketching User Experiences

1. Co-Evolution of Problem-Solution

- **Desirable:**
 - In most **complex real-world situations** and **new domains**, as this pattern facilitates learning, stimulates communication among stakeholders, and minimizes the risk of failure
- **Undesirable:**
 - In **well-known domains**, where it may lead to the “reinventing-the-wheel” and “not-invented-here” anti-patterns.

2. Puzzle Solving

*“A problem well put is half solved.” (John Dewey, *The Pattern of Inquiry*)*

Summary: A design situation is viewed as a **clearly defined and static problem** (i.e., a problem that can be clearly stated and where it is known what form the solution should have). A design outcome is seen as a **solution for this problem.** Design is viewed as a **problem-solving activity.**

2. Puzzle Solving

- **Topics:** problem-solving, the puzzle trap, education, well-scoped design sub-tasks, test-driven development



2. Puzzle Solving

- **Desirable:**
 - In **education**, as well as in a limited number of practical cases for **well-scoped design sub-tasks**.
- **Undesirable:**
 - In most real-world situations, because few design problems are fully understood before the start of design activity.

3. Solution Looking for a Problem

“When humans possess a tool, they excel at finding new uses for it.” ([Nye 2006](#))

Summary: Understanding of a design outcome and its possibilities leads to innovative usages of the design outcome in situations and for problems that were not initially envisioned.

3. Solution Looking for a Problem

- **Topics:** novelty, creativity, curiosity, unordinary usages of ordinary things, early adopters, bitcoin, and blockchain



3. Solution Looking for a Problem

- **Desirable:**
 - As an **innovation strategy**, when an organization wants to be an **early adopter** of emerging technology and where the organization can afford associated risks.
- **Undesirable:**
 - In most other situations as it requires significant **investments without tangible benefits**.

4. Problematic Solution

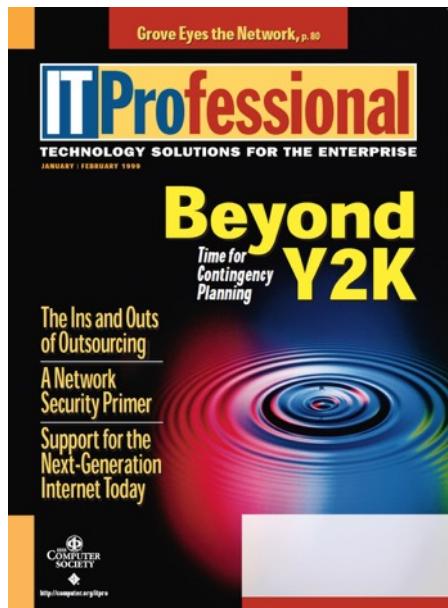
“Everything we design has the potential not only to solve problems but also to create new ones.” ([Lawson 2005](#))

Summary: The consequences of a design outcome create new situations that are perceived as problematic and may ask for **another design** to improve it. A design outcome may become more known for the problems it caused than for the solution it provided.

Alternative name: *Collateral Damage.*

4. Problematic Solution

- Topics: unexpected and undesired effects, innovative domains, expectation management, the year 2000 problem



4. Problematic Solution

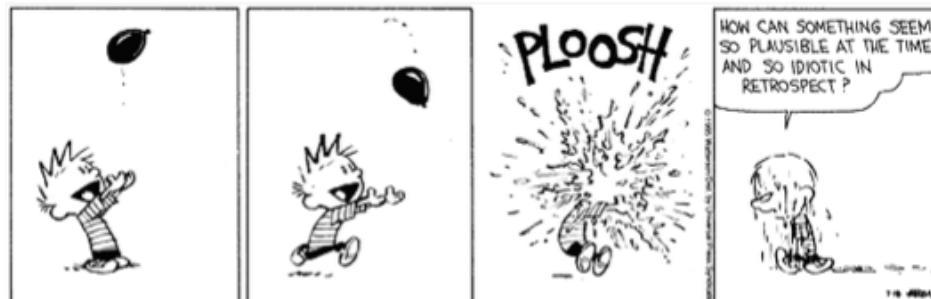
- **Desirable:**
 - In a limited number of real-world situations, when a goal is to stimulate further development of some solution without immediately benefiting from it.
- **Undesirable:**
 - In most other real-world situations.

