Data Science Workshop
Lecture 7: Design

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MSc program in Data Science has been developed
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Innovation

Design process

1. Identify Needs
2. Information Phase
3. Stakeholder Phase
4. Boundary Research
5. Hazard Analyses
6. Specifications
7. Creative Design
8. Conceptual Design
9. Prototype Design
10. Verification

source: Mastering Innovation & Design-Thinking by Blade Kotelly & Joel Schindall

Preliminary Research

1. Identify Needs
   - What is the underlying problem?
   - 5 Why questions to get to the root case
2. Information Phase
   - What can inform us about this problem?
   - Morphological analysis.
3. Stakeholder Phase
   - Who benefits?
   - How do you think about the users?
   - What do users want?

Morphological analysis

1. Limit the dimensions of the problem to the relevant issues.
2. Define a spectrum of values for each issue.
3. Reduce the total set of possible configurations to a smaller set of internally consistent configurations representing a "solution space".

Geographic priority	Functional priorities	Size and cramming	New construction	Maintenance	General philosophy
Metropoles	All socio-tech. functions	Large, not crammed	With new construction	More frequent maintenance	All get same shelter quality
Cities + 50,000	Tech support systems	Large & crammed	Compensation	Current levels	All take same risk
Suburbs and countryside	Humanitarian aims	Small, not crammed	New only for defence build up	No maintenance	Priority: Key personnel
No geo-priority	Residential	Small & crammed			Priority: Needy

General Morphological Analysis A general method for non-quantified modelling by Tom Ritchey from Swedish Morphological Society

Future Research

4. Boundary Research
    - What can you do in the given time?
    - With the resources you have?
    - What are you limited by?
    - How can you overcome limitations?
5. Hazard Analyses
    - What can go wrong for the user?
    - How can we prevent user errors?
    - How do we help users recover from errors?
6. Specifications
    - Good specifications are part of the design.
    - They create a vision that aligns technical and business audiences and gets executive support.
    - Helps to create clear expectations of success.

Design phases and tools

7. Creative Design
   - Ideate solutions
8. Conceptual Design
   - Solution finding
9. Prototype Design
   - Prototyping

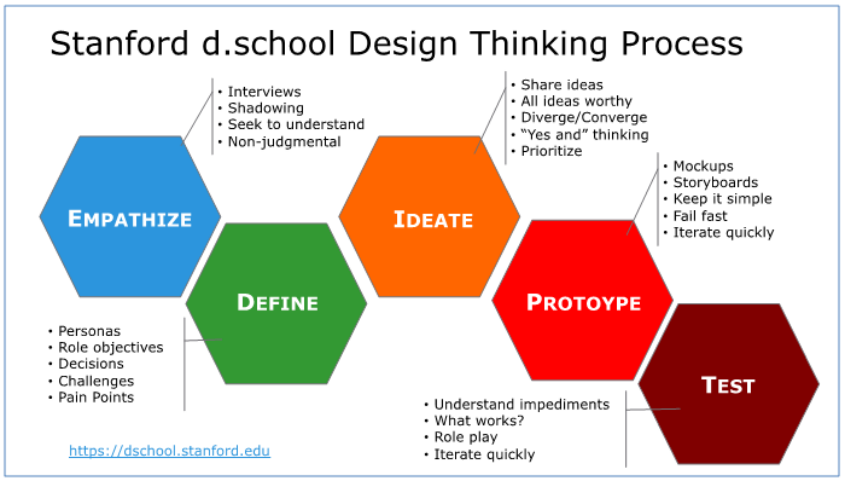
- Brainstorming
- Reviewing research
- Thought experiments
- Physical experiments
- Externalisation of ideas (paper, clay, etc.)
- Down selecting based on previous criteria
- Prototype rendering (conceptual, physical, partial, semi-complete)

Verification

10. Verification
    - Testing for quality
    - Testing for usability
    - Is the solution working? If not, start again from the design or research phase.

Design Thinking

- The presented process indirectly includes the Design Thinking process.
  1. Emphasise
     - Stakeholder Phase
  2. Define
     - Identify Needs
  3. Ideate
     - Creative Design
  4. Prototype
     - Prototype Design
  5. Test
     - Verification



`https://dschool.stanford.edu`

Task

- In groups:
  - Prepare the initial phases of the design process.
  - Limit the task to phases that are relevant at this stage of the project.

