sagentia

THE SCIENCE IN DESIGN THINKING

Searching for Balance: The Science in Design Thinking

By Carl Hewett

"Success lies in the sweet spot where need, commercial viability and technical enablement converge. Most product failures are linked to problems in one or more of these areas."

As any product developer will tell you, new project briefs can vary hugely in terms of their inception point.

Some are rooted in a great idea, but give no thought to enablement. Others feature a novel technology but lack a commercial application.

How do you navigate a consistent development pathway from such diverse beginnings?

The team at Sagentia use Design Thinking to encompass the three essential elements of development success (as shown in Figure 1).

Design thinking is not a new concept. It was established in the mid 60s and matured in the 90s as a process to frame problems and innovate through the lens of the user. It can be defined as "a human-centered search for balance between the user need, the technical enabler and commercial viability", as shown below in figure 1.

Maintaining equilibrium across these three areas is key to a product's success. Imbalance often results in products failing on the market or being terminated pre-launch. Design thinking is a powerful tool to ground development in a clearly defined problem statement or need.

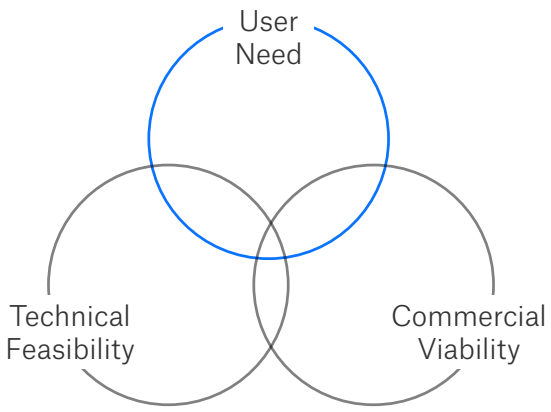


Figure 1: The lenses of balance

Need validation

Immersing yourself and your team in the problem statement is an essential first step. It's a prerequisite of design thinking, where emphasis should be placed on employing tools such as cognitive walkthroughs and Voice of Customer (VoC) interviews with different stakeholders that could interact with the product. In a medical context, these might include health care professionals, service engineers or patients receiving care. The insights generated inform the creation of meaningful use experiences. Which means developers can test the problem statement before progressing to formal design development and specification freeze.

"As product developers, it's our job to notice the habitual things, to unpick the coping strategies people develop and create better use experiences. A key starting point for design thinking is empathy.

By observing and validating use experience we can identify pain points and develop better ways of enablement."

The interview stage of VoC studies is often a source of definitive insight to prove or disprove assumptions.

A recent project we undertook for a medical device company involved an instrument and a consumable element. We framed our VoC to explore the working environment, size and usability parameters of the device.

The working assumption was that the consumable would be plastic. Yet a typical response from healthcare professions looking at the early block prototypes was: "Is that made of plastic? I've got way too much plastic waste already." It was clear that this could be a barrier to them considering the product.

Figure 2: Disproving or proving assumptions through Voice of Customer study is key

Insights like this - the 'unknown unknowns' - are really transformative and highlight the value of understanding your user at an early stage of product development. In this example, the VoC paved the way for a different design direction. It led to a new supply chain route for our client and improved confidence in the commercial model and business case.

Need validation is a clean tool to ascertain what should and shouldn't be developed, and how to best focus R&D resourcing. Once stakeholder insights have been explored and challenged, it forms a benchmark for future ideation as you can sanity test and ask "so what?". There's no point adding new features if there will be little usability benefit, a static use experience or low value to the end user. It would be better to focus effort on alternative solution spaces that deliver tangible benefits.

Technical enablement

Innovation by its very nature should be knocking on the door of what is possible. But over-reliance on breakthrough technology can be a product's downfall.

An unyielding focus on being first to market encourages rapid creation of specifications which can result in the release of technology before maturity.

This risks a suboptimal product experience akin to a square peg in a round hole. The mitigation technique of "fixing it in Gen 2" is increasingly permissible for software, but a death sentence for hardware.

When the Sinclair C5 was released in 1984, battery densities didn't exist to mate with the C5's small form resulting in pedal backup being used when faced with a modest hill. This resulted in scathing performance reviews that contributed to the downfall of the product, and the bankruptcy of Sinclair Vehicles.

Understanding and testing use case scenarios is key to stress test your technology, ensuring it's fit for purpose and meets end user expectation. In some situations, this may reveal an alternative focal point for innovation. Imagine if Sinclair had diversified and channelled efforts into next gen battery technology. It could have become the Tesla of the 80s.

Figure 3: The infamous Sinclair C5

Commercial viability

Understanding the impact of design on commercial viability is vital. Naturally, design engineering has a huge bearing on the cost of goods and ease of manufacture. But there is more to it than that.

Many design engineers are educated in the "Design for X" methodology. However, this can sometimes be at odds with ensuring commercial viability. Design isn't simply about addressing isolated engineering functions. It's a collaborative and creative process that needs to dovetail with marketing, regulatory matters and sales. When R&D teams work with professionals in these areas, they look beyond manufacturability and cost to also consider factors such as market size, label claims, pricing, sales channels and strategic fit.

