# DESIGN THINKING WORKSHOP

# CO-DESIGNING A VR LEARNING ENVIRONMENT ABOUT SEAWATER DESALINATION

Dr. Stella Kanatouri, DLR, Institute of Data Science

DLR

# German Aerospace Center

At a Glance

**Domain-independent methods**

**Represented in all DLR research domains**

# German Aerospace Center

## At a Glance

**~ 11.000 Employees**

**55 Institutes and Facilities**

**30 Sites (Headquarter in Cologne)**

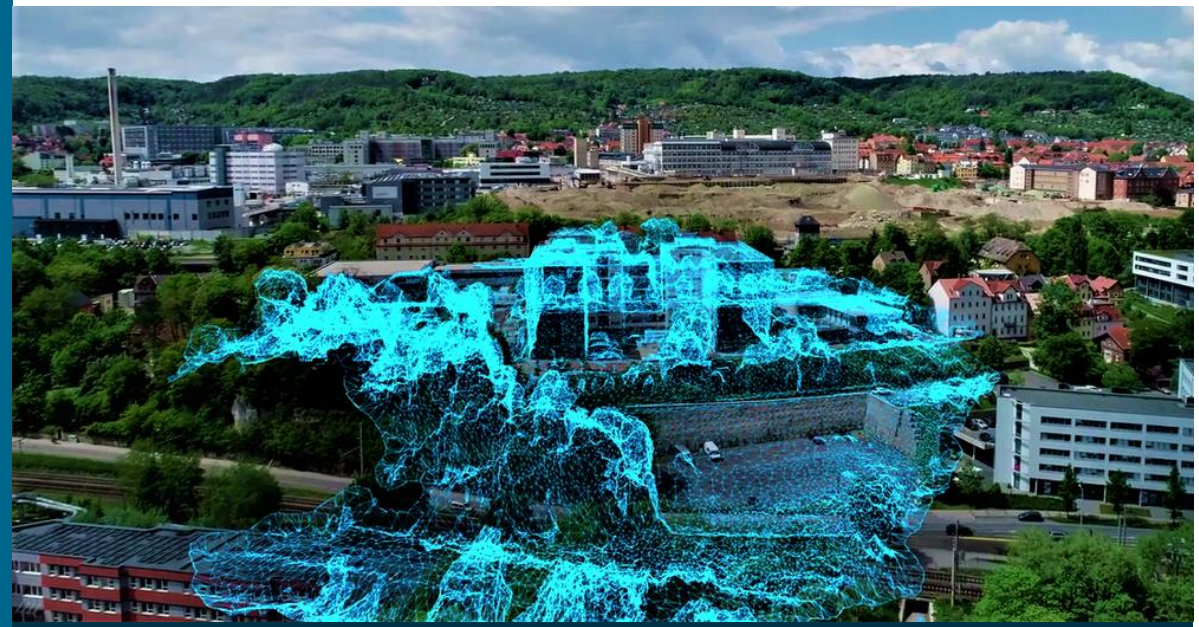
**External offices: Brussels (EU), Paris (ESA), Washington, Tokyo**

**Space Agency and two Project Agencies**

**Independent partner and advisor to policymakers** on the topics of aerospace, energy, transport, security and digitalisation