5. The Force Awakens

"How can something seem so plausible at the time and so idiotic in retrospect?" (Bill Watterson, Calvin, and Hobbes)

Summary: Designer's efforts to address some situation **triggers reactions that radically change** the original design **situation**. Often such reactions make the intended design outcome or a contribution of a designer **obsolete or irrelevant**. Such responses would typically not occur without the design activity.

Alternative names: Boomerang, Ricochet, Shoot Oneself in the Foot.



5. The Force Awakens

- **Topics:** social and political issues, mass market, competition, IBM PC, vaporware, one laptop per child (OLPC) project

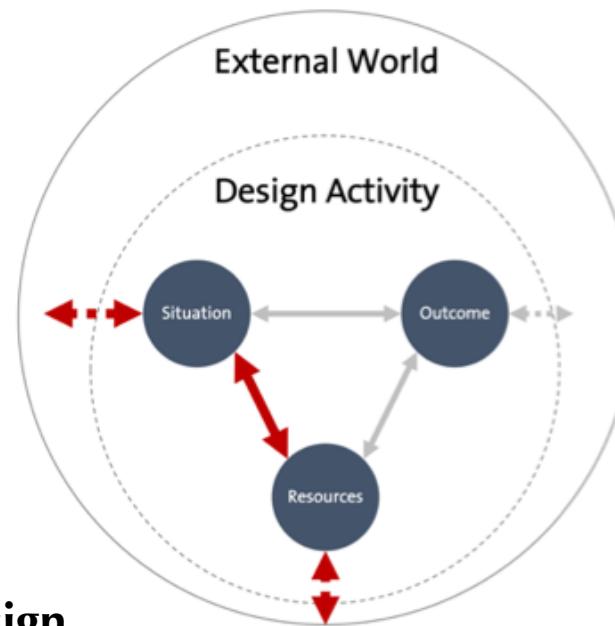


5. The Force Awakens

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Patterns of Dynamics – Situation ↔ Resources

1. Co-Evolution of Problem-Solution
2. Puzzle Solving
3. Solution Looking for a Problem
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5. The Force Awakens



- 6. Your Design Is Your Reflection**
- 7. You Are Reflection Of Your Design**
- 8. Design-by-Buzzword**

- 9. Conformity**
- 10. Commitment**
- 11. Cherry Picking**

6. Your Design Is Your Reflection

"Every contact leaves a trace." (Edmond Locard)

Summary: Design **resources**, as well as the way **how working with these resources is organized**, are leaving a characteristic signature on a design outcome.

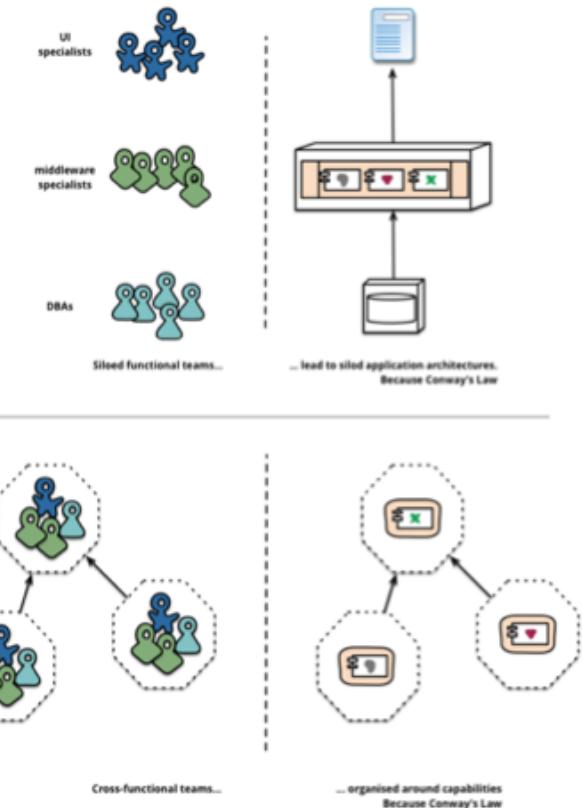
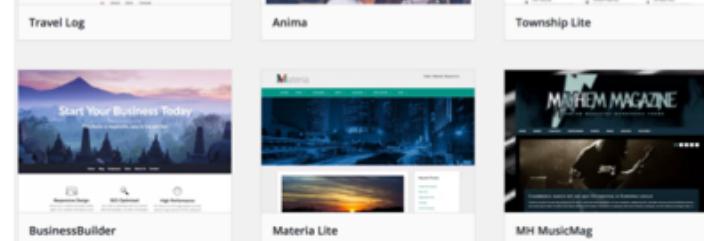
- It is often possible to guess, from the design outcome, which design resources designers used, and how the working with the resources was organized.

