UNIVERSITATEA LUCIAN BLAGA DIN SIBIU
HPI Hasso Plattner Institut
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SID 2024
Sibiu Innovation Days
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THE EMERGING TECHNOLOGIES: the drivers for digital transformation in business and education

AI-Enhanced Co-Creativity: Introducing 'Nature's Voice' during Creative Teamwork in Sustainable Design Hubs

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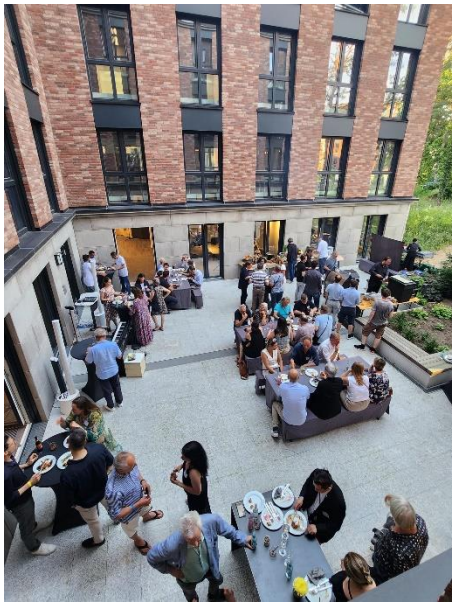


- **German UDS**, situated at the intersection of Berlin and Potsdam, is Germany's first fully **digital university**.
- We offer innovative **online programs**, including Master's degrees, MBAs, and micro-degrees.
- Topics include **Digital Transformation**, **Applied AI**, **Digital Reality**, and **Cybersecurity**, fostering a vibrant international community dedicated to **learning and research**.

Potential Lines of Exchange & Collaboration

Designing a **virtual university campus,** investigating how various **online environments** and **digital resources** influence user satisfaction, work efficiency, and **learning outcomes**.

Providing **technologies** and **best practices**, as well as **research** in **online education**, with the goal of enhancing learning experiences and fostering **social connectedness over distance**.

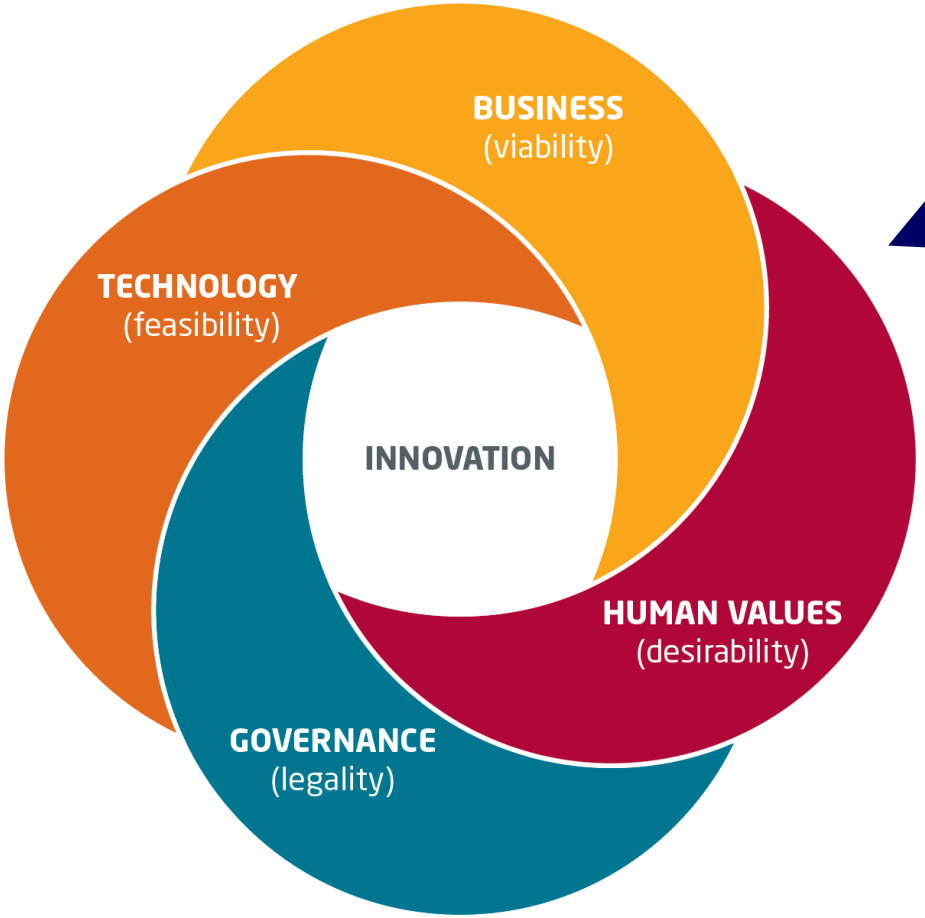
Utilizing AI to analyze individual learner pathways, offering (automated) **tutoring and support** to enhance student achievements, well-being, and passion for the study topics.