# DLR Institute of Data Science

## At a Glance



**Facts**

Location Jena | founded in 2017 | ~ 80 employees | HPDA Cluster

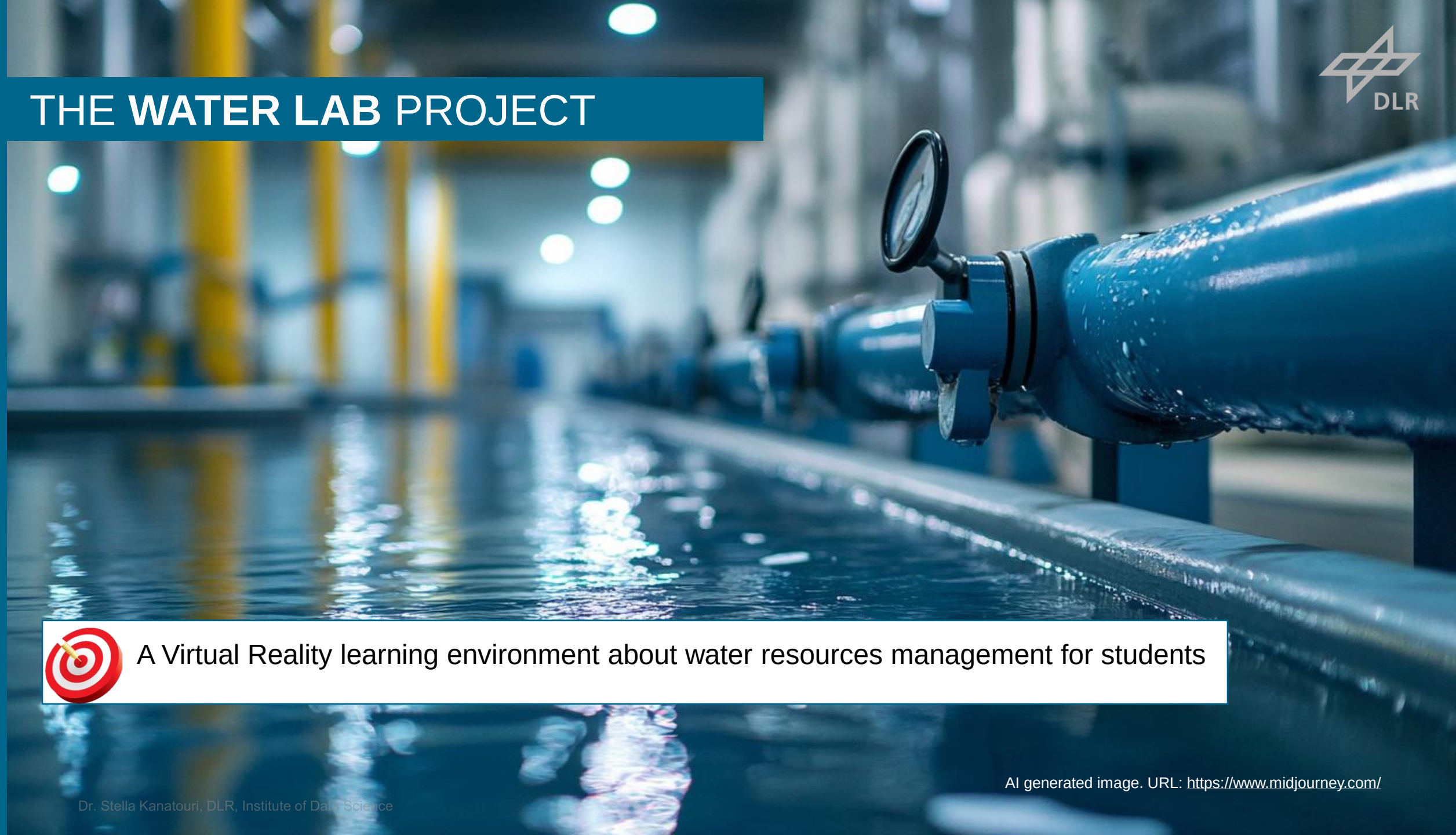
### Goal

Enabling new applications for data and data spaces beyond the state of the art

### Our Approach

Developing methods and applications along the entire data life cycle for DLR and external partners

# THE **WATER LAB** PROJECT



🎯 A Virtual Reality learning environment about water resources management for students

AI generated image. URL: https://www.midjourney.com/

# CO-CREATION

Design **FOR** you

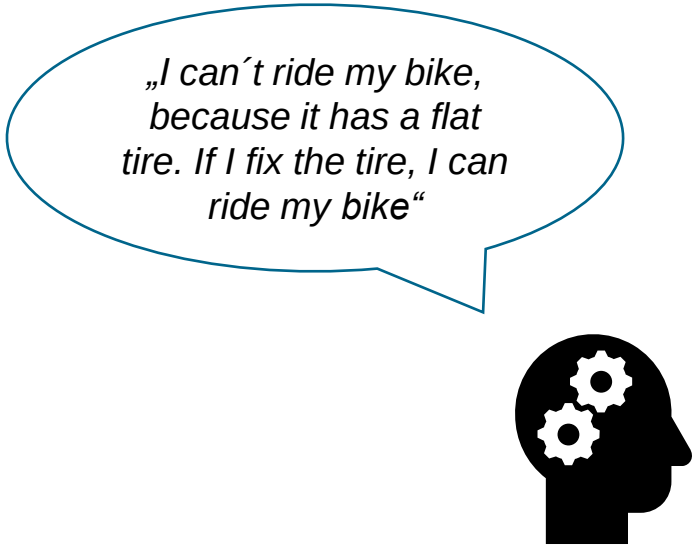
VERSUS

Design **WITH** you

AI generated image. URL: https://www.midjourney.com/

# Traditional problem solving mindset

- **Linear, rational** thinking to eliminate problem
- **Cause & effect**
- **Well-defined** problems

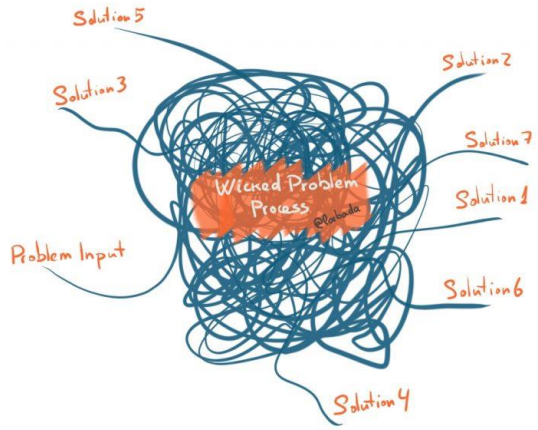


# OUR DESIGN CHALLENGE:

What should a VR scenario look like that students can use to acquire the specialist knowledge & skills they need to plan a seawater desalination plant?