Alternative name: Design Style.

6. Your Design Is Your Reflection

- Topics: constraints, consistency, templates, frameworks, convention-over-configuration, Conway's Law

Level	Examples
Technology and tools	Templates, material characteristics or default tools settings drive the shape of outcome
Individual designers	Designer's style, skills and preferences drive the shape of outcome
Team and organization	Team organization and communication structures drive the shape of outcome (Conway's law)



6. Your Design Is Your Reflection

- **Desirable:**
 - In situations where **consistency** among design outcomes is essential
- **Undesirable:**
 - In **complex real-world situations** and in new domains where it may lead to unnecessary **limited** or **complex** solutions

7. You Are Reflection of Your Design

*“We are what we repeatedly do.” (Will Durant, *The Story of Philosophy*)*

Summary: Design resources are adapted to a design outcome, sometimes to the point that the form and organization of design resources reflects the (intended) shape of the outcome.

7. You Are Reflection of Your Design

- Topics: *Specialization, Inverse Conway's Law, Work Optimization*

Level	Examples
Technology and tools	Tools and materials are selected and configured to facilitate creation of particular outcome types.
Individual designers	Designers' style, skills and knowledge are defined by types of outcomes they worked on
Team and organization	Team organization and communication structures are defined to facilitate a particular outcome structure (inverse Conway's law).



7. You Are Reflection of Your Design

- **Desirable:**
 - In situations where **efficiency** of design work is essential.
- **Undesirable:**
 - In complex real-world situations and in new domains where it may limit designers' ability to apply other approaches.

8. Design-by-Buzzword

“Projects that do not capitalize on new opportunities will generally find their products unable to compete.” [Boehm and Bhuta \(2008\)](#)

Summary: A designer is joining a growing trend in using some technology, often in an opportunist way. New possibilities of design resources are shaping the design outcome.

Alternative names: *Design-by-Buzzword, Opportunistic Design.*

8. Design-by-Buzzword

- **Topics:** exploiting new opportunities, hype, trends, end-user development and meta-design

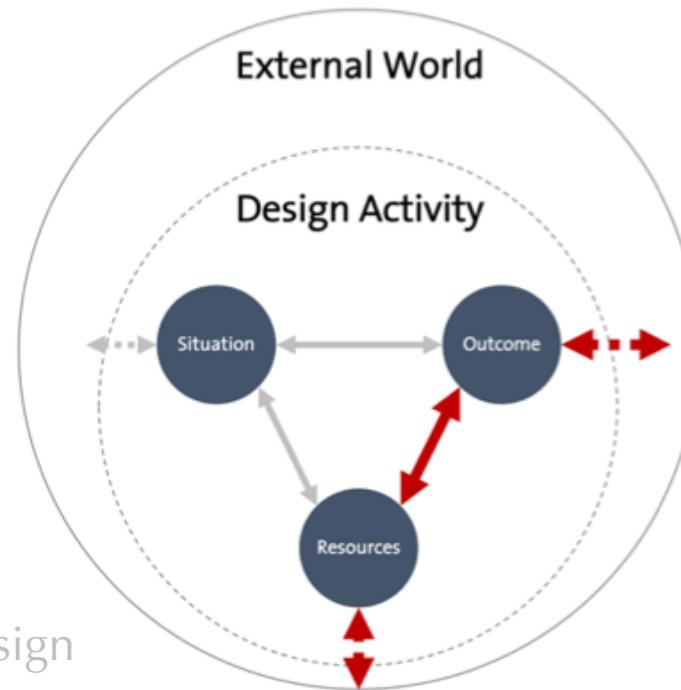


8. Design-by-Buzzword

- **Desirable:**
 - In **fast-changing domains** where capitalization on new opportunities is a crucial competitive advantage.
- **Undesirable:**
 - In real-world situations and in well-known domains where it may lead to **unnecessary complex solutions**.

