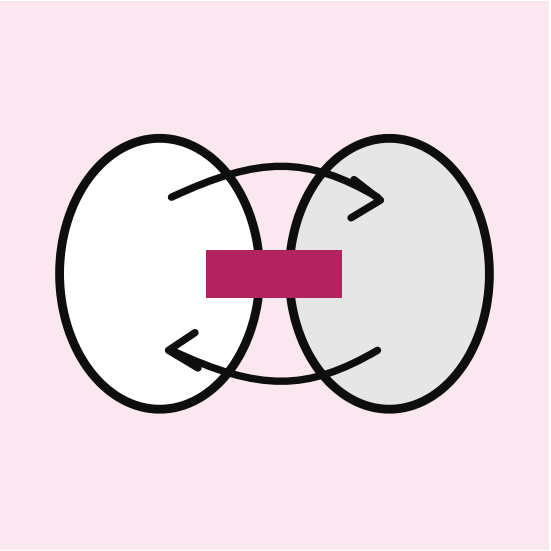
Model

Problem–solution co-evolution

In design, the problem and the solution develop together. An idea reveals something about the problem, which in turn calls for another idea, until the two fit.



In Spanish

Coevolución del problema y la solución

Origin

Maher and Poon (1996); Dorst and Cross (2001)

What problem it addresses

It explains why designers don't finish defining the problem before generating ideas. It gives design a model for arguing that reframing the brief is part of the process and a source of creativity.

Components

Two spaces

The problem space and the solution space. Neither is fixed at the start.

Back and forth

Part of the problem suggests an idea, and the idea makes the problem look different.

A bridge

The process settles when a problem and a solution fit.

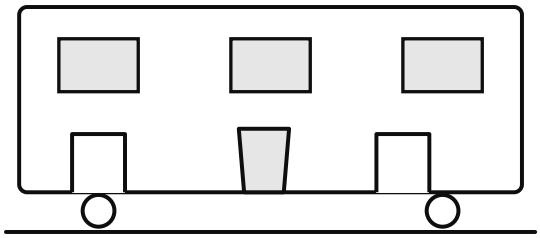
Surprise

Something unexpected in one space forces a rethink of the other, and that is where original ideas appear.

An example

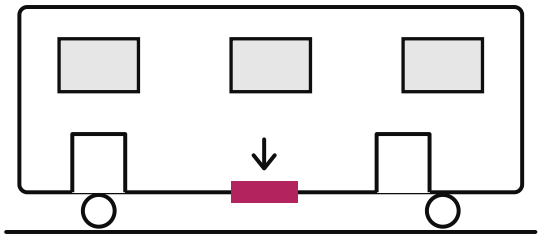
A case from Dorst and Cross's study: the brief was a litter disposal system for a new train.

Fixed problem



You design a better bin for the car. **The answer the brief expected.**

Problem and solution together



A designer proposes a hole in the floor, learns the toilets already drop waste onto the tracks and changes the goal. **The problem is redefined.**

The idea didn't answer the problem, it transformed it. That back and forth is co-evolution.

How it works

1 

Part of the problem becomes clear and suggests an idea;

2 

the idea makes the problem look different;

3 

and it repeats until problem and solution fit.

Applications in design

✓ Use it like this

Show early ideas to understand the problem better, and revise the brief with what you learn.

✗ Avoid

Freezing requirements before generating ideas, or sticking with a brief your ideas have already shown to be poorly framed.

Don't fall for it

Reframing isn't changing the problem on a whim. Explain to whoever commissioned the work why the framing changed.

9 designers

What the research says

Dorst and Cross recorded nine experienced industrial designers thinking aloud for 2.5 hours. Their protocols broadly supported the model (Dorst and Cross, 2001).

● ○ ○ **Single study.** It is a small lab study. The idea was already around in the early 1990s; Maher and Poon turned it into a model (Gero, Kannengiesser and Crilly, 2022).

Connections

Used in

- How might we...?
- Design thinking
- Double Diamond

Related to

- Problem framing
- Reflective practice
- Wicked problems

Authors and works

1996	**Mary Lou Maher and J. Poon**	Modeled design exploration as the joint evolution of two spaces, the problem space and the solution space.
2001	**Kees Dorst and Nigel Cross**	Observed the model in professional designers and added surprise as a driver of creativity.
2022	**John S. Gero, Udo Kannengiesser and Nathan Crilly**	Reviewed where the model comes from and formalized it.

Sources

Original sources

- Maher, M. L., & Poon, J. (1996). Modelling design exploration as co-evolution. Microcomputers in Civil Engineering, 11(3), 195–209.
- Dorst, K., & Cross, N. (2001). Creativity in the design process: Co-evolution of problem–solution. Design Studies, 22(5), 425–437. View source (https://doi.org/10.1016/S0142-694X(01)00009-6)

Academic reviews

- Gero, J. S., Kannengiesser, U., & Crilly, N. (2022). Abstracting and formalising the design co-evolution model. Design Science, 8, e14. View source (https://doi.org/10.1017/dsj.2022.10)

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