1. Identify Needs
2. Information Phase
3. Stakeholder Phase
4. Boundary Research
5. Hazard Analyses
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7. Creative Design
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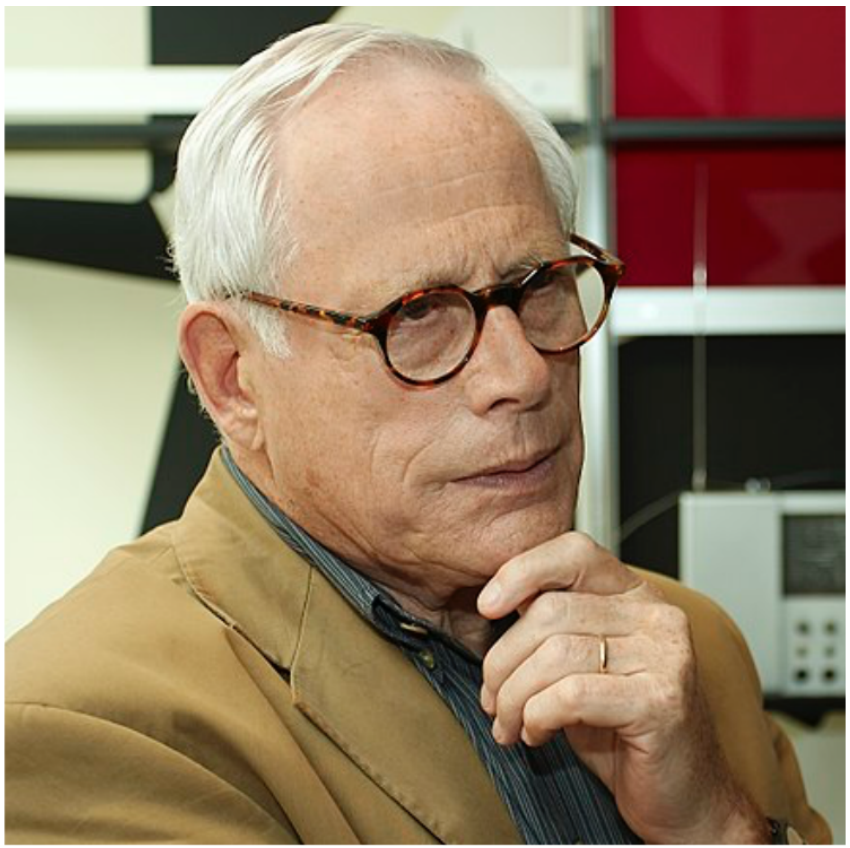
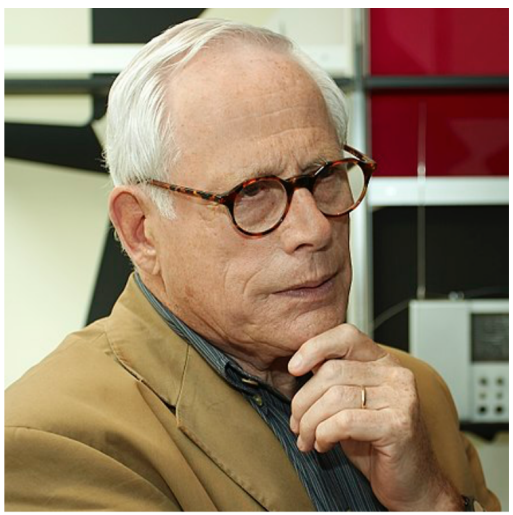
Dieter Rams



Dieter Rams (born 1932) is a German industrial designer closely associated with the consumer products company Braun and the functionalist school of industrial design.

https://en.wikipedia.org/wiki/Dieter_Rams

Dieter Rams "Good design" principles



1. Good design is innovative.
2. Good design makes a product useful.
3. Good design is aesthetic.
4. Good design helps us to understand a product.
5. Good design is unobtrusive.
6. Good design is honest.
7. Good design is durable.
8. Good design is consequent to the last detail.
9. Good design is concerned with the environment.
10. Good design is as little design as possible.

Good design principles - discussion I

1. is innovative
   - The possibilities for progression are not exhausted.
   - Technological development is always offering new opportunities for original designs.
   - Imaginative design always develops in tandem with improving technology.
2. makes a product useful
   - A product is bought to be used.
   - It has to satisfy the functional, psychological, and aesthetic criteria.
   - Good design emphasises the usefulness of a product and disregards anything that could detract from it.
3. is aesthetic
   - The aesthetic quality of a product is integral to its usefulness.
   - Products are used every day and affect people and their well-being.

Good design principles - discussion II

4. makes a product understandable
   - It clarifies the product's structure.
   - It can make the product clearly express its function by making use of the user's intuition.
   - In the best case, it is self-explanatory.
5. is unobtrusive
   - Products fulfilling a purpose are like tools.
   - They are neither decorative objects nor works of art.
   - Their design should be both neutral and restrained.
6. is honest
   - It does not make a product appear more innovative, powerful, or valuable than it is.
   - It does not attempt to manipulate the consumer with promises that cannot be kept.

Good design principles - discussion III

7. is long-lasting
   - It avoids being fashionable and therefore never appears antiquated.
   - It lasts many years – even in today's throwaway society.
8. is thorough down to the last detail
   - Nothing must be arbitrary or left to chance.
   - Care and accuracy in the design process show respect towards the consumer.
9. is environmentally friendly
   - Design makes an important contribution to the preservation of the environment.
   - It conserves resources and minimises physical and visual pollution throughout the lifecycle of the product.
10. is minimal
    - Less is more.
    - Simple as possible but not simpler.
    - Good design elevates the essential functions of a product.

Jonathan Ive

Sir Jonathan Paul "Jony" Ive (born 1967) is an English industrial, product and architectural designer. Ive was Chief Design Officer (CDO) of Apple Inc., and is now the serving Chancellor of the Royal College of Art.

https://en.wikipedia.org/wiki/Jony_Ive

Dieter vs Jonathan Design

Good design - conclusions

- The good design principles are timeless.
- The principles are not limited to one field.
- We can use the principles in industrial design, UI design, or software design.

Task

- Individually:
  - Find good and bad design examples in your surroundings.
  - Take photos.
  - Justify your assessment.

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