Patterns of Dynamics – Resources ↔ Outcome

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9. Conformity

“When in Rome, do as the Roman’s do.”

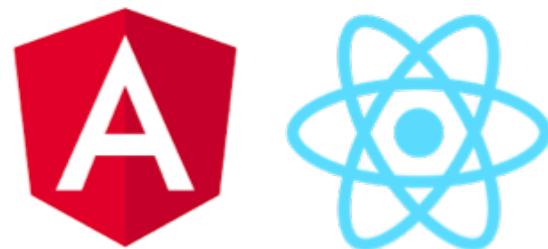
Summary: To minimize risks in a new design situation, designers use popular and proven resources with established best practices.

Conformity may be driven by positive **experiences** of others in similar situations, **popularity** of design resources, or **mandatory** requirements.

The usage of a design resource **further contributes to establishment and reputation** of the resource and its usage in new design situations.

9. Conformity

- Topics: *popularity, compliance, communities, peer pressure, legal requirements, education*



9. Conformity

- **Desirable:**
 - When conformity is **mandatory**, or when designers can **benefit** from joining a **broader community**.
- **Undesirable:**
 - In **new domains** where there are no established best practices, or in areas where capitalization on new opportunities is crucial.

10. Commitment

“It is a poor craftsman that blames his tools.”

Summary: In a new design situation designers use tools they committed to beforehand.

10. Commitment

- Topics: learning, standardization of work, tool development, “eating its own dog food,” “if all you have is a hammer, everything looks like a nail”



10. Commitment

- Desirable:
 - When designers want to *master resource usage* or further improve the resource itself.
- Undesirable:
 - In complex real-world situations where *over-commitment* may lead to worse design outcomes and lost opportunities.

11. Cherry Picking

"Do one thing and do it well."

Summary: Design situations are selected based on how quickly designers can approach these situations with preferred or available resources. Other situations are avoided.

Alternative names: Low-Hanging Fruits, Selective Design.

11. Cherry Picking

- Topics: *focusing usage of resources, specialization, work efficiency, minimizing risks*

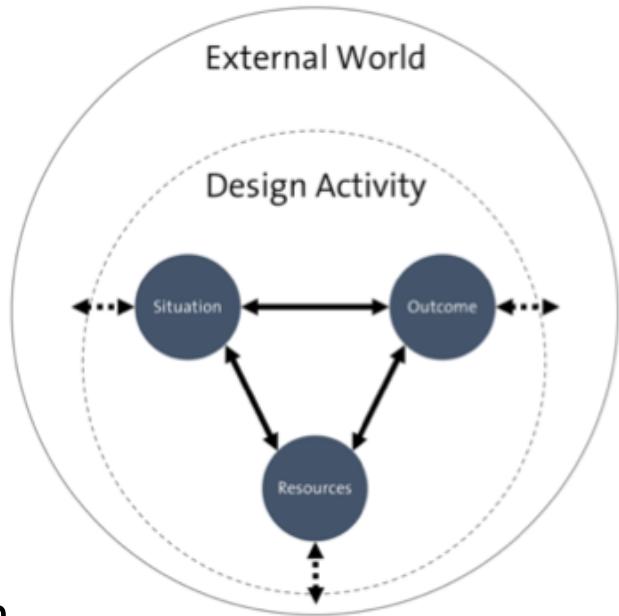


11. Cherry Picking

- Desirable:
 - *In new domains where there are plenty of opportunities or little competition, or when an organization needs to focus usage of scarce resources.*
- Undesirable:
 - *In complex real-world situations as it may stimulate solving easy instead of important problems.*

