

Faculty of Design

2022

Could Systemic Design Methods Support Sustainable Design of Interactive Systems?

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Suggested citation:

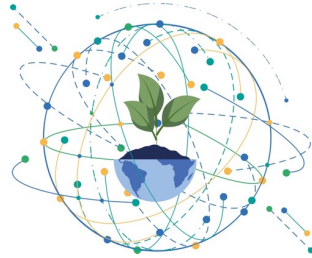
Bornes, Laetitia, Letondal, Catherine and Vingerhoeds, Rob (2022) Could Systemic Design Methods Support Sustainable Design of Interactive Systems? In: Proceedings of Relating Systems Thinking and Design, RSD11, 3-16 Oct 2022, Brighton, United Kingdom. Available at <https://openresearch.ocadu.ca/id/eprint/4291/>

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Relating Systems Thinking and Design
2022 Symposium
University of Brighton, Brighton, UK,
October 13-16, 2022



Could **systemic design** methods support
sustainable design of **interactive systems**?



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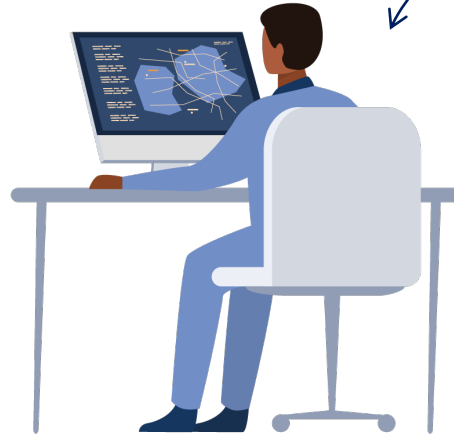
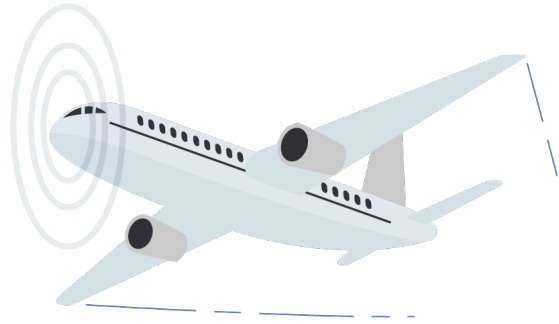
Laetitia Bornes
PhD Candidate
ENAC & ISAE-SUPAERO





Systems Engineering (SE)

managing all the engineering specialties in a transversal way to carry out complex projects



Human Computer Interaction (HCI)

multidisciplinary field focusing on the design of the interaction between humans and machines

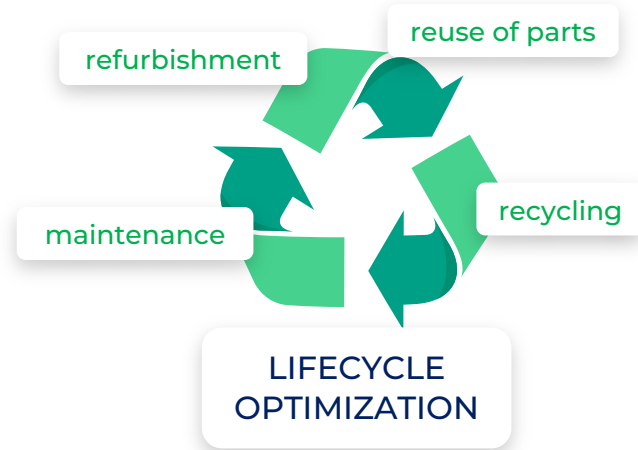
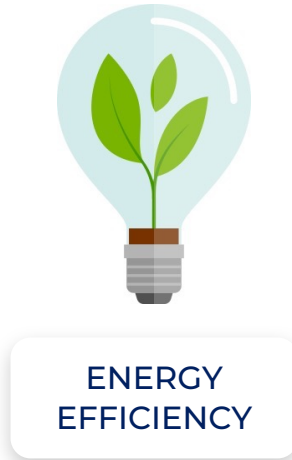
SE & HCI should consider the interactions between the interactive system and the social system



Sustainability should be a central concern of interactive system design.