AI generated image. URL: https://www.midjourney.com/

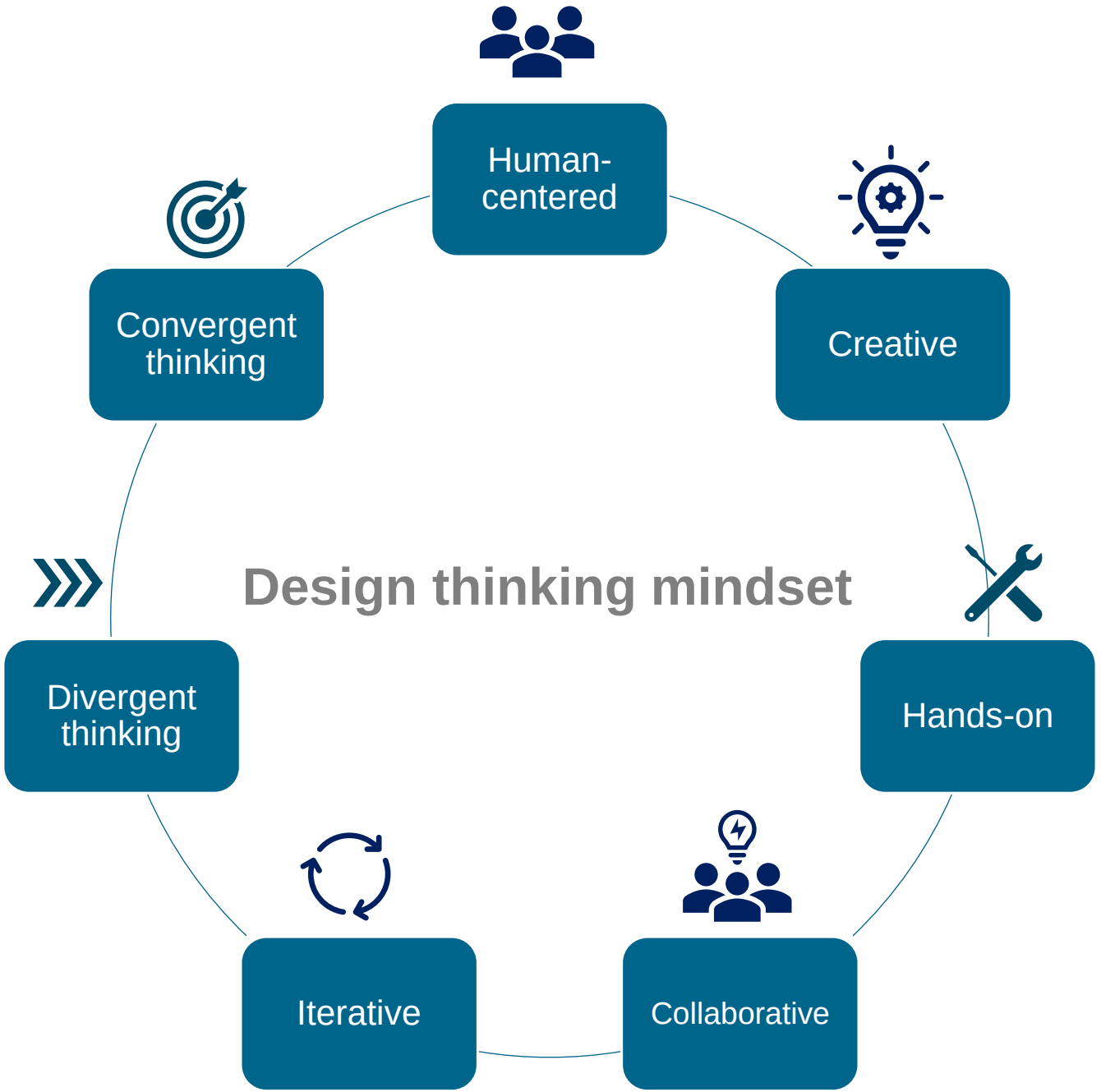
# Creative problem solving




G.R. Lorbada. *Los Wicked Problems en el árbito corporativo.* Blog post, published: 16.06.2016. URL: https://lorbada.com/blog/2016/06/16/espanol-los-wicked-problems-en-el-ambito-corporativo/

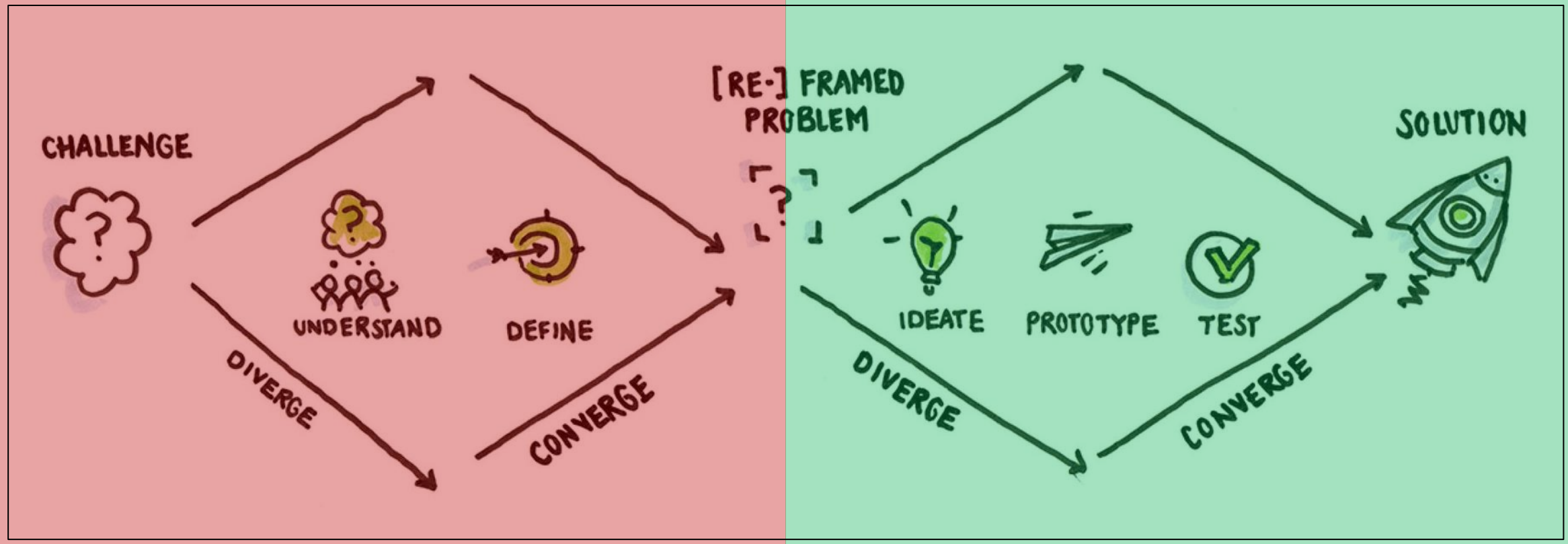
- **Ill-defined, wicked** problems
- **Many possible** design solutions
- Requires **creativity**
- Aim to **understand** the problem
- Aim to **iterate** our way to a solution
- **Collaborative** approach to innovation

*„How might we design a VR learning environment about desalination? “*


Human-centered
Creative
Hands-on
Collaborative
Iterative
Divergent thinking
Convergent thinking
Design thinking mindset

