EGU26 GENERAL ASSEMBLY

NTNU
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Environmental Decision-Support Tool Evaluation: What Impacts Can Be Measured and How?

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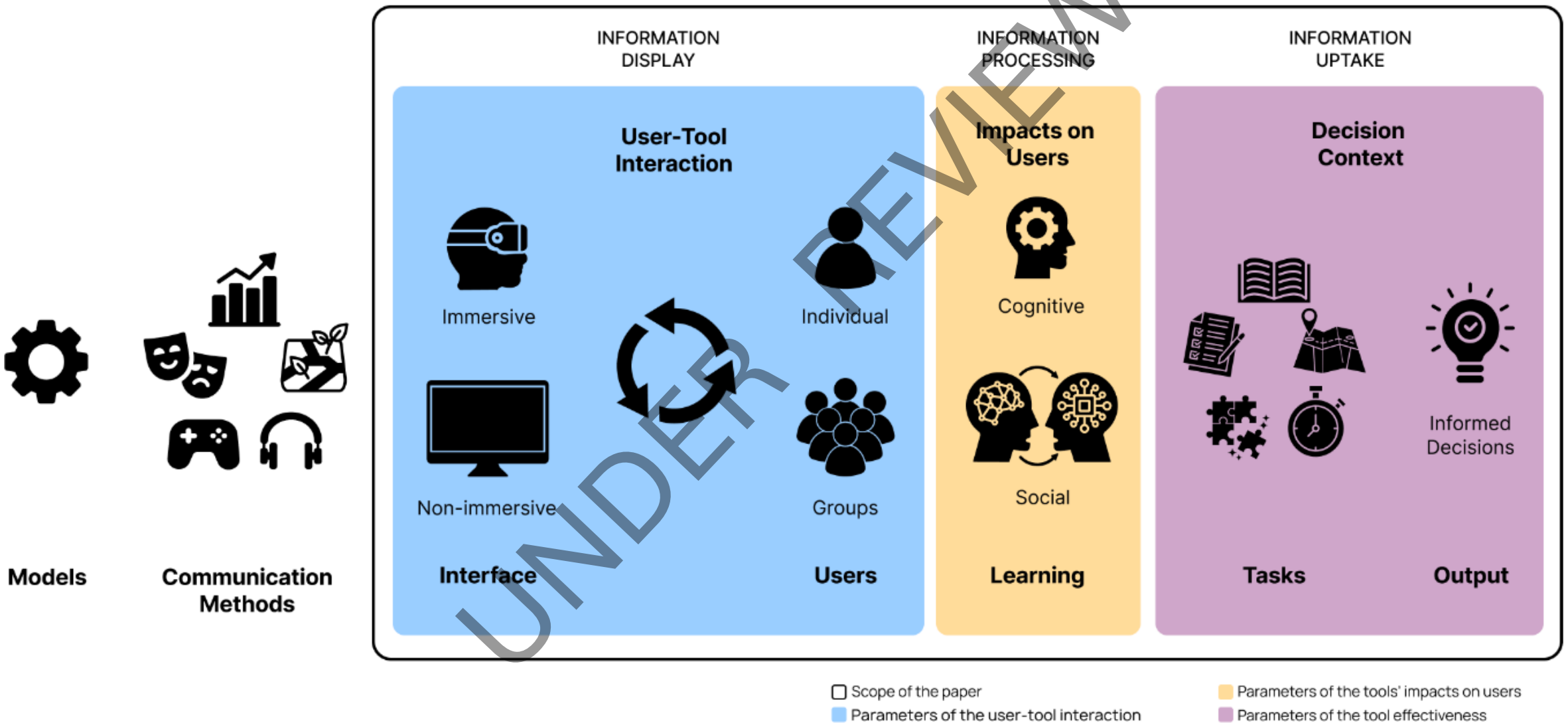
Outline

- Paradox: environmental problems worsening, proliferation of decision-support tools
- Gaps & research needs: theory on what works and what impacts the tools have on real users and and decision problems
- We present a methodological framework to evaluate any decision-support tool
- Based on a systematic literature review

Parameters within the Tool-Aided Decision Space



Operationalising the Parameters

MODEL / TOOL - DRIVEN | **USER - DRIVEN** | **PROBLEM - DRIVEN**

Models

Communication Methods

Interface

Immersive

Non-immersive

User-Tool Interaction

Users

Individual

Groups

Learning

Cognitive

Social

Tasks

Decision Context

Output

Informed Decisions

Technical validation | **Preferences / Usability** | **Usefulness** | **Use**

To what degree the tool is:
- Realistic
- Dynamic
- Interactive
- Immersive
- Dimensional (2D, 3D, 4D)

Tool development:
- Context of development
- User involvement in development (e.g., participatory modelling)

Evaluation set-up:
- Number of iterations through development
- Random vs. target users
- Experimental vs. non-experimental
- Individual vs. group
- Data collection approach (workshop, interviews, serious game, etc.)

To what degree the tool helps user:
- Answer correctly
- Perceive risks accurately
- Reduce cognitive load
- Reduce cognitive biases
- Build consensus
- Learn from each other

To what degree the tool:
- Provides task relevance
- Improves user efficiency, insights or overview of a problem in their tasks

To what degree the tool helps users:
- Integrate information in decision-making
- Show consistency with stated goals
- Improve decision outcome by limiting negative environmental impacts or improve positive impacts

Scope of the paper
Epistemological focus
Operationalisation: parameters of the tool-aided decision space
Evaluation scope

Domain problem characterisation. ***Evaluation of impacts on decision outcome***: *monitoring **use**, real (domain) decisions as tool-informed and environmental asset object of the decision: observation, web analytics, interviews*

Data/operation abstraction design. ***Evaluation of impacts on decision process***: ***usefulness*** *assessment, task relevance with targeted end-users in real decision contexts, learning and consensus building: workshops, observation, focus groups, interviews*

Encoding/interaction technique design. ***Evaluate impacts on users***: ***usability*** *study through self-reported assessment or user performance with experimental set-up: randomly selected users, questionnaire, observation, eye-tracking*

Algorithm design. *Technical **validation** of the model and algorithm*

Inspired by Munzner's nested model for visualization design and validation (2009, IEEE transations on visualization and Computer graphics)