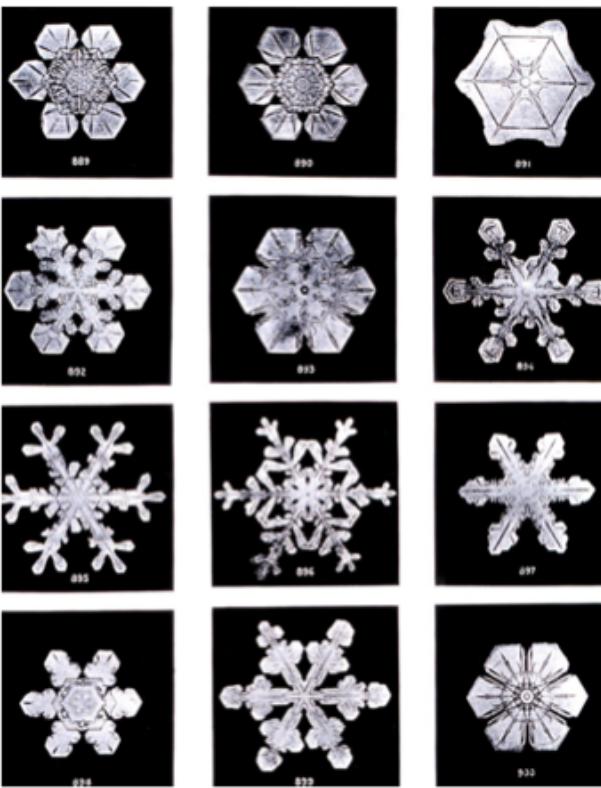
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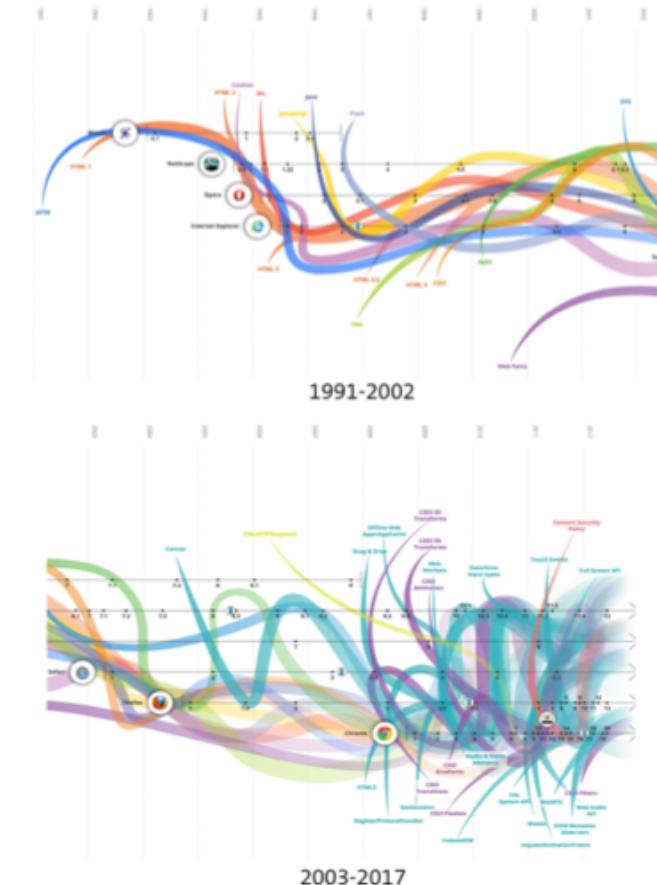


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The Moving Target Problem

- Design situations, resources, and outcomes **change more rapidly than designers' understanding of them**
 - Designers need to work **without having significant experience and understanding**
 - **Waiting** to obtain more knowledge and better understanding is **risky**
 - the issues may quickly become less relevant or obsolete