## Problem space

## Solution space

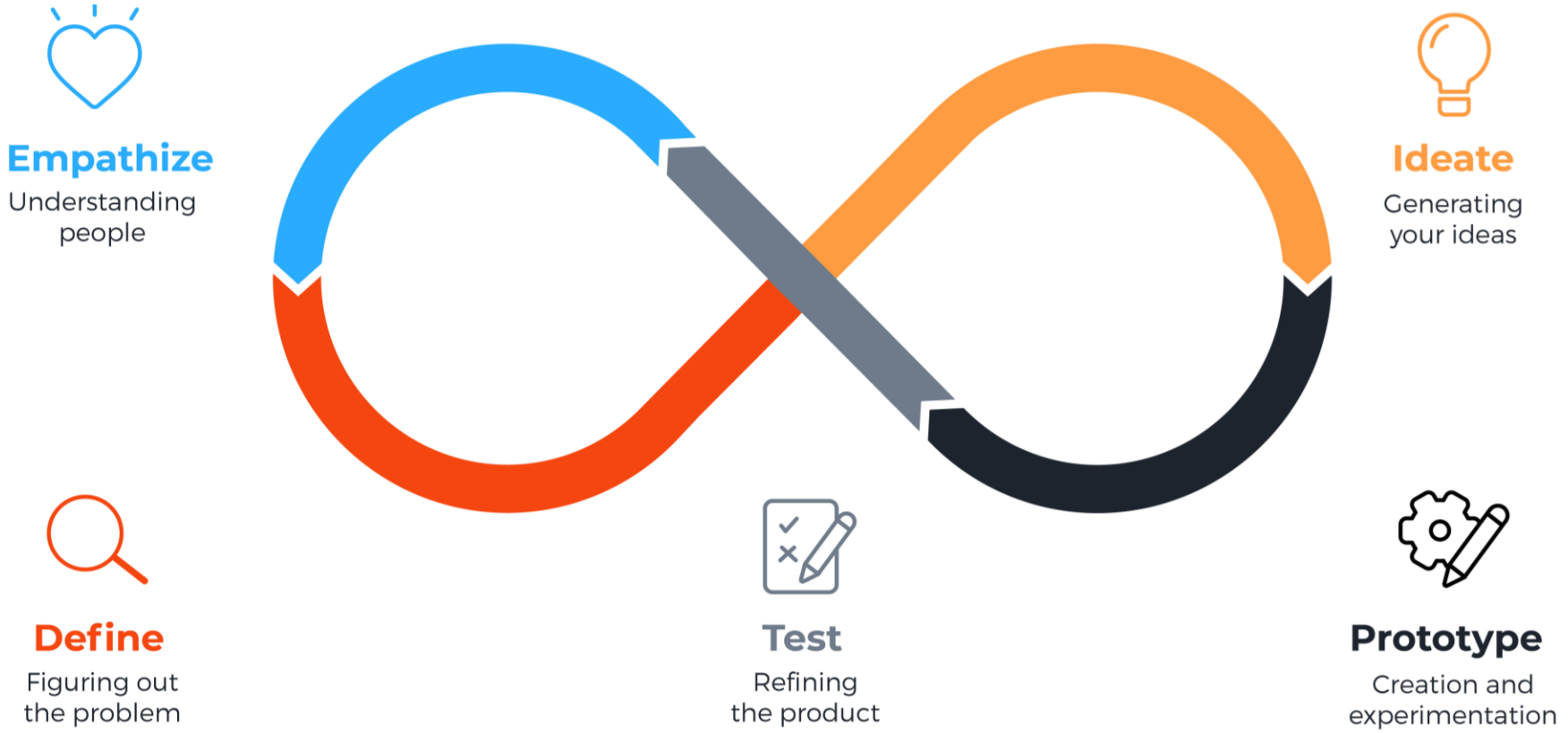



Sovanta AG. *Design Thinking Process*.Published online: 27. Nov. 2017.
URL: https://x.com/sovanta_AG/status/935089281932152832/photo/1

Image credit: Sovanta AG.