Considering course content, materials, learning goals, and exams across **IT courses**, ensuring state-of-the-art **topic coverage**, industry **relevance**, and student engagement in **real-world projects**.

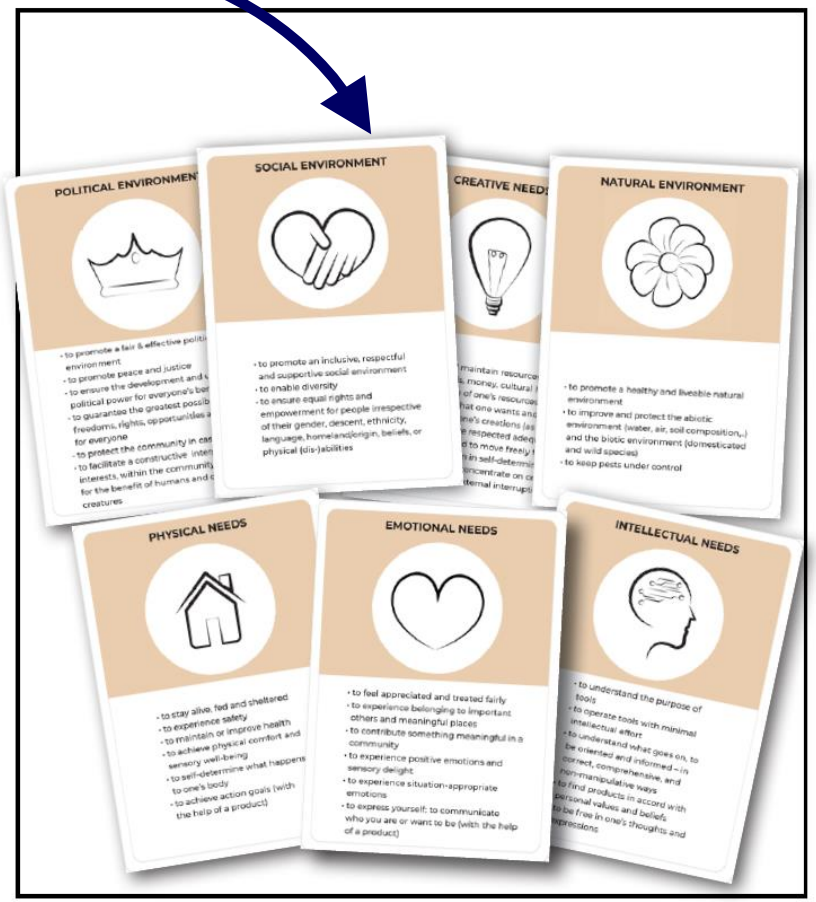
German University of Digital Science

Technology for Enhanced Sustainability

