Reproducibility Review of: Enhancing the Potential of a Tangible-Digital Planning Interface through User Evaluation

Item	Value
Title	Enhancing the Potential of a Tangible-Digital Planning Interface through User Evaluation
Authors	Vincent Holtorf Maria Moleiro Dale Jörg Rainer Noennig
Ref. paper	Holtorf, V., Dale, M. M., and Noennig, J. R.: Enhancing the Potential of a Tangible-Digital Planning Interface through User Evaluation, AGILE GIScience Ser., 7, 5, https://doi.org/10.5194/agile-giss-7-5-2026, 2026.
Codechecker(s)	Jeonghwan Choi (0009-0002-5027-1151)
Date of Check	2026.03.19
Summary	Full reproduction
Repository	Data & analysis materials: https://doi.org/10.5281/zenodo.18195076 System repository (COUP): https://github.com/reproducible-agile/COUP-TangibleTable
Ref. certificate	https://doi.org/10.17605/OSF.IO/KCPZE

Table 1: Reproduction metadata

Output	Comment
~result/Figure_1.png	Regenerated Figure 1 reported in the manuscript.
~result/Figure_2.png	Regenerated Figure 2 reported in the manuscript.
~result/regenerate_figures.xlsx	Reviewer-created workbook used to reconstruct the tables underlying Figures 1 and 2 from “Keywords_Pro&Con.pdf”.

Table 2: Summary of output files generated

Summary

The authors investigate a tangible-digital planning interface through a user evaluation with 12 participant groups. The paper includes a Data and Software Availability section and provides access to anonymised feedback data and analysis materials via a Zenodo repository. The analysis was conducted using a qualitative framework and spreadsheet-based analysis (Microsoft Excel) rather than custom programming scripts.

During the reproducibility check, I reviewed the materials in the repository and contacted the authors for clarification on the analysis workflow. The authors confirmed that the file “Summary_Data.xlsx” corresponds to the Groups × Categories analysis matrix described in the paper and that “Keywords_Pro&Con.pdf” represents the aggregated thematic counts used to generate Figures 1 and 2 in the paper.

Based on the available materials, I was able to verify and reproduce the analytical workflow and results. The figures reported in the manuscript were successfully regenerated from the provided analysis materials. The workflow primarily relies on spreadsheet-based analysis, and no custom analysis script is required to reproduce the reported results. Overall, the paper demonstrates a high level of transparency and reproducibility.

Reproducibility reviewer notes

Installation prerequisites and computational environment

The analysis was conducted using Microsoft Excel, and no custom analysis scripts are provided. The authors indicated that figures were generated directly from the keyword counts documented in the PDF (Keywords_Pro&Con.pdf). Thus, no separate visualisation script is required to reproduce the reported results. Using the provided materials, I regenerated the figures independently.

Data preparation

The Zenodo repository provides:

- qualitative feedback reports from 12 participant groups
- Summary_Data.xlsx, containing an aggregated representation of feedback across groups
- Keywords_Pro&Con.pdf, summarising thematic categories and their frequency

The materials provided in the repository cover both the raw input data and the structured analysis materials used to derive the reported figures.

The GitHub code repository for the COUP system is available at https://github.com/reproducible-agile/COUP-TangibleTable (archival fork). Although the reproducibility assessment focuses on evaluating the analysis workflow, the repository provides additional content on the system implementation.

Reproduction workflow

The reproducibility check followed the workflow described in the manuscript:

1. Collecting qualitative feedback from 12 participant groups
2. Identifying relevant keywords and themes across reports
3. Aggregating these into a Groups × Categories matrix ("Summary_Data.xlsx")
4. Summarising category frequencies ("Keywords_Pro&Con.pdf")
5. Generating figures (Figures 1 and 2)

I examined the dataset and verified that the aggregated entries in "Summary_Data.xlsx" are consistent with the thematic summaries in "Keywords_Pro&Con.pdf". Based on these summaries, I regenerated Figures 1 and 2 shown in the manuscript.

Outputs and results

Figures 1 and 3 demonstrate the distribution of thematic categories across 12 participant groups. The numerical basis for these figures is fully traceable to the provided materials. The results can be reproduced from the provided data, and the figures can be regenerated without requiring a separate visualisation script (Figures 2 and 4).

Category	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	Freq.	%	Intensity
Real-time Interactivity	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	11/12	91.7%	High
Collaboration Support	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	10/12	83.3%	High
Visualization	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	10/12	83.3%	High
Intuitive Usability			✓	✓	✓	✓			✓	✓		✓	7/12	58.3%	Medium
Multiple Parameters		✓		✓	✓	✓	✓	✓		✓	✓	✓	9/12	75.0%	High
Physical-Digital Interface	✓			✓	✓					✓	✓		5/12	41.7%	Medium
Data-Driven Decision-Making				✓	✓		✓	✓			✓		5/12	41.7%	Medium
Quick Testing/Iteration	✓		✓		✓	✓	✓		✓		✓		7/12	58.3%	Medium
Environmental/Climate Focus		✓	✓	✓	✓		✓	✓			✓	✓	8/12	66.7%	Medium
Educational Value						✓				✓		✓	3/12	25.0%	Low