Typically, commercial viability starts at the system architecting stage. The system architecture itself should be informed by user insight and use experience data. What's more, to avoid premature commercial decisions, the product vision should be tested through early research on concept developments.

It's equally important to understand how hardware selection can dictate latter stage developments. For instance, during fast iteration, a core component such as a DC motor might be sourced from a helpful supplier to expedite prototyping. Suddenly it's locked into the design, and system elements are designed around it. Problems arise when it can't be sourced, or its cost is too high at volume. To avoid this, make a conscious effort to validate component selection at an early stage. Is the motor life tested? Does it meet the sound or vibration profile users expect, can it be obtained in the required volume at the expected price point? Addressing these factors upfront mitigates surprises. It's not uncommon to hear accounts of projects that are derailed due to off the shelf component oversight. It's one to avoid.

A little while ago, Sagentia was appointed to resolve issues with an early next generation concept development of a small-scale benchtop medical device. The initial designers had achieved what they set out to: improved efficacy. However, the proof of concept device had been developed with a singular technical focus which lost sight of the use case scenario. The resulting device was four times the size of its predicate and significantly exceeded the cost target.

The engineering team had good intentions of reducing costs during the next phase. But the project ran into teething problems as the client's marketing and sales teams couldn't see how the device size and cost could be reduced sufficiently for customer uptake. To break this deadlock, Sagentia's medical team drew on clinical insight from healthcare professionals and undertook a study to ascertain how and where the device was used. The study findings drove that same engineering team to conceive a wholesale size reduction which included a simplified fluidic pathway and consolidation of the pump arrangement. Together, these changes also resulted in significant Bill of Material (BOM) savings, and project development was able to resume.

> "Creative confidence is the belief that everyone is creative, and that creativity isn't the ability to draw or compose or sculpt, but a way of understanding the world."
>
> David Kelley

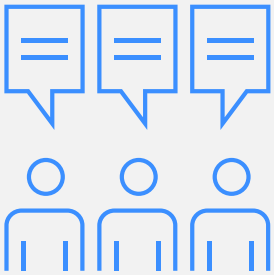
Figure 4: Early confirmation of a commercially viable system architecture can accelerate a product development timeline

The Application

With appreciation of the three lenses of balance, it's much easier to frame a hierarchy of functions and define a development methodology.

The core top level questions that must be addressed are:

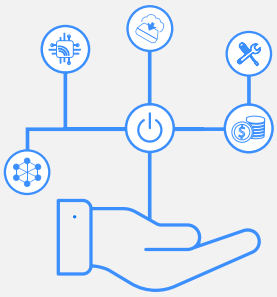
1



Does your concept address a validated user need and have you defined the problem space?

This may seem obvious, but it's often the case that product hypotheses are based on assumptions rather than data. VoC research is a fundamental requirement as it enables engineers to fully understand the problem space. Any insights gained need to be looped into the concept design process so various options can be generated for testing via formative studies. All too often VoC can be gathered and then lost in the noise of achieving technical feasibility and commercial viability.

2



Does the technology exist to enable the functionality?

Enabling technologies can come from surprisingly diverse places, applications and industries. So, it's worth investing in broad and far reaching technology landscaping. You might also consider competing architectures that utilise off-the-shelf (OTS) technology to further expedite timelines and avoid the need to create from new.

3

Is the enabling technology and concept cost model at a level your customers can afford?

Understanding your target audience is critical. There are a number of ways this can be achieved, such as working alongside marketing and sales teams to ensure strategic fit. Assessing various concept options in relation to different commercial models allows you to find the best compromise. If a concept is not viable, consider whether it is feasible to develop it further and delay market uptake. Interrogating these three areas ensures early concepting is user-centric, as depicted in figure 5.

By segmenting the development process, stage gates can be used to control design. This prevents it from freewheeling out of balance and ultimately maximises the user experience. If you reach stage gate A without validating user need, you loop back through the process, potentially exploring different angles or diverting resource to new ideas before detailing technology enablers.

Equally, you may reach stage gate B and find you're struggling to develop a technical enabler or that the commercial model is not attractive to the target users. If this is the case, loop back and iterate different architectures before re-testing. You may find that you're able to redefine the user need with greater clarity.

Sometimes a product simply won't offer the expected ROI. This is often recognised at a late stage when significant R&D budget has been invested, which makes the decision to shelve the product even harder. This framework empowers and enables project managers and developers to make better decisions throughout the process. By constantly reflecting on needs, they ensure the user voice is heard despite the clamour surrounding technical feasibility and commercial viability.