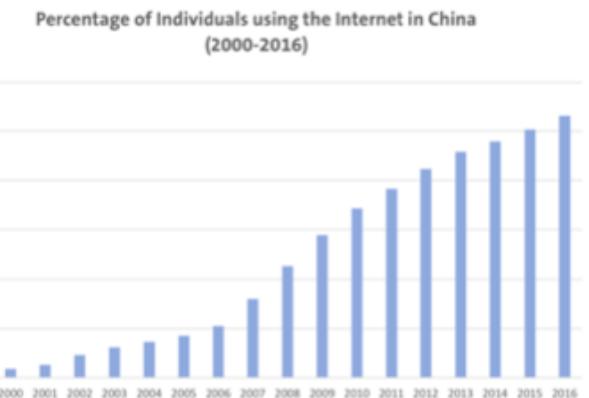
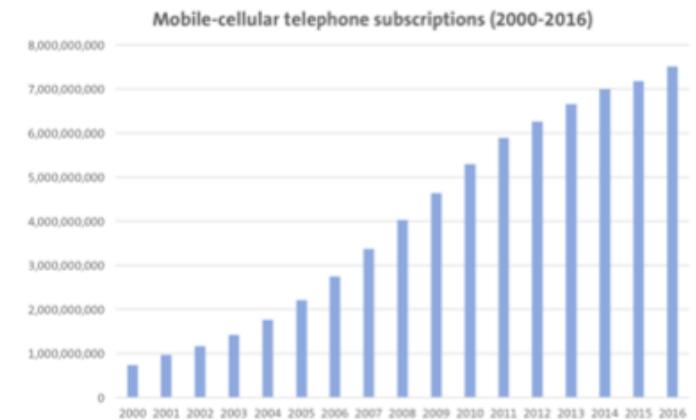


The Moving Target Problem

- *The force awakens* pattern: rapid changes as a reaction to a design effort + lack of understanding / experience with similar situations
- The *co-evolution of problem-solution* pattern designers are dealing with new situations with little previous projects and experiences
- The *Design-by-Buzzword* pattern, may contribute to the constant change, introducing new opportunities that change design situations

Increasing Interconnectivity

- Design situations, design outcome, design resources are increasingly **more globally interconnected**
- There are **more ways or channels** through which a design activity may be **influenced**



Increasing Interconnectivity

- The *force awakens* pattern is often a direct consequence of the impact of design outcomes on external, globally connected context
- The *problematic solution* pattern is a consequence of a chain of unforeseen consequences of design in interconnected environments
- The *conformity* pattern is in part a result of the ability of design professionals to quickly obtain globally accessible knowledge
- The *Design-by-Buzzword* pattern may lead to successful design outcomes because of globally connected environments
 - enable more people to interact with design and find novel applications

Learning and Creativity

- Behaviors and **expectations** of people are continually **changing** due to their learning and **creativity**



Learning and Creativity

- The *co-evolution of problem-solution* pattern is often a consequence of learning and creativity of both designers and their clients
- The *force awakens* pattern is a consequence of people outside the design activity learning about the value of the design outcome
- The *solution looking for a problem* pattern is a consequence of people's creativity in finding new uses for existing solutions
- The *commitment* pattern, committing to using some design resources facilitates learning and mastering of its usage
- The *conformity* pattern is a consequence of design professionals being able to quickly learn how to use the same popular design resource
- the *eating its own dog food* pattern is an attempt to stimulate intensive learn within the design company about their designs
- The *cherry picking* pattern may be viewed as an attempt to avoid risks and costs of extensive learning

Tacit Knowledge and Skills

- Designers are relying on **tacit knowledge and skills** that they **do not fully understand and cannot fully explain**
- Because of its **implicit nature**, it is hard to predict what effects tacit knowledge will have in design



Tacit Knowledge and Skills

- The co-evolution of problem-solution pattern is often a consequence of actions based on intuition, judgment, and tacit skills
- The commitment pattern as mastering usage of tools often requires acquiring an extensive set of tacit knowledge and skills

Social Dynamics

- Design situations, resources, and outcomes are **complex socio-technical systems**, with complex, difficult to predict dynamics