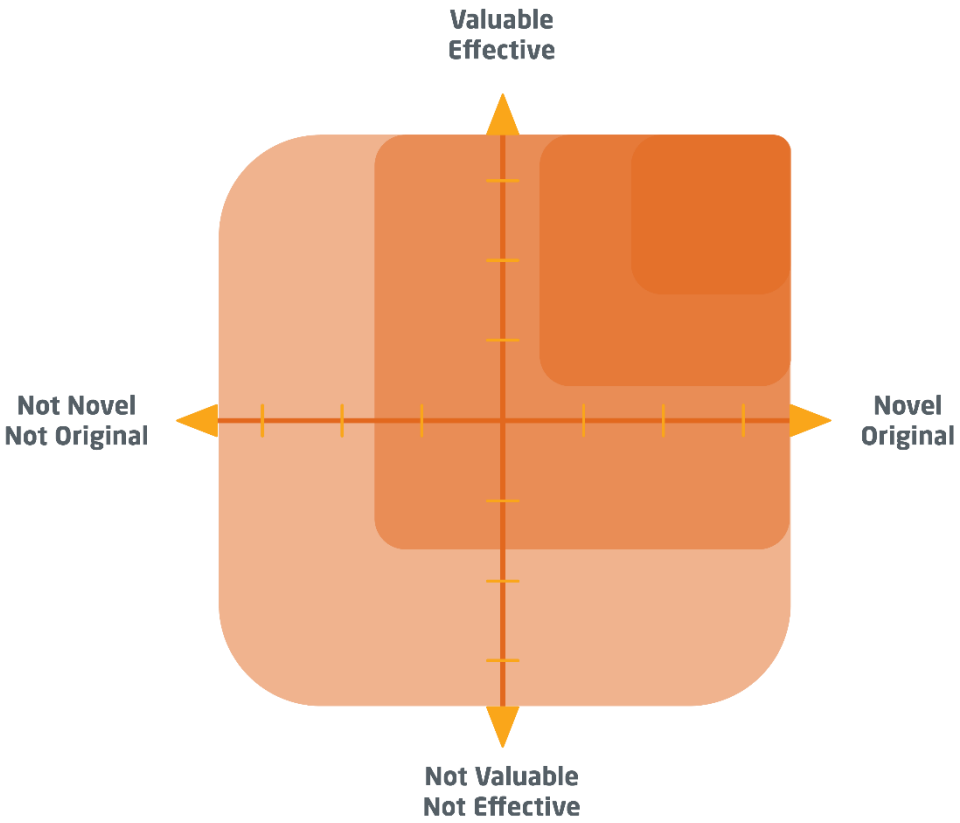
Design Thinking: Towards Desirable Innovation



Anticipating the impact of my Innovation: Who wins? Who loses?



Goals of Innovation – Towards Novel & Effective Solutions



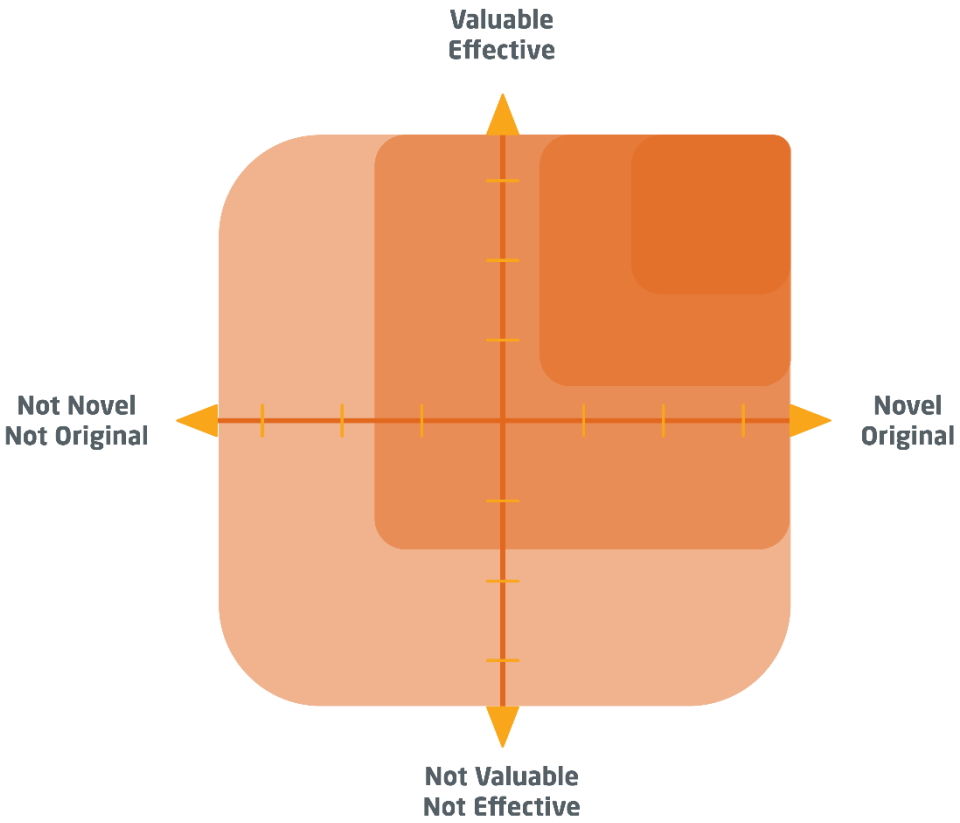
Classic definition:
A creative product is **novel** and **effective**.

