Digital Design Network+
Case Study 1 Individual Report Template

Name	Ross Brisco
Email	Ross.brisco@strath.ac.uk
Institution	University of Strathclyde
Team	Group 3
Focus	Better, Faster, With Less
Design Process	Early stage requirements
Tools Used	Creation of an AI tool using OpenAI and Grok for coding and OpenAI API Platform to query ChatGPT
Links	https://d2npda.netlify.app/

Executive Summary

Dr Ross Brisco, University of Strathclyde, developed the Product Design Assistant, an AI-augmented tool that supports early-stage design by helping designers generate structured specifications, identify typical components, and produce digital outputs that would normally emerge much later in the design process. When combined with a VR-based configurator and analytical interfaces, this workflow enables rapid exploration of design alternatives, improves spatial and systems understanding, and reduces reliance on costly prototyping and late-stage simulation. As a result, the approach delivers better design outcomes through improved specification and uncertainty management, faster progression through reduced iteration and earlier feedback, and design with less time, cost, rework, and risk.

Problem

The existing design problem addressed by this project was the limitation of traditional design workflows in supporting informed decision-making during the earliest stages of complex engineering design. Conventional processes require designers to commit to key decisions early, when understanding of requirements, system behaviour, and downstream impacts is weakest, while meaningful analytical tools, CAD development, and simulation are typically introduced much later. This misalignment results in high levels of uncertainty, conservative decision-making, and costly late-stage change, particularly for complex, system-level products such as autonomous drone swarms. The project therefore sought to overcome the lack of accessible early-stage digital support by enabling designers to generate higher-quality problem specifications, explore alternatives analytically and spatially, and manage uncertainty proactively rather than deferring it to later, more constrained phases of development.

Digital Design Solution

The digital design solution developed in this project is the Product Design Assistant (Figure 1), an AI-augmented tool designed to support early-stage design activities where uncertainty is high and traditional digital tools provide limited value. The Product Design Assistant operates through a structured user interface that separates what is being designed from how the AI is instructed to

respond, allowing designers to maintain control over both design intent and output quality. Designers begin by entering a product description (Figure 2), which captures key information such as the product's purpose, intended users, operating environment, functional requirements, and constraints. This description forms the contextual foundation for all subsequent outputs and encourages more deliberate and explicit problem formulation at an early stage.

In parallel, the Product Design Assistant exposes the instruction prompts (Figure 3) used to guide the AI's behaviour, allowing designers to define the role, level of expertise, tone, structure, and intended audience of the response. This transparency enables users to adapt the tool to different stages of the design process and to understand how outputs are shaped, rather than treating them as opaque results. The tool further allows users to select the underlying AI model (Figure 4), balancing speed and depth of reasoning depending on whether the task is exploratory or more technically detailed. A creativity control (Figure 4) enables adjustment between consistent, comparable outputs and more varied, generative responses, supporting different design objectives such as convergence or divergence. Together, these features allow the Product Design Assistant to generate structured outputs that would traditionally emerge much later, thereby bringing digital capability, analytical thinking, and design learning forward in the process.