(Bremer et al., 2022) (Thackara, 2005, p. 12) (Blevis, 2007) (Woodward, 2007) (DiSalvo et al., 2010)

Sustainability in Systems Engineering



focus on the material impact of a single system and not impact at scale: problem of the rebound effect

(Vezzoli and Manzini, 2008, p. 33) (Combaz, 2022) (Misra, 2008, p. 946)

Sustainable HCI



criticized for being a reductive approach: need for methods and tools to address the systemic challenge of sustainability

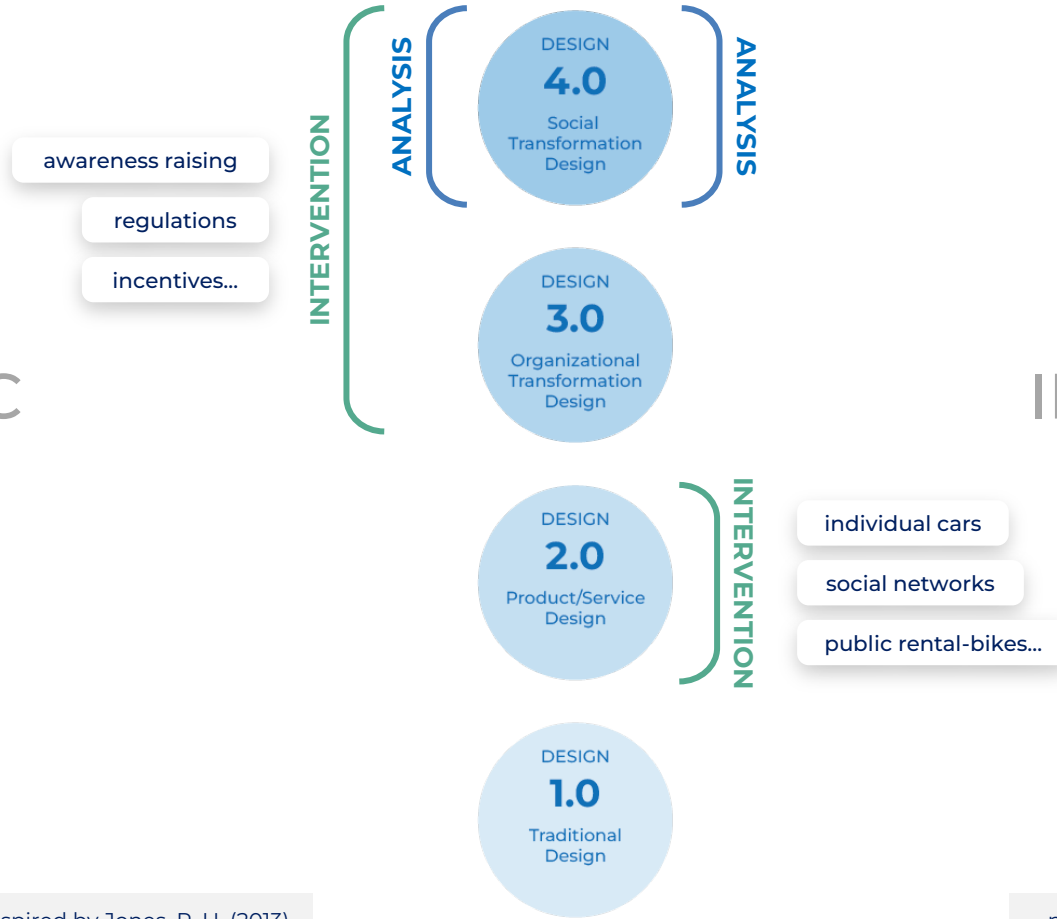
(Mankoff et al., 2007, p. 2-3) (Rivière, 2021) (Giaccardi & Redström, 2020) (Bremer et al., 2022, p. 6) (Knowles et al., 2018, p. 1)

Both SE and HCI fields need to be equipped to consider the systemic aspect of sustainability

we suggest to draw inspiration from systemic design methods and tools

(Giaccardi & Redström, 2020) (Rivière, 2021) (Knowles et al., 2018, p. 1) (Bremer et al., 2022, p. 6)

SYSTEMIC DESIGN



INTERACTIVE DESIGN (HCI & SE)

figure inspired by Jones, P. H. (2013)

public rental-bike systems: (Taylor, 2015)

Systemic design tools and methods should be
adjusted to the needs of SE and HCI fields

difference in the level of intervention

need to dimension interactive systems

we think the priority is to rework the methods and tools here, so that interactive system designers could **understand and explore** the **interactions between the social system and the designed system**