Design thinking addition:
A product is **effective**

(i) when it does what it is supposed to do and

(ii) it is supposed to do 'the right things.'

Goals of Innovation – Towards Novel & Effective Solutions



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→ **VALUES**, like sustainability, which altogether serve to advance products that are **desirable**

Nature-Exposure Facilitates Sustainable Thinking

- Developing solutions in **different environments** shapes the content of ideas (Oppezzo & Schwartz, 2014; Nelson & Guegan, 2019).
- **Nature exposure** encourages more **sustainability-minded** decisions (Nisbet et al., 2011; Zelenski et al., 2015).

- By contrast, many human environments for discussing ideas and taking decisions are charaterized by the **absence of nature** – potentially fatal for sustainability.

Nelson, J., & Guegan, J. (2019). "I'd like to be under the sea": Contextual cues in virtual environments influence the orientation of idea generation. *Computers in Human Behavior*, *90*, 93-102.

Nisbet, E. K., & Zelenski, J. M. (2011). Underestimating nearby nature: Affective forecasting errors obscure the happy path to sustainability. *Psychological science*, *22*(9), 1101-1106.

Oppezzo, M., & Schwartz, D. L. (2014). Give your ideas some legs: the positive effect of walking on creative thinking. *Journal of experimental psychology: learning, memory, and cognition*, *40*(4), 1142.

Zelenski, J. M., Dopko, R. L., & Capaldi, C. A. (2015). Cooperation is in our nature: Nature exposure may promote cooperative and environmentally sustainable behavior. *Journal of environmental psychology*, *42*, 24-31.

Dark Traces of Human Creativity

Ekamb, CC BY-SA 4.0, https://commons.wikimedia.org/wiki/File:Pollution_of_soil_on_Earth.webp

The **Anthropocene** refers to a time period when human actions drastically impacted the Earth and its ecosystems (Zalasiewicz et al., 2019; Rangel-Buitrago et al., 2023).

Already in prehistory, hunter-gatherers altered environments through **cultural practices** like vegetation burning, and early settlers cleared forests (Altman & Mesoudi, 2019).

Is **human creativity** malevolent, egoistic, short-sighted, or simply **misguided by inappropriate values**?

Altman, A., & Mesoudi, A. (2019). Understanding agriculture within the frameworks of cumulative cultural evolution, gene-culture co-evolution, and cultural niche construction. *Human Ecology*, *47*, 483-497.

Rangel-Buitrago, N., Neal, W. J., & Galgani, F. (2023). Plastics in the Anthropocene: A multifaceted approach to marine pollution management. *Marine Pollution Bulletin*, *194*, 115359.

Zalasiewicz, J., Waters, C. N., Williams, M., & Summerhayes, C. P. (Eds.). (2019). *The Anthropocene as a geological time unit: a guide to the scientific evidence and current debate*. Cambridge University Press.

“Telesymbiosis” Initiative in Collaboration with the MIT Media Lab

PIs & Coordinators

Prof. Hiroshi Ishii, MIT

Prof. Bert Arnrich, HPI

Dr. JB Labrune, MIT

Dr. Julia von Thienen, HPI & German UDS

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Collaborators

Holly McKee, HPI

Dr. Alaa Algargoosh, MIT

Kim-P. Borchart, HPI

Cato Zantman, King’s C. L.