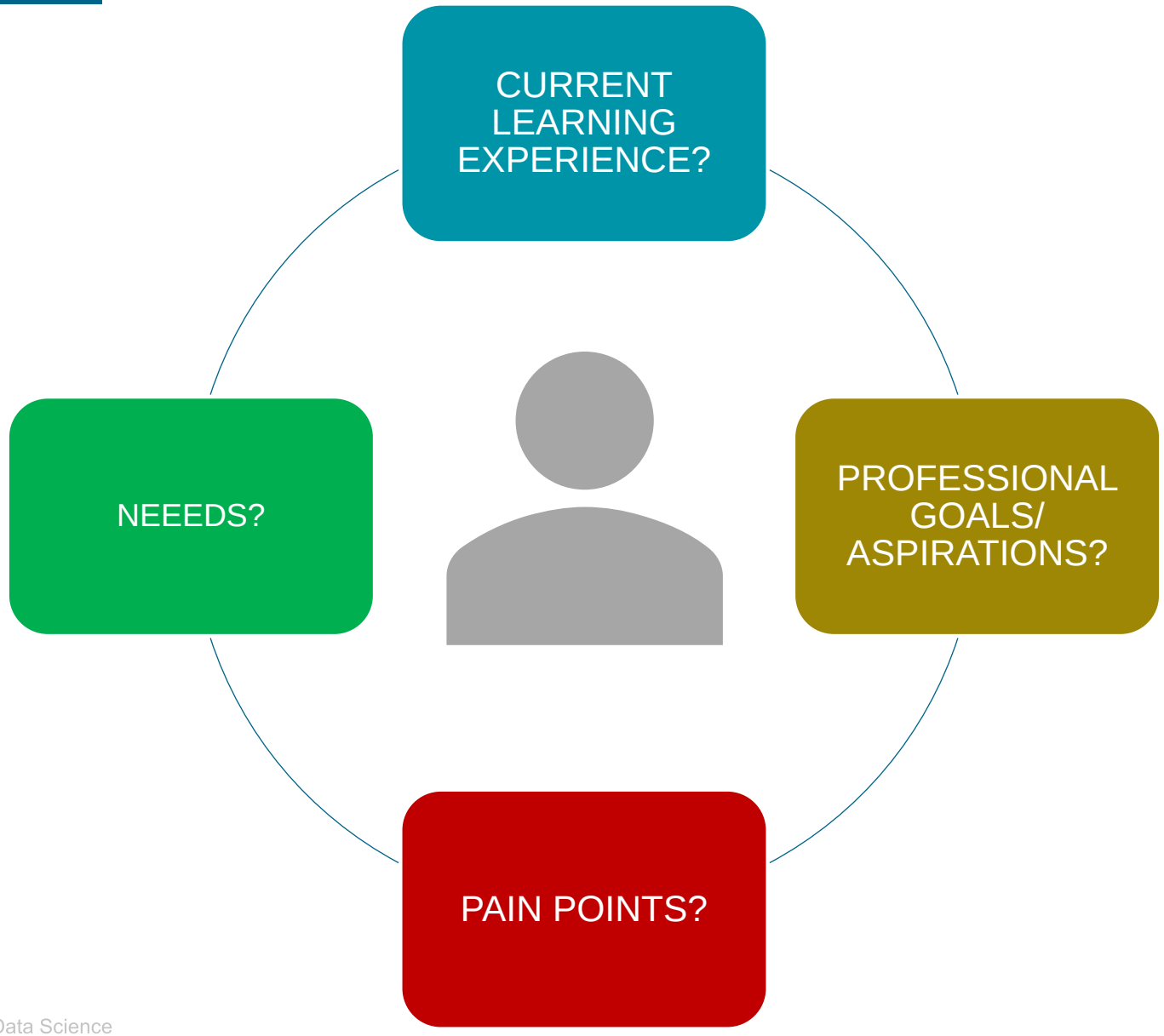
# Five-stage process

Design Thinking Model by Hasso-Plattner Institute, Institute of Design at Stanford.




A.Samaraweera. Design Thinking simplified. LinkedIn blogpost published: 27.04. 2023.
URL: https://www.linkedin.com/pulse/design-thinking-simplified-asitha-samaraweera

# 1. EMPATHIZE


CURRENT LEARNING EXPERIENCE?
NEEEDS?
PROFESSIONAL GOALS/ ASPIRATIONS?
PAIN POINTS?

# 2. DEFINE

- Synthesize insights
- Derive „design criteria“

AI generated image. URL: https://www.midjourney.com/

# 3. IDEATE

Wallpaper Access.
URL: https://wallpaperaccess.com/colorful-umbrella

# 4. PROTOTYPE

Business Design. Tools for Process and Service Prototyping (2026).
URL: https://businessdesign.org/knowledge-base/tools-for-process-and-service-prototyping



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# 5. TEST & REFINE PROTOTYPE

A. Scholl (2024) Zentrum für Digitale Transformation Thüringen (ZeTT)

URL: Zentrum Digitale Transformation Thüringen - ZeTT

# Rules

D Discovery… recommended

- We seek originality! There is no right or wrong!

R Respect… of other

- Don´t criticize others´ ideas!

E Express… all ideas

- 1 idea=1 Post-it note.
- Be open, be present!

A Associate… based on others´ ideas

- Build up on others´ ideas and let others´ ideas inspire you!

M Maximum… ideas

- As many as possible – good and bad!

# Agenda

## DAY 1

| | |
|---|---|
| 09:30-10:30 | Familiarization with VR |
| | ***Coffee Break 10:30-10:40*** |
| 10:40-11:45 | Familiarization with VR (cont´d) |
| | ***Lunch Break 11:45-12:45*** |
| 12:45-14:15 | Seawater desalination – Content ideas |
| | ***Coffee Break 14:15-14:30*** |
| 14:30-16:00 | Design criteria, learning objectives & topics |