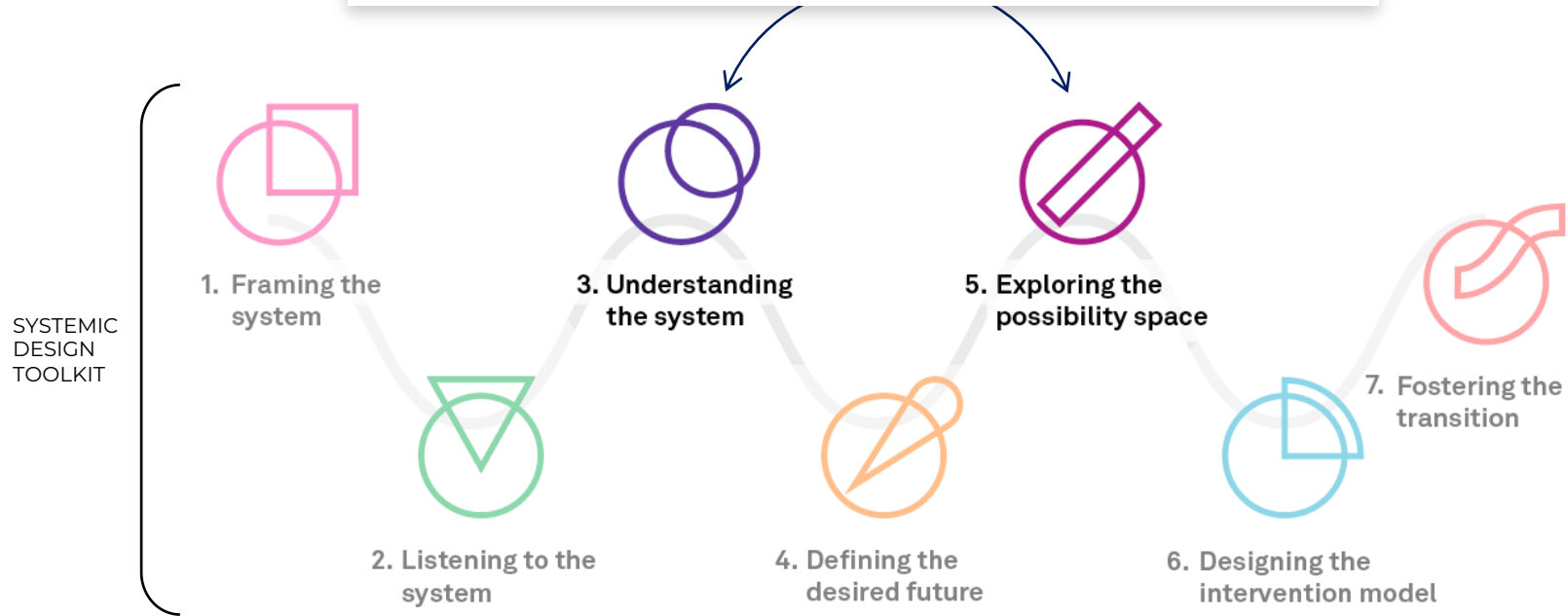
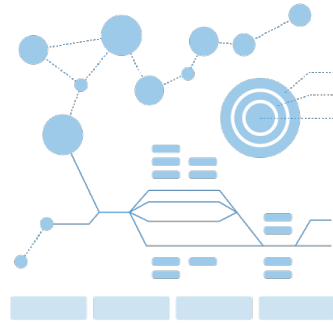


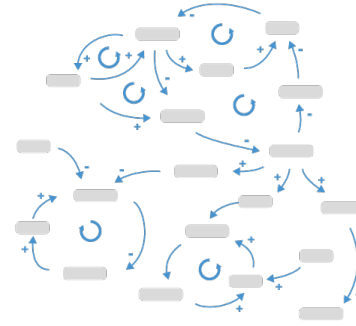
figure from: Van Ael, K., Jacoby, A., Nedaei, M., Jones, P., (2021). Exploring the Activity Network Tool: Understanding and embracing the tensions between systems. Relating Systems Thinking and Design (RSD10) Symposium. rdsymposium.org