…and others…

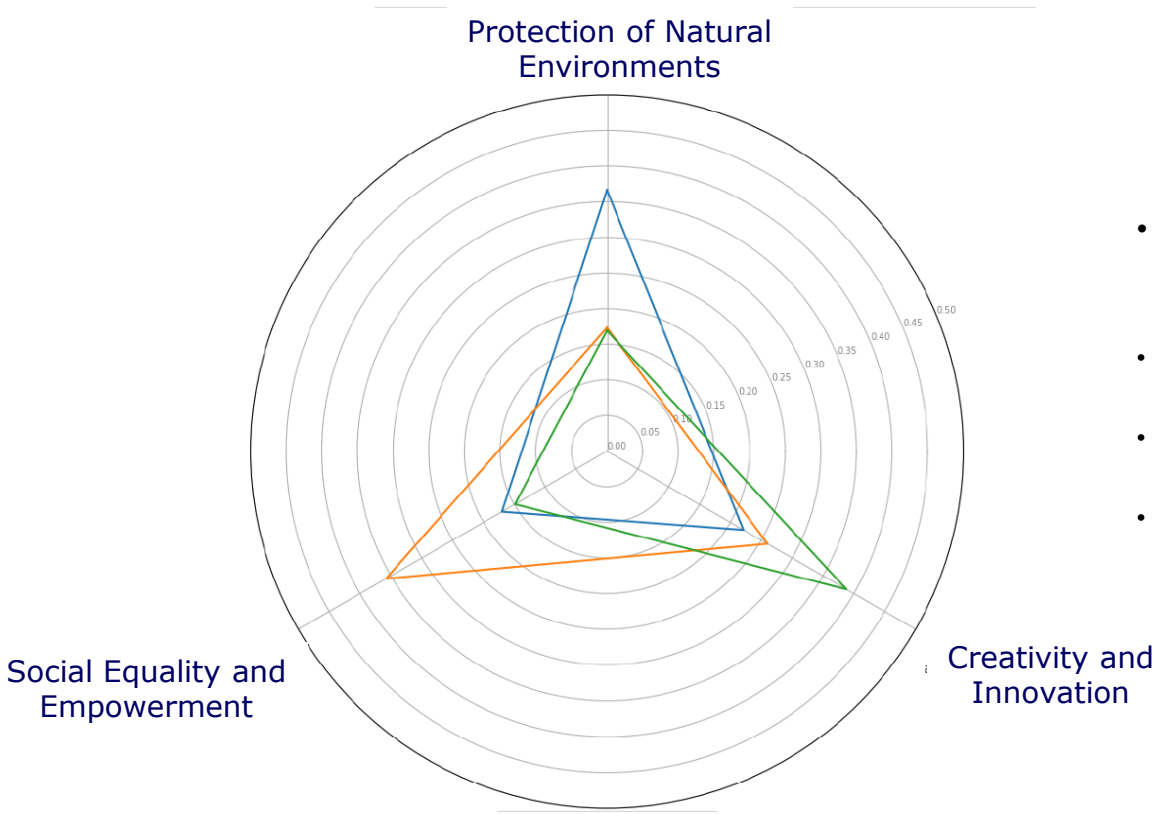
PLEASE REACH OUT TO JOIN

Sustainable Design Hub

Component I - Automated Sustainability Feedback: AI analyzes design discussions to assess sustainability, offering feedback on environmental impact, social equality, and innovation.

Component II - Technology-Mediated NatureScape: Simulated natural environments immerse creators in nature to promote sustainable thinking, even indoors.

AI-Based Sustainability Feedback



- **Automatic Sustainability Feedback**: Design team conversations are (i) recorded, (ii) transcribed via OpenAI's Whisper, (iii) assessed using Sentence BERT across three sustainability dimensions: natural environment, social inclusivity, and innovation.
- **Image (left)**: **Validation of Sentence BERT** shows distinct peaks for each dimension.
- *Principles of Ecosystem Sustainability* by Chapin et al. (1996) peaks on "Natural Environment"
- *Education for Diverse Societies* by Cerna et al. (2021) peaks on "Social Equality"
- *Enhancing Creativity and Innovation in Engineering Education* by Badran (2007) peaks on "Innovation"

Badran, I. (2007). Enhancing creativity and innovation in engineering education. *European Journal of Engineering Education*, *32*(5), 573-585.

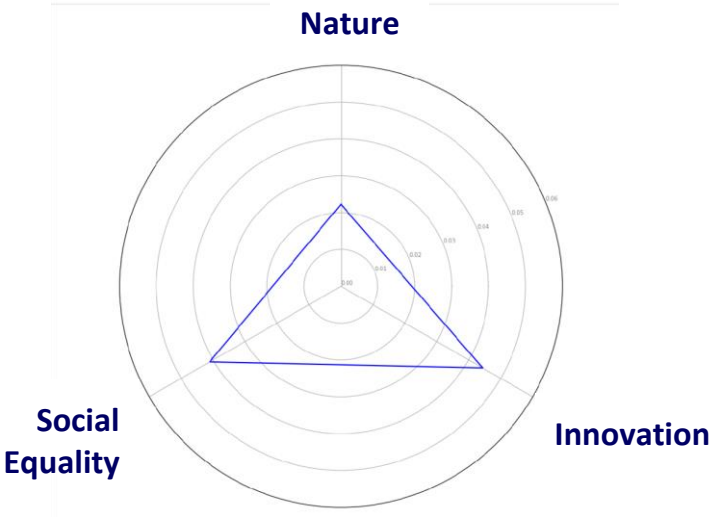
Cerna, L., Mezzanotte, C., Rutigliano, A., Brussino, O., Santiago, P., Borgonovi, F., & Guthrie, C. (2021). Promoting inclusive education for diverse societies: A conceptual framework.