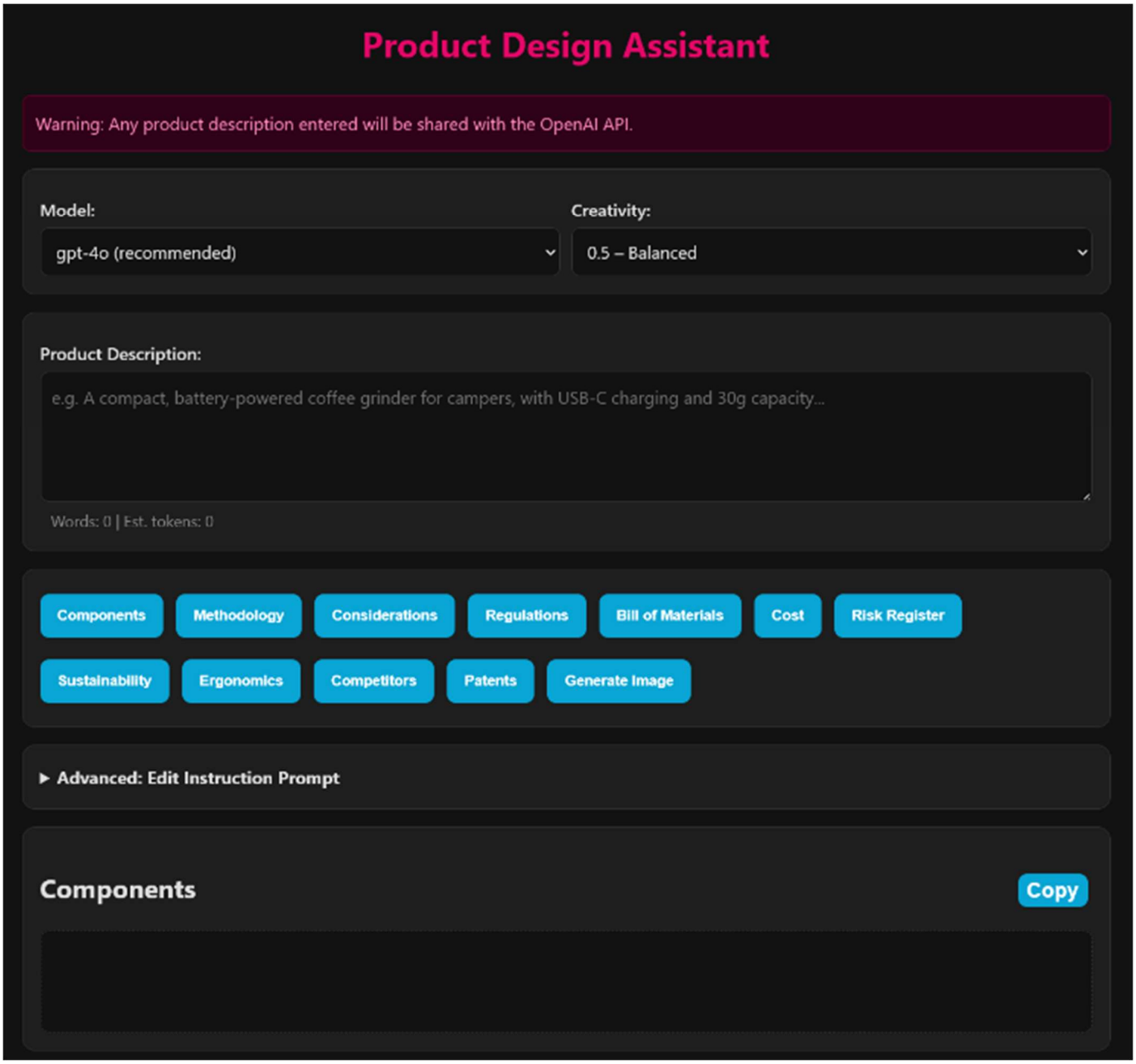

Figure 1 – Product Design Assistant Tool

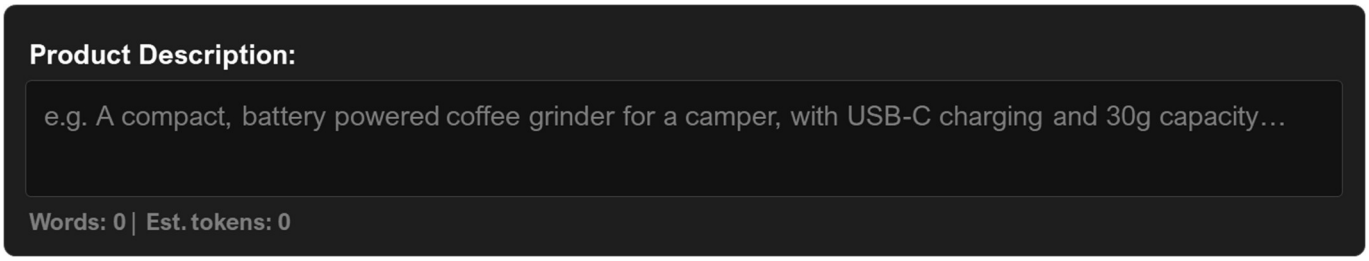

Figure 2 – Product Description Input

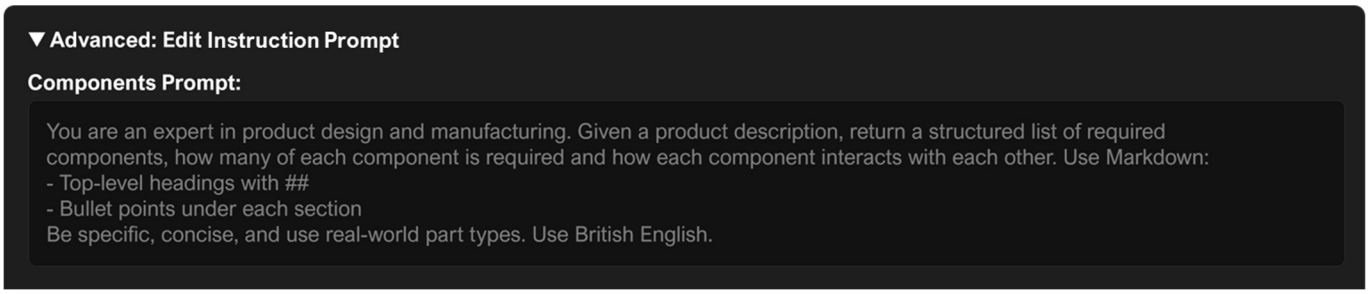

Figure 3 – The Advanced Instruction Prompt Editor

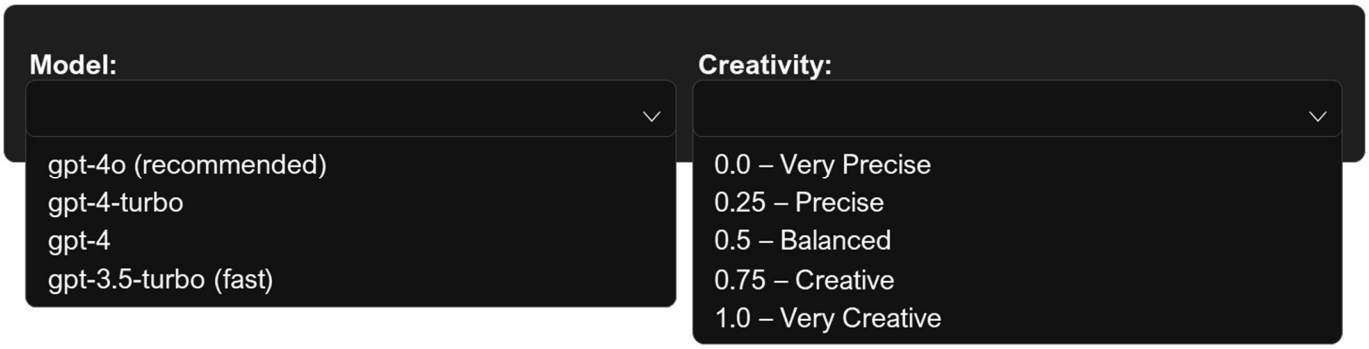

Figure 4 – GPT Model and Temperature Selection

How it makes Digital Design Better, Faster and/or With Less

The digital design solution improves the design process by fundamentally changing when insight, evaluation, and learning occur. It makes digital design better by enabling higher-quality problem specification and more informed early decision-making through AI-augmented support, immersive spatial exploration, and early analytical feedback, reducing reliance on assumption and late validation. It makes digital design faster by accelerating progression from concept to structured digital models, enabling rapid iteration and comparison of alternatives without the delays associated with traditional CAD development, prototyping, or specialist simulation. It enables digital design with less by reducing uncertainty-driven rework, lowering the cost of early analysis and simulation, minimising late-stage change, and reducing cognitive and organisational burden on designers, allowing complex system designs to be developed more efficiently and with lower risk.

Reflections

A key learning from this activity is that the value of digital design tools lies less in automation and more in re-timing cognition, analysis, and learning within the design process. The Product Design Assistant and associated workflow were most effective when used to support early-stage problem framing and exploration, rather than attempting to replace later-stage detailed design work. This highlights a significant opportunity for future R&D: digital design tools should prioritise supporting when decisions are made, not just how fast they are executed. By enabling designers to articulate higher-quality specifications and explore alternatives earlier, the tools helped reduce uncertainty at a point where change is still low-cost and design freedom is high. However, this also exposed the challenge that early-stage outputs are inherently provisional, requiring designers to remain critically engaged rather than treating AI-generated content as authoritative.