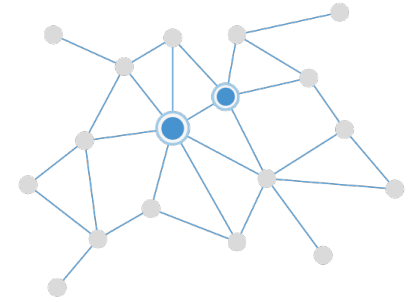
Systemic design toolkit



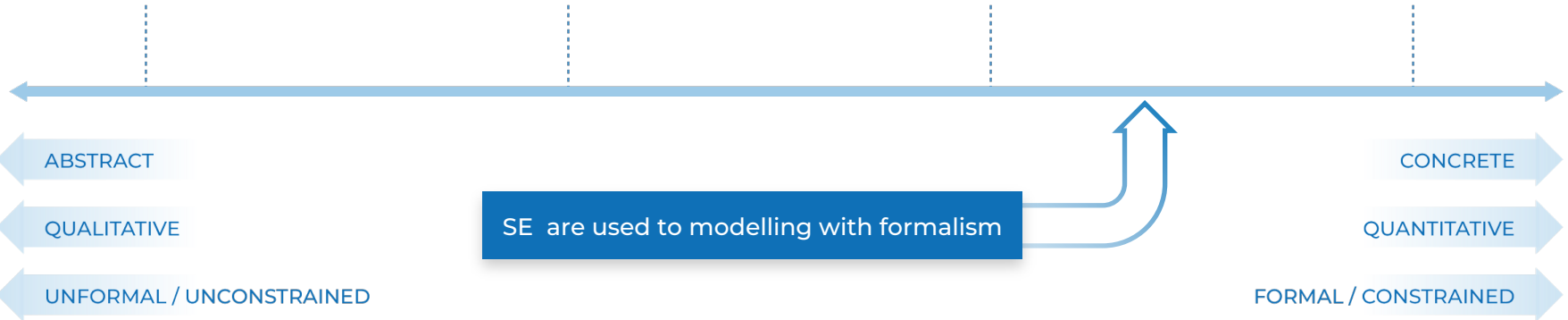
Giga maps



Causal loop diagrams



Leverage analysis



inspired by (from left to right): Systemic Design Toolkit. (n.d.), Sevaldson, B. (2018b), Kim, D. H. (1992), Murphy, R. J. A., & Jones, P. H. (2020).