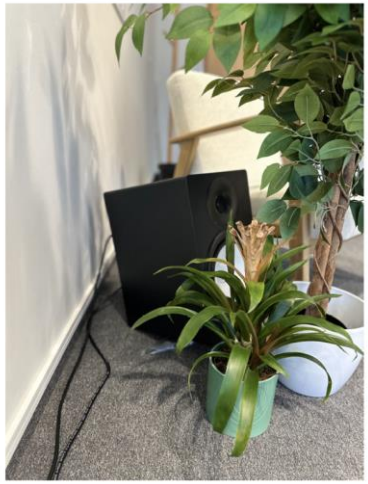
Chapin, F. S., Torn, M. S., & Tateno, M. (1996). Principles of ecosystem sustainability. *The American Naturalist*, *148*(6), 1016-1037.

Randomized Experiment

- Testing the two components of **Sustainable Design Hubs**
  - Performance Feedback
  - NatureScape (nature sounds, wind)

- N=27 participants, 9 Teams





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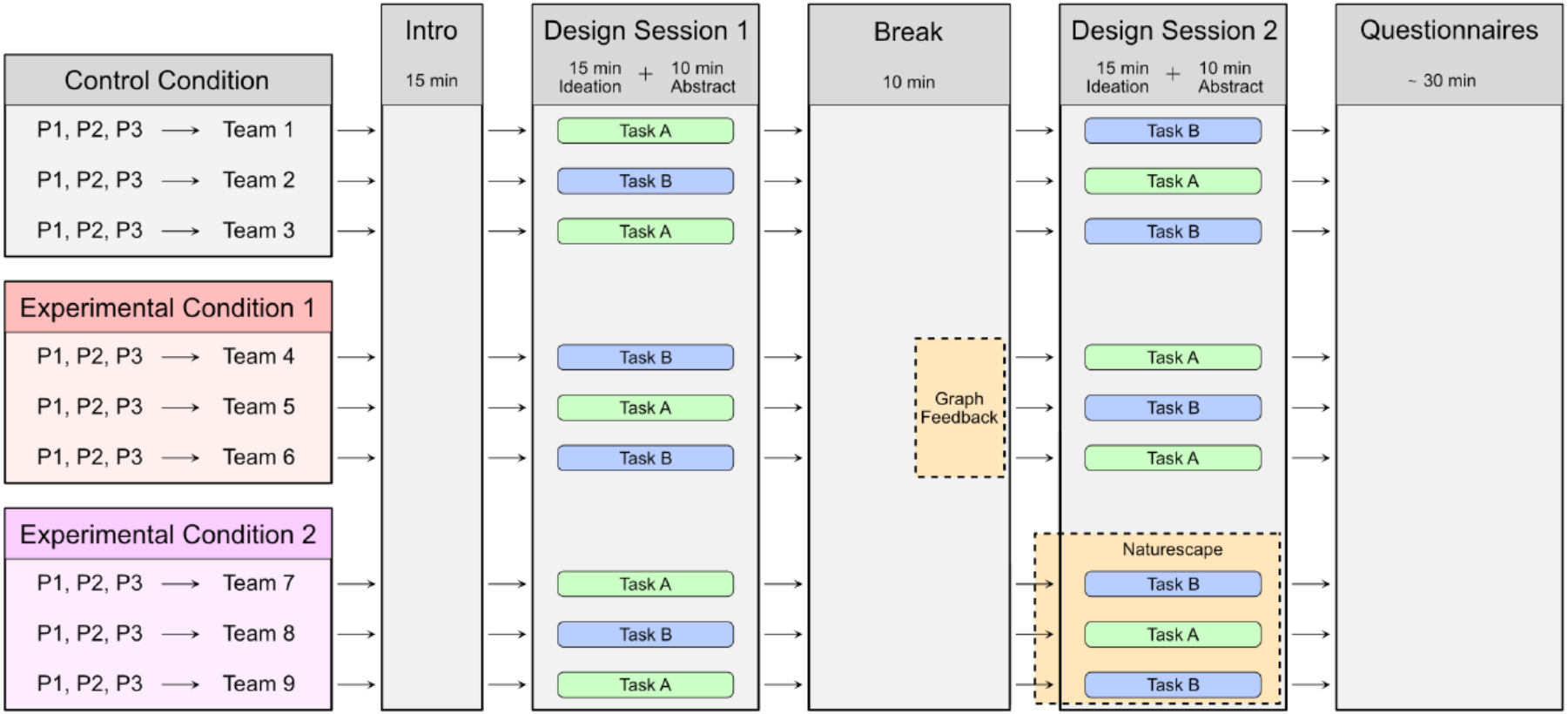
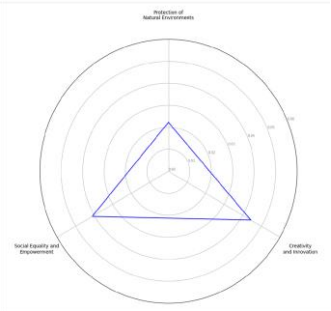