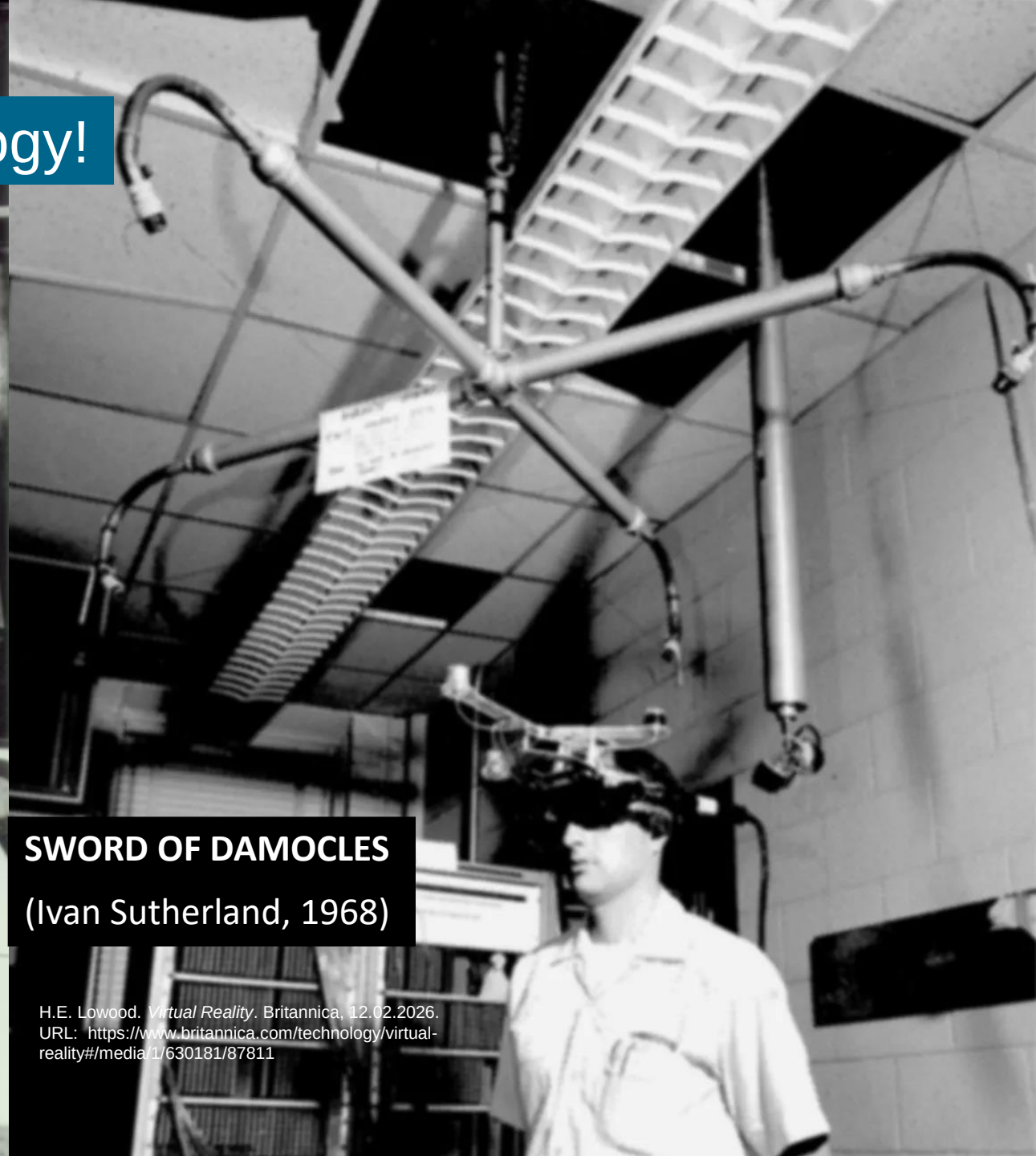
## DAY 2

| | |
|---|---|
| 09:00-10:30 | Lego® Serious Play® session 1 (skill building) |
| | ***Coffee Break 10:30-10:40*** |
| 10:40-11:40 | Lego® Serious Play® session 2 (individual models) |
| | ***Lunch Break 11:40-12:40*** |
| 12:40-14:30 | Lego® Serious Play® session 3 (collective model) |
| | ***Coffee Break 14:30-14.45*** |
| 14:45-15:30 | Prototype testing in VR |
| 15:30-16:00 | Wrap up |

# Immersive VR – not a new technology!

**SENSORAMA**
(Morton Heilig, 1962)

J. Norman. History of Information. Exploring the History of Information and Media through Timeline. *The Sensorama: One of the First Functioning Efforts in Virtual Reality 1955 to 1962*.
URL: https://www.historyofinformation.com/detail.php?id=2785
Image Source: upload.wikimedia.org



**SWORD OF DAMOCLES**
(Ivan Sutherland, 1968)

H.E. Lowood. *Virtual Reality*. Britannica, 12.02.2026.
URL: https://www.britannica.com/technology/virtual-reality#/media/1/630181/87811

# Today´s consumer-ready immersive VR…

- Head and hand motion tracking
- Detailed interaction
- Haptic feedback

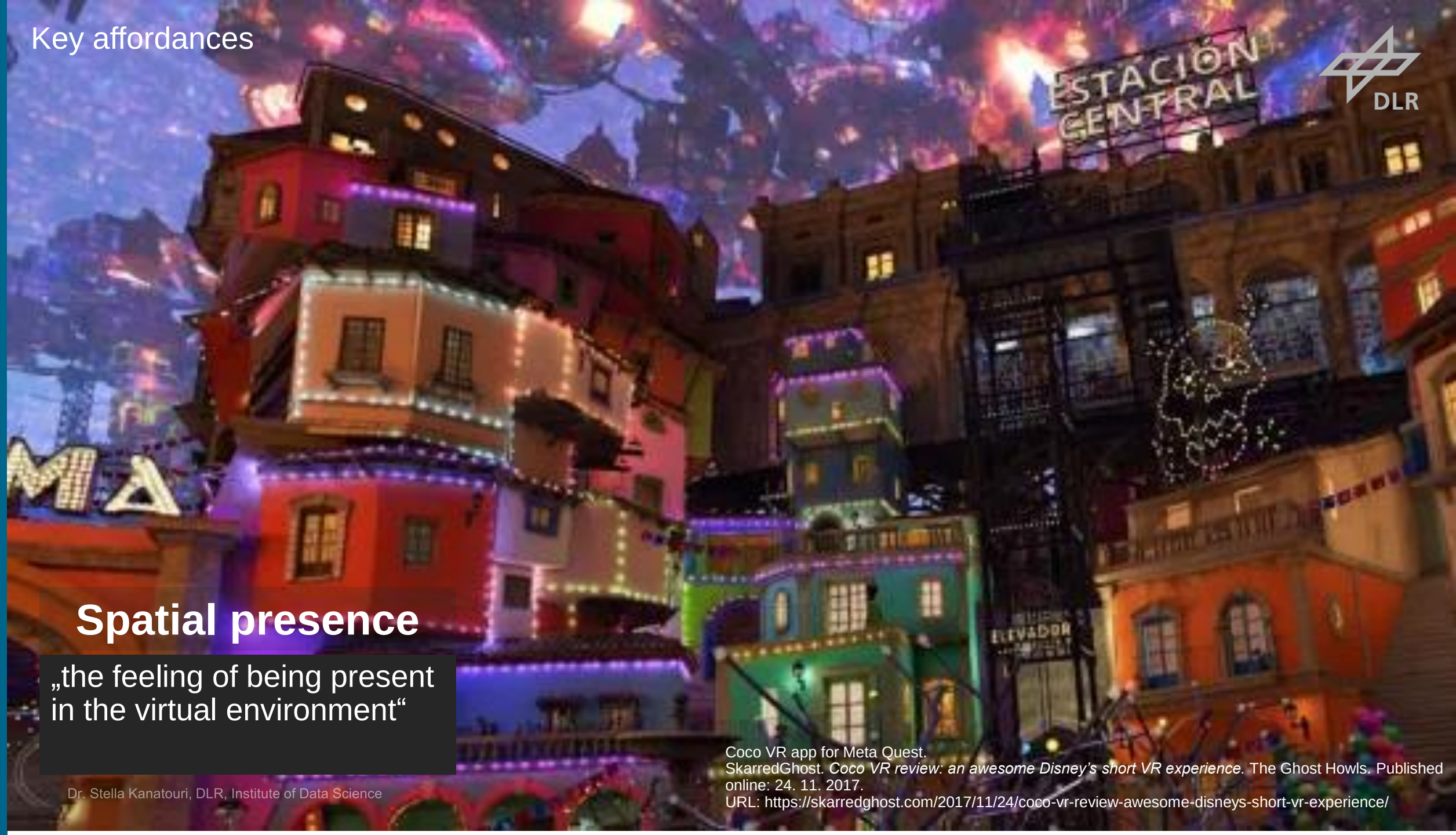
AI generated image. URL: https://www.midjourney.com/

