

# A Method for Critical and Creative Visualisation Design-Thinking

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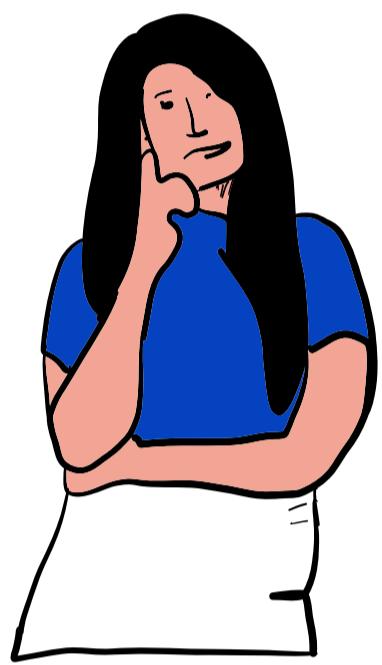
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We introduce the **Critical Design Survey (CDS)**: a structured method that facilitates visualisation design analysis through reflective and critical thought. Applying the CDS helps an individual to structure critical thought. It provides a unified method that can be readily taught, learners can actively engage with the process and directly use it to write a critical-thinking report of their design ideas.

## Learn to assess, critique, and reflect your visualisation designs

Often students do not have the know-how or vocabulary to critique. They may not have necessary skills to structure and report ideas in a systematic way. Individuals need a logical way to systematically analyse the viability of their designs, and create a structured critical reflective report of their creative-design process. Design guidelines and heuristics can help but learners still struggle to know how to proceed.



## The Critical Design Survey

### Step 1 - Overview

Take a holistic view of the design. Name design; write short summary (the essence); select five first-impression words.

This is a crucial step as it helps to frame the problem, and enables individuals to synthesise the ideas, and encapsulate the essential aspects of the design in a simple description.

- Seven positive (average, beautiful, clear, clever, reliable, sensible, spectacular),
- seven negative (bad, complex, indistinctive, pointless, confusing, useless, vague)
- Six neutral (fair, fulfilling, indifferent, moderate, organised, useful) words.

### Step 2 - Detail

Critique the design using the 30 questions. Use top-down thinking (consider broad aspects of user's perspective to specific visual mappings).

The questions are intentionally designed to encourage deep thought, while helping to maintain a focused viewpoint on specific design goals. Questions prompt individuals to consider how the user would view the solution, the environment of its use, how the interface and individual components work; overall design aesthetic; and finally how effective are the visual marks.

### Step 3 - Reflection

Consider each part in turn. Use the score to guide. compile a list of actionable items (as improvements).

The scores help someone understand where issues may lie, they should not be used as a quantitative measure of success/failure.



## CDS design

Workshops, reflective analysis, expert feedback, student use, improvement.

- **Initial two-day workshop [1]** investigating critical, creative visualisation vocabulary.
- Carefully considered workshop findings - performed a **reflective analysis**.
- After deliberation, adopted a UEQ-like structure with themed questions.
- **Version 1 (V1)** evaluated with two talk-aloud sessions, using two company-based, experienced visualisation, software developers.
- V2 was evaluated with students. One student wrote "has a good structure, but some questions needed more descriptive detail". Subsequently we added a longer descriptive guide, and included an additional lecture on critical thinking skills.
- **Ongoing** use with students

- [1]** H. Alnjar. Analysis and synthesis of **critical design-thinking** for data visualisation designers and learners. PhD thesis, School Computer Science, Bangor University, 2017
- [2]** Roberts, J C., Headleand, C. J and Ritsos, P.D. "Sketching designs using the **five design-sheet** methodology." TVCG 22.1 (2016): 419-428.
- [3]** Roberts, J. C., Headleand, C. J., and Ritsos, P. D. . **Five design-sheets**: creative design and sketching for computing and visualisation. Springer. 2017
- [4]** Roberts, J C., and P D. Ritsos. "**Critical Thinking Sheet** (CTS) for Design Thinking in Programming Courses." Eurographics (Education Papers). 2020.
- [5]** Roberts, J. C., Ritsos, P. D., Jackson, J. R., & Headleand, C.. **The explanatory visualization framework**: An active learning framework for teaching creative computing using explanatory visualizations. IEEE TVCG, 24(1), 791-801 2017

## Look further

The work is part of ongoing research into design guidelines and techniques for for visual, creative, critical thinking and visualisation.