From a tool-building perspective, a major challenge was balancing accessibility, control, and transparency. While generic AI models enabled rapid development and broad applicability, their limitations, such as hallucinated data or inappropriate assumptions, highlight the need for clearer boundaries, provenance indicators, and validation mechanisms within future tools. Tool designers must assume that users will operate under time pressure and may over-trust outputs if the interface does not actively encourage reflection and verification. Equally, building such tools revealed that significant value can be created without highly specialised or bespoke AI, provided the interaction design, prompts, and integration into downstream workflows are carefully considered. This suggests that future R&D should invest as much effort in human–AI interaction design and workflow integration as in model development itself.

The activity also highlighted important skills and capability gaps. While AI lowered the barrier to tool creation and enabled rapid prototyping, effective use still required a hybrid skill set spanning design thinking, basic computational literacy, and critical AI awareness. Designers benefited most when they understood not only how to use the tools, but also their limitations, failure modes, and appropriate contexts of use. This raises questions for digital design education and professional development: future designers will need to be fluent in orchestrating tools, shaping prompts, and interpreting outputs, rather than simply consuming them. Without this capability, there is a risk that digital tools amplify poor specifications or embed unexamined assumptions earlier in the process.

References

[Add any references you like to support your statements]

Appendix

Paper in Review:

Brisco, Ross; Gunn, Kieran; Holliman, Alexander "Freddie" (2025) PROMPT, COMPARE, REFLECT, REPEAT: learning responsible AI use for product design (In Review) In DS XXX: Proceedings of the International Conference on Engineering and Product Design Education (E&PDE 2026)