# Why Virtual Reality?

- A viable alternative when physical presence is limited
- Highly memorable contents

## Common use cases

- Hazardous situations
- Costly set-up
- Ethical constraints
- Abstract concepts
- Memorize complex procedures
- Social learning and collaboration




## Spatial presence

„the feeling of being present in the virtual environment“

Coco VR app for Meta Quest.
SkarredGhost. *Coco VR review: an awesome Disney's short VR experience*. The Ghost Howls. Published online: 24. 11. 2017.
URL: https://skarredghost.com/2017/11/24/coco-vr-review-awesome-disneys-short-vr-experience/

# Key affordances

- **Depth**
- **Spatial sound**




AI generated image. URL: https://www.freepik.com/premium-photo/underwater-coral_269659349.htm#from_element=cross_selling__photo

VR Games Meta. Richie´s Plank Experience for Meta Quest.
URL: https://www.meta.com/de-de/experiences/richies-plank-experience/1642239225880682/?forced_locale=en_US#description

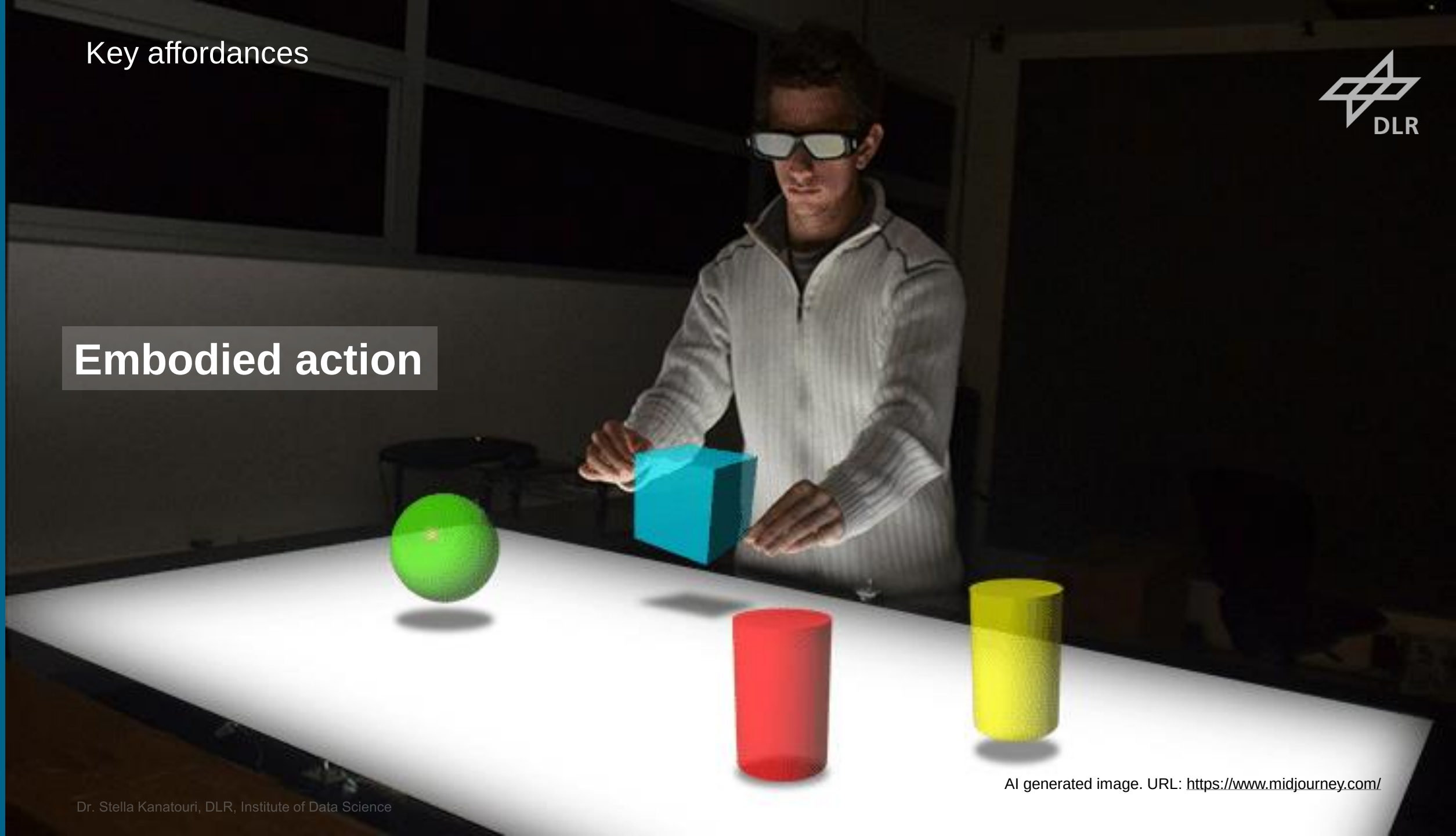
# Real-life scale

AI generated image. URL: https://www.midjourney.com/

Gravity Sketch app. Private video, made using the Gravity Sketch app (2024).