The perspective of a **quali-quantitative** interactive modelling tool

social systems cannot be reduced to quantitative data

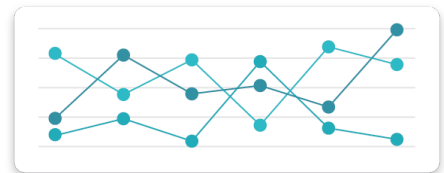
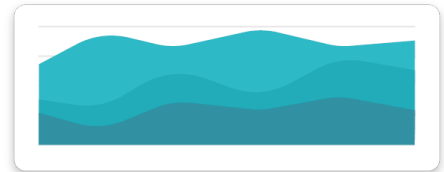
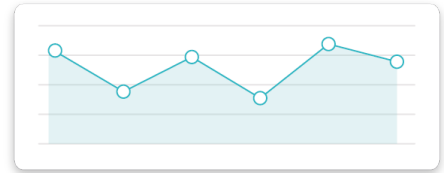
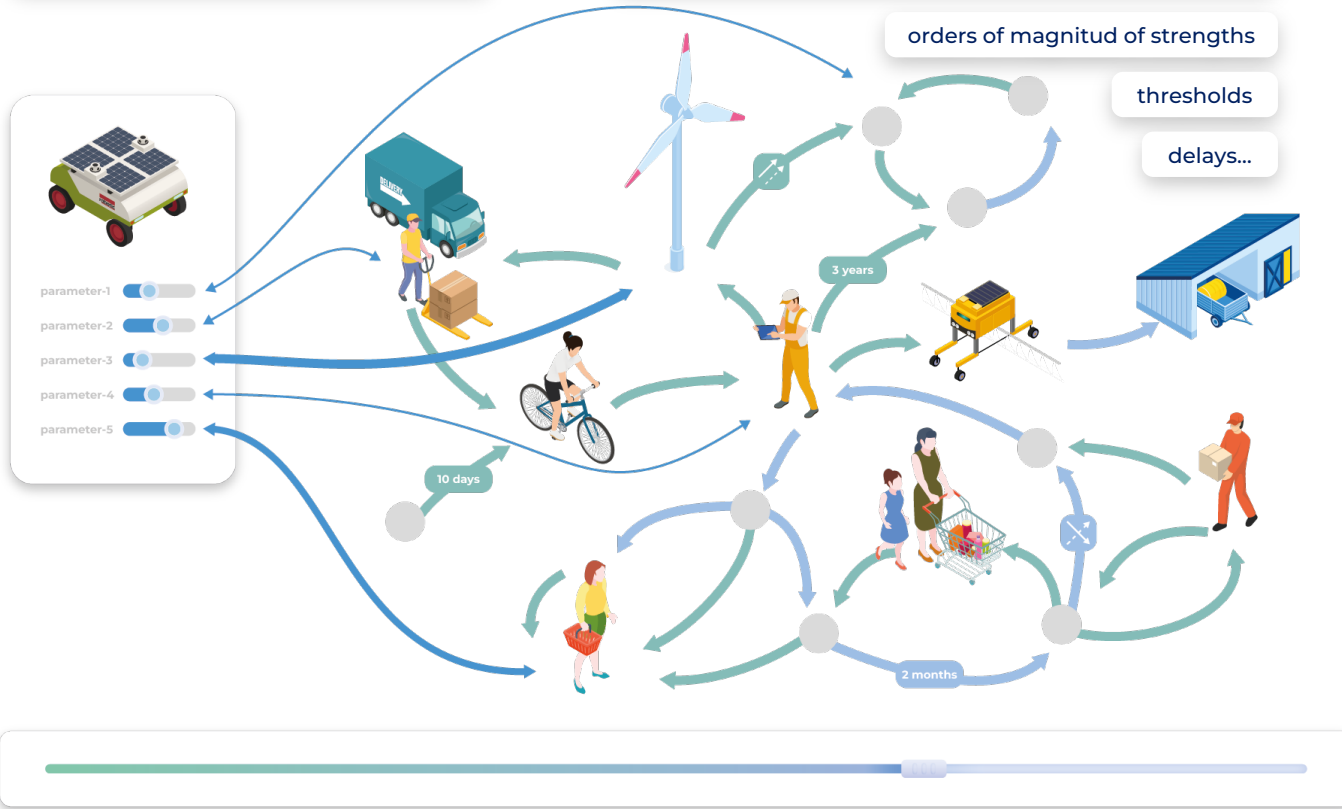
some of the problems we face are concrete and tangible

Norman, D. A. (n.d.). Future of Design Education. Retrieved 18 February 2022, from <https://www.futureofdesigneducation.org/>

interactions with designed system

social or sociotechnical system and its dynamics

compare scenarios and trends



interactions with designed system

social or sociotechnical system and its dynamics

compare scenarios and trends

orders of magnitude of strengths

thresholds

delays...



what if we rent it?

what if the market evolves?

what are the possible consequences?

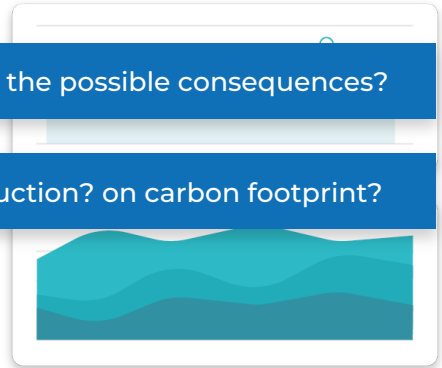
what if we design for share?

does it change the structure?

on production? on carbon footprint?

what if the battery last 4h, 8h...?

what if the market evolve?