Figure 1. *Matrix illustrating the system strengths identified by the 12 participant groups (Original plot).*

Category	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	Freq.	%	Intensity
Real-Time Interactivity	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	11/12	91.7%	High
Collaboration Support	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	10/12	83.3%	High
Visualisation	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	10/12	83.3%	High
Intuitive Usability			✓	✓	✓	✓			✓	✓		✓	7/12	58.3%	Medium
Multiple Parameters		✓		✓	✓	✓	✓	✓		✓	✓	✓	9/12	75.0%	High
Physical-Digital Interface	✓			✓	✓					✓	✓		5/12	41.7%	Medium
Data-Driven Dicision-Making				✓	✓		✓	✓			✓		5/12	41.7%	Medium
Quick Testing/Iteration	✓		✓		✓	✓	✓		✓		✓		7/12	58.3%	Medium
Enviornmental/Climate Focus		✓	✓	✓	✓		✓	✓			✓	✓	8/12	66.7%	Medium
Educational Value						✓				✓		✓	3/12	25.0%	Low

Figure 2. *Matrix illustrating the system strengths identified by the 12 participant groups (Regenerated plot).*

Category	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	Freq.	%	Severity
Table-Web Discrepancies				✓	✓		✓	✓		✓	✓		6/12	50.0%	High
Limited Simultaneous Simulations						✓		✓		✓	✓		4/12	33.3%	High
Performance/Lag Issues		✓		✓	✓	✓		✓		✓	✓	✓	8/12	66.7%	High
Technical Bugs/Crashes	✓			✓	✓	✓			✓		✓	✓	7/12	58.3%	High
Data Accuracy/Reliability	✓	✓	✓	✓	✓	✓	✓	✓			✓		9/12	75.0%	High
Missing Legends/Scales			✓						✓	✓	✓	✓	5/12	41.7%	Medium
Steep Learning Curve	✓					✓			✓	✓		✓	5/12	41.7%	Medium
Complex Workflow				✓	✓				✓	✓		✓	5/12	41.7%	Medium
Visualization Difficulties			✓	✓					✓			✓	4/12	33.3%	Medium
Missing Environmental Modules						✓	✓	✓		✓			4/12	33.3%	Medium
Limited Editing Capabilities				✓			✓	✓			✓	✓	5/12	41.7%	Medium
No Save/Compare Function								✓			✓	✓	3/12	25.0%	Low

Figure 3. *Matrix illustrating the system limitations identified by the 12 participant groups (Original plot).*

Category	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	Freq.	%	Severity
Table-Web Discrepancies				✓	✓		✓	✓		✓	✓		6/12	50.0%	High
Limited Simultaneous Simulations						✓		✓		✓	✓		4/12	33.3%	High
Performance/Lag Issues		✓		✓	✓	✓		✓		✓	✓	✓	8/12	66.7%	High
Technical Bugs/Crashes	✓			✓	✓	✓			✓		✓	✓	7/12	58.3%	High
Data Accuracy/Reliability	✓	✓	✓	✓	✓	✓	✓	✓			✓		9/12	75.0%	High
Missing Legends/Scales			✓						✓	✓	✓	✓	5/12	41.7%	Medium
Steep Learning Curve	✓					✓			✓	✓		✓	5/12	41.7%	Medium
Complex Workflow				✓	✓				✓	✓		✓	5/12	41.7%	meidum
Visualisation Difficulties			✓	✓					✓			✓	4/12	33.3%	Medium
Missing Environmental Modules						✓	✓	✓		✓			4/12	33.3%	Medium
Limited Editing Capabilities				✓			✓	✓			✓	✓	5/12	41.7%	Medium
No Save/Compare Function								✓			✓	✓	3/12	25.0%	Low

Figure 4. *Matrix illustrating the system limitations identified by the 12 participant groups (Regenerated plot).*

Communication with the author

I contacted the authors during the review process to clarify the analysis workflow. They confirmed:

- Summary_Data.xlsx corresponds to the analysis matrix.
- Keywords_Pro&Con.pdf contains the counts used for the figures.
- No additional intermediate Excel workbook exists.
- The figures were generated directly from these counts.

These clarifications helped resolve the remaining uncertainties in the reproducibility check.

Recommendations

For completeness, reproducibility could be further improved by providing more detailed documentation of the figure-generation process within the shared analysis materials. Additionally, the COUP system repository could benefit from a more comprehensive README describing the system and its usage independently of the manuscript.

Reproducibility assessment

Result: Full reproduction.

I was able to reconstruct Figures 1 and 2 in the paper using the data provided in the Zenodo repository and the clarified analysis workflow.

Citing this document

This report is part of the reproducibility review at the AGILE conference. For more information, see https://reproducible-agile.github.io/. This document is published on OSF/ResearchEquals at https://doi.org/10.17605/OSF.IO/KCPZE

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