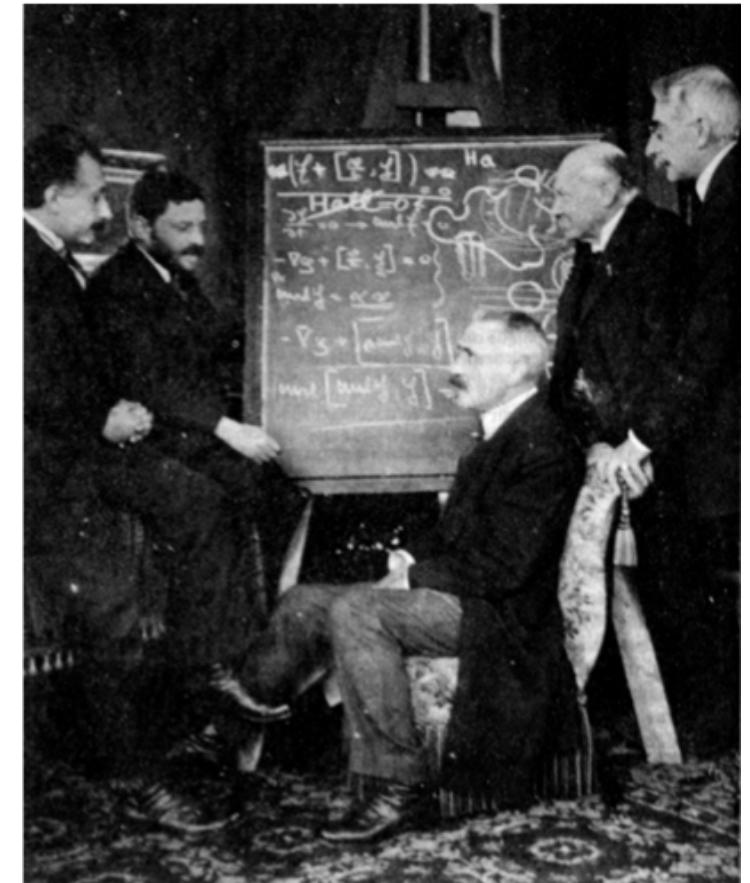


Social Dynamics

- The *force awakens* pattern is often a consequence of complex social dynamics in society
- The *Design-by-Buzzword* pattern is in many ways a consequence of social dynamics related to the adoption of new technologies
- The *conformity* pattern may be viewed as a consequence of workings of social mechanisms, such as peer-pressure in the community of designers, popularity of some design resources
- The *commitment* pattern may be influenced by social dynamics related to promotion of some design resource
- The *your design is your reflection* pattern, is related to social dynamics within design organizations and teams

Lack of Strong Principles, Theories, Laws

Designers are dealing with **poorly understood phenomena**, for which we do not have strong underlying principles, theories, and laws



Lack of Strong Principles, Theories, Laws

- The *force awakens* and *problematic solution* patterns, are partially a consequence of our inability to estimate the impact of our design efforts in a broader context
- The *co-evolution of problem-solution* pattern partially happens due to lack of knowledge and theories about a particular design situation and our inability to develop sufficient understanding of the design situation beforehand
- The *solution looking for a problem* and *Design-by-Buzzword* patterns, practically assume that our current understanding and predicted usages of some technology are limited, and that new, unpredicted usages will emerge.

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Design Instability and Complexity = Design

- The instability and unpredictability of a design process as *a defining characteristic of any design activity*
- A lack of stability is a requirement for any process to be called **design**
 - If a process is more predictable and stable, we would typically not see it as a design activity. Or, at best, we would call it a routine design
- The key question is not how to make design activities stable and entirely predictable, but **how to deal with the resulting complexity**

Joggling as a Metaphor for Design



Dealing with Complexity

- Reduce
 - E.g. simplify, abstract
- **Accept & Manage**
 - Accepting != Ignoring
 - Accepting complexity has to be combined with more awareness about it

Design Instability As a Tool

- **Visibility**
 - Insights about why particular design approaches are more (or less) successful in dealing with design complexity
 - A strong movement from prediction based management toward management that adapts to change
- **Remedy**
 - Remove / introduce particular dynamics
- **Prevention**
 - Prevent occurrence / non-occurrence of particular dynamics