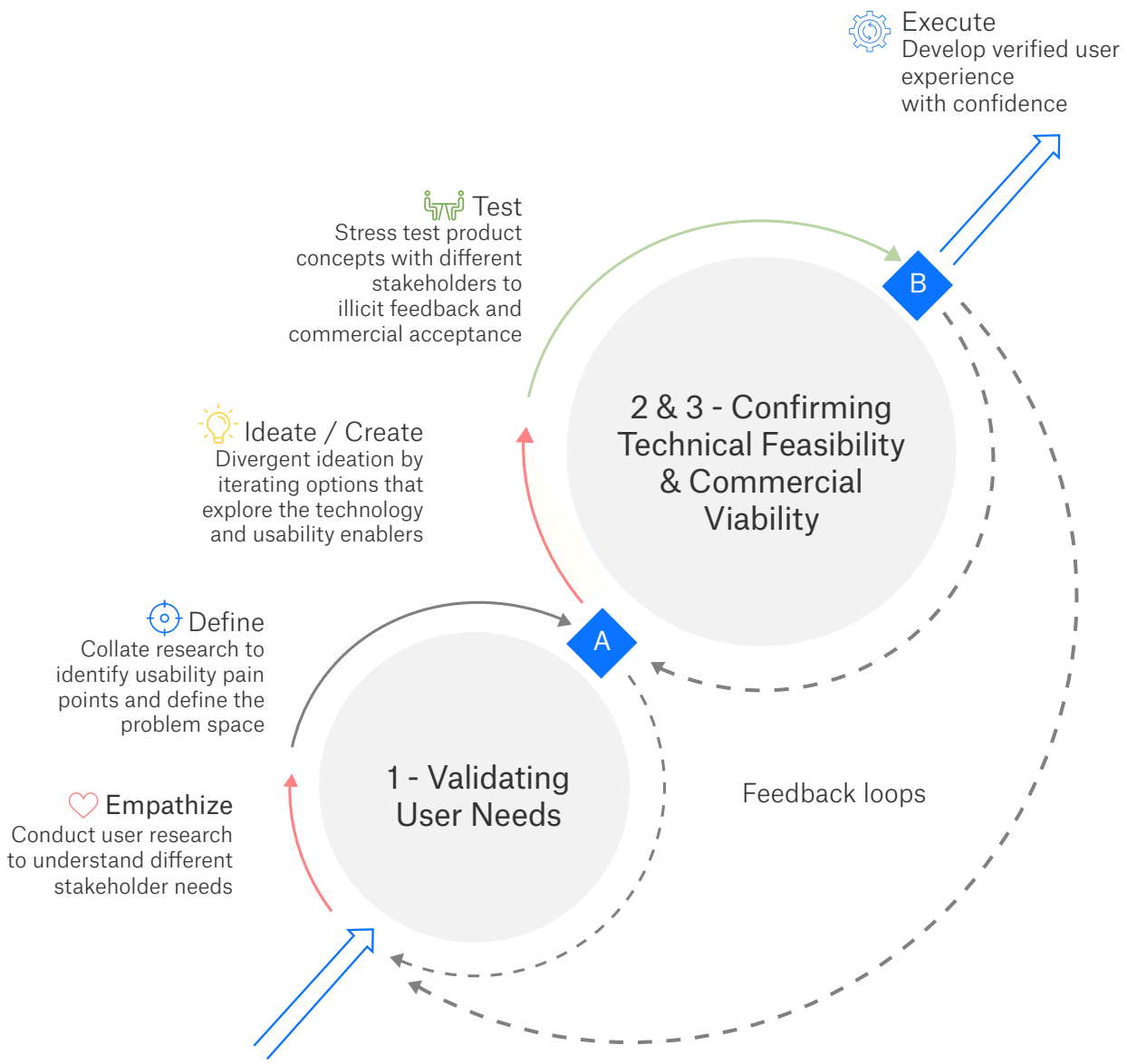


Figure 5: A human-centred approach to system design

A question of balance

When the need is properly validated with a problem statement and use context, development teams are better equipped to notice if technical enablement or commercial viability start to fall out of balance. This gives product developments a better chance to reach their full commercial success.

Validating user needs to unlock the ultimate use experience, then testing product options, takes time. But ultimately, it reduces waste. An iterative mentality enables us to proceed with confidence and speed when the time is right, avoiding wasted development and missed market opportunity.

Sagentia would always advise product developers to put a little more human-centered thinking into any innovation challenge. If you're interested in further reading on Design Thinking, a good starting point is:

https://www.interaction-design.org/literature/topics/design-thinking

Answer 12 quick questions to assess the balance of your project and get some suggested activities that could mitigate risk: www.sagentia/searchingforbalance.com

About the authour

As Medical Design & Innovation Manager, Carl is passionate about creating impactful user experiences by blending technology and human factors into novel devices. Working across medical landscapes he has in-depth experience in ethnographic needs translation, ideation and design for manufacture.

About Sagentia

Sagentia is a global science, product and technology development company. Our mission is to help companies maximize the value of their investments in R&D. We partner with clients in the medical, consumer, industrial and food & beverage sectors to help them understand the technology and market landscape, decide their future strategy, solve the complex science and technology challenges and deliver commercially successful products.

Sagentia employs over 150 scientists, engineers and market experts and is a Science Group company. Science Group provides independent advisory and leading-edge product development services focused on science and technology initiatives. It has ten offices globally, two UK-based dedicated R&D innovation centers and more than 400 employees. Other Science Group companies include OTM Consulting, Oakland Innovation, Leatherhead Food Research, TSG Consulting and Frontier Smart Technologies.

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