parameter-6

10 days

3 years

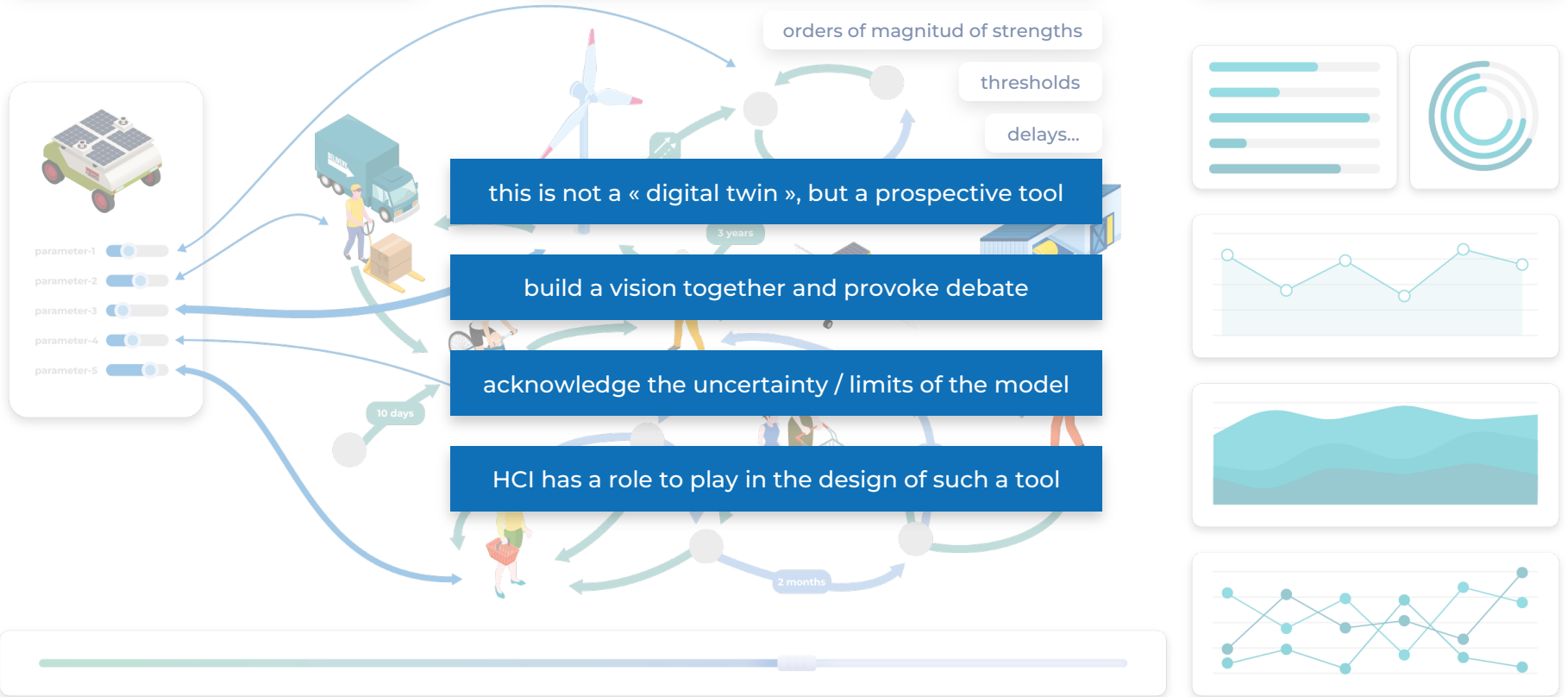
2 months



interactions with designed system

social or sociotechnical system and its dynamics

compare scenarios and trends



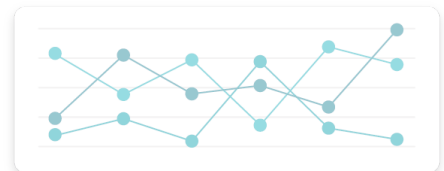
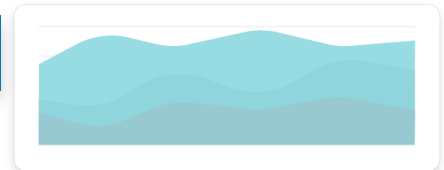
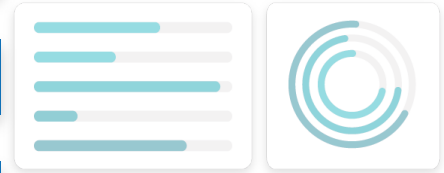
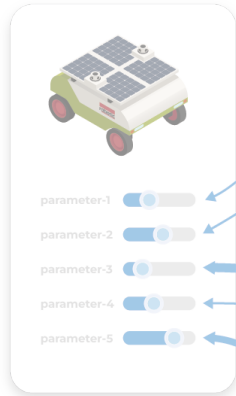
Who should be involved in the co-construction and when?

How do we define the boundaries of the considered system?

What parameters of the designed system should be represented?

How can we define orders of magnitude from the field study?

When do we need to define the dynamics more precisely?



In this paper we have attempted to...



establish the fact that SE and HCI are both ill-equipped to design for sustainability



propose to draw inspiration from systemic design methods and tools



identify the difference in the level of intervention and analysis



infer the need to adapt the tools of systemic design



open up the perspective of a “quali-quantitative” modelling tool

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