# Key affordances

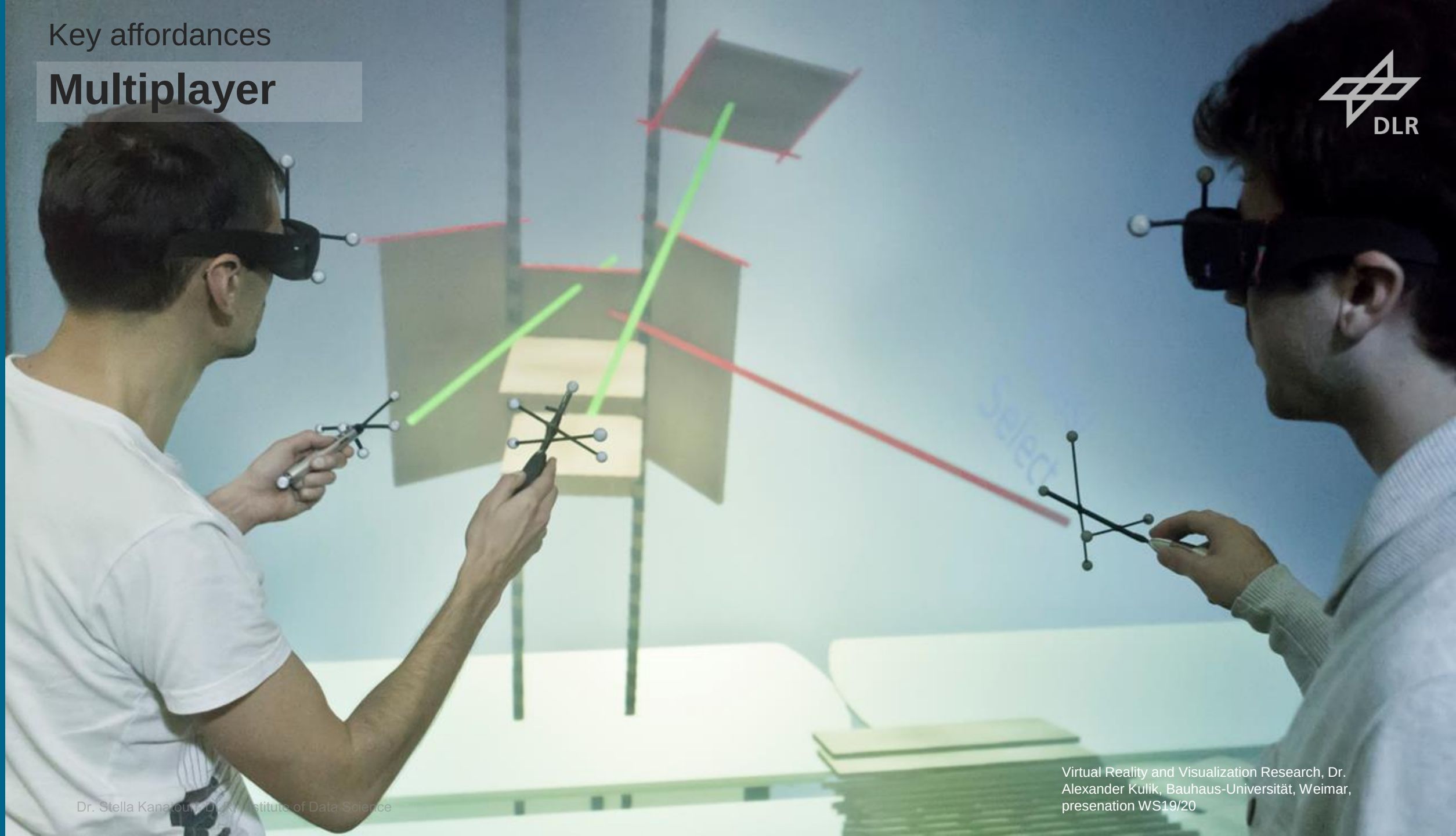
## Embodied action



AI generated image. URL: https://www.midjourney.com/

Key affordances

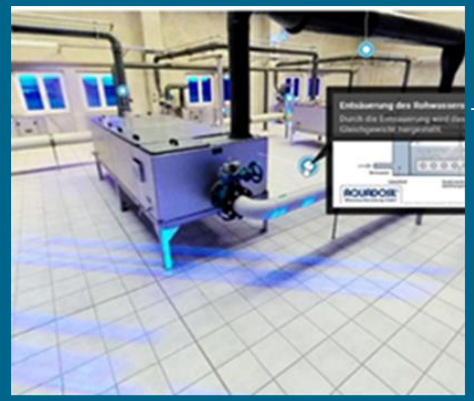
# Multiplayer



Virtual Reality and Visualization Research, Dr. Alexander Kulik, Bauhaus-Universität, Weimar, presenation WS19/20

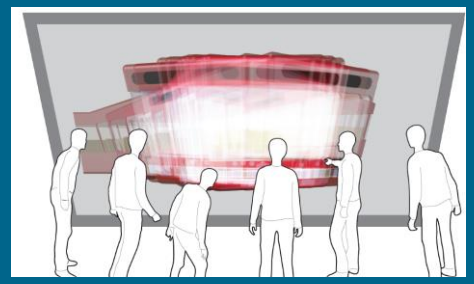
# Design elements - examples

## Virtual tours



Wolf, M. et al. (2021) 360-based virtual field trips to waterworks in higher education. In *Computers, Sept. 2021, 10 (9):118*. DOI: 10.3390/computers10090118

## Simulation



Collaboration in realistic environments

A. Kulik, A. Kunert, S. Beck, R.Reichel, R. Blach, A. Zink, B. Froelich, 2011, A stereoscopic six-user display for co-located collaboration in shared virtual environments. ACM SIGGRAPH Asia 2011. DOI: 10.1145/2024156.2024222

## Gamification

Challenges

Levels

Badges / rewards