Results

Intervention 1: Feedback



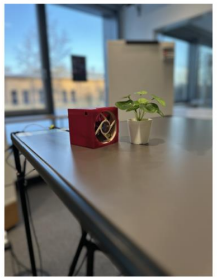
- Final design outcomes evaluated by three human raters blind to condition and team (high inter-rater agreement)
- Design performance post-intervention (feedback during break) **significantly improved across all metrics** compared to control condition

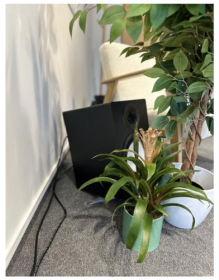
Factor	Experimental Group	Average	Standard Deviation
Natural Environment	Control	0.67	2,52
	Feedback	1.44	3,09
Social Equality	Control	-0.11	0,88
	Feedback	2,00	1,00
Innovation	Control	0,22	1,30
	Feedback	2,56	1,42
Novelty	Control	1,56	0,83
	Feedback	2,33	1,04
Effectiveness	Control	1,67	0,50
	Feedback	3,22	0,93

Results

- In this study, NatureScape operates passively, providing no feedback
- Main research question: Does the sound and wind disturb teams (does design performance decrease)?
- Answer: No, performance is **equal to or better than the control condition**

Intervention 2: NatureScape





Factor	Experimental Group	Average	Standard Deviation
Natural Environment	Control	0,67	2,52
	Audio/Tangible	0,44	1,20
Social Equality	Control	-0,11	0,88
	Audio/Tangible	1,11	0,17
Innovation	Control	0,22	1,30
	Audio/Tangible	1,00	0,87
Novelty	Control	1,56	0,83
	Audio/Tangible	1,67	0,50
Effectiveness	Control	1,67	0,50
	Audio/Tangible	2,56	0,44

Vision of the Sustainable Design Hub

Call to the Community

Let’s Foster Innovation to Heal, Not Harm.

The Digital Transformation needs a **value compass** to avoid reckless consequences.

Our **community** has a **responsibility** to tackle challenges of global destruction.

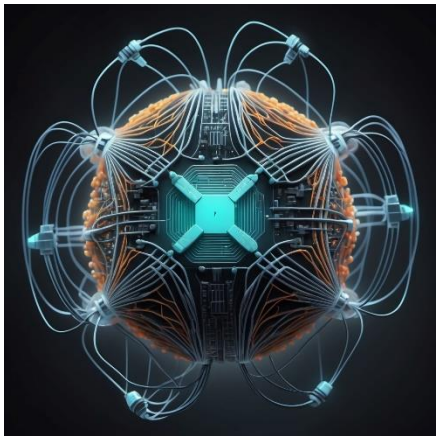
Let’s ensure innovation helps the **world thrive**, not wither.

German University of Digital Science

Next Steps @ the German UDS

…will you join?

AI for Enhanced Sustainability



Energy-Efficient Low Bit Networks: Focusing on reducing energy consumption in AI and network infrastructures.

AI-Based Nature Avatars: Assisting students in adopting non-human perspectives to inspire more sustainable design solutions.

Culture Avatars (e.g., Leibnitz): AI-based avatars help students reflect on the values and implications of their project ideas.

Please reach out to connect:
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Thank you!