A Method for Critical and Creative

Visualisation Design-Thinking



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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

Three steps of the CDS

Overview Write own the essence of the idea

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.



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

Experienced visualisation designers can perform this critique more easily as they frame ideas against prior experience of what works or does not.

Detail In-depth critique; answer 30 questions (in six perspectives)

Reflection. Synthesise ideas, Consider each part. Decide next steps

Critical Design Survey (CDS)				
Step 1	Name design :	Circle 5 (first impression) words:		
	Summarise essence :	clear confusing sensible indifferent clever reliable pointless indistinctive complex organised moderate spectacular useless average bad fulfilling useful fair vague beautiful		
Step 2		-2 -1 0 1 2		
 Is suitab Is unders It doesn' Is trustwe Would be 	le for the user and task standable for user and task to hand t require guesswork orthy e useful	0 0 0 0 0 Unsuitable> Suitable 0 0 0 0 0 Incomprehensible> Understandable 0 0 0 0 0 Requires guesswork> Clear assumptions 0 0 0 0 0 Useless> Useful	3	
 6 It would 7 Uses sui 8 Has app 9 Its sizing 10 Gives a 	fit in with other technologies itable technology ropriate interaction is correct positive ambience	0 0 0 0 0 Wrong setting> Right setting 0 0 0 0 0 Unsuitable technology> Right technology 0 0 0 0 0 Unsuitable interaction> Appropriate intera 0 0 0 0 0 Unsuitable size> Suitable physical size 0 0 0 0 0 Poor vibe/ambience> Positive ambience	, action	
 Suitable Ergonom Facets a Interface Suitable 	user interface nic interface are sized suitably suitably spaced quantity of interface parts	0 0 0 0 0 Unsuitable GUI····>Suitable GUI 0 0 0 0 0 Uncomfortable····>Ergonomic 0 0 0 0 0 Poorly proportioned····>Suitable sized facet 0 0 0 0 0 Poorly proportioned····>Relevant spacing 0 0 0 0 0 Unsuitable facet quantity····>Suitable facet	ts quantity	

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 com- ponents 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.





Look further

The work is part of ongoing research into design guidelines and



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 companybased, 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

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techniques for for visual, creative, critical thinking and visualisation.



[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

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