



How Remote Work Changes Design Thinking

Replacing onsite design-thinking sessions with virtual ones fundamentally changes the innovation process and outcomes.

By Daniel Wentzel, Alice Minet, Stefan Raff-Heinen, and Janina Garbas

DESIGN THINKING IS A POWERFUL method for understanding customer needs and developing new solutions to meet them.¹ It has been used by innovators to invent consumer products like electric toothbrushes and to develop business-to-business services such as customer relationship management software. A key advantage of the design-thinking process over other innovation methods is its emphasis on the user experience. Whether a team is imagining a car dashboard, a tax declaration app, or an electric lawnmower, each step relies on repeated, personal interactions among team members, end users, and other stakeholders.

To facilitate such interactions, observational workshops are typically conducted onsite in end users' familiar environments or in carefully arranged design studios. In recent years, however, with the rise in hybrid work, we have seen some innovation processes shift to the digital realm.² Design-thinking practitioners now frequently watch consumers use products through videoconferencing and discuss their observations on digital conference boards and in group chats. Using these kinds of digital tools is certainly more convenient than getting people into the same room. But by shifting away from in-person interactions, are companies sacrificing the essence of what makes design thinking so powerful in the first place?

To answer that question, we conducted 41 semistructured interviews with design-thinking experts from leading companies, innovation consultancies, and academia and also drew on our own extensive experience running design-thinking projects.³ One key insight that emerged from our research is that the transition from physical to virtual is much more than just a change of medium. It fundamentally changes team members' experience of the design-thinking process and the outcomes they generate, in both positive and negative ways. Understanding these changes is essential for innovation leaders to determine how they will apply the best features of both the physical and the virtual design-thinking formats.

Virtual Environments Change Perception and Understanding

Design-thinking practice is often thought of as a process that begins with team members gaining a deep understanding of customer problems and then imagining or refining products or services as they move through distinct phases in a sequential, iterative manner.

The popular framework Stanford University uses in its design program breaks the design-thinking process into five distinct phases: *empathize* (understand user needs), *define* (frame the design challenge), *ideate* (explore the potential solution space), *prototype* (build tangible representations of potential solutions), and *test* (gather feedback and refine the prototypes).⁴ The phases differ in the extent to which each relies on *divergent* thinking (nonlinear, spontaneous, and free-flowing) or *convergent* thinking (linear, structured, and rule-based).⁵ Generally speaking, research on design thinking shows that empathizing with end users and ideating novel solutions is better served by divergent thinking, whereas defining the design challenge, prototyping, and testing benefit from convergent thinking.

We wanted to understand how the shift from a physical to a virtual environment affects the individual phases as well as the design-thinking process as a whole. Certainly, the most important change concerns the loss of direct, physical experience, both when observing potential customers and, later, when figuring out what those observations mean. In a virtual environment, design thinkers interact with users and one another through screens. Instead of writing down their thoughts on physical Post-it notes that they can arrange on a wall, they type them on virtual notes, which sit on shared computer screens; instead of building physical prototypes, they sketch them with digital tools.

Research has shown that the loss of physical experience has profound implications for one's psychological experience.⁶ For example, having a conversation with someone through Zoom will feel more distant in a psy-

chological sense compared with having that same conversation face-to-face. This, in turn, affects how people think about the conversation: They are more likely to form an abstract mental representation of what is being said, devoid of specific details, and focus instead on the big picture. Moreover, the body and mind are intimately connected: The way we think is strongly influenced by all of the information acquired by our bodily senses, our physical movements, and our embodied interactions with the world.⁷ Being able to touch a product leads to a different understanding of what the product may or may not do compared with just seeing it or reading a product description. Simply put, people think not only with their minds but also with their bodies.

Consequently, when design thinkers work in virtual environments, they are likely to form a different impression of end users and their latent needs than they would if they were physically present with the users. They are also deprived of important ways to express their ideas about solutions and iterate them with their team. In onsite environments, design teams often engage in collaborative experimentation, where they use physical materials and artifacts to arrive at a common understanding of the design problem. They're able to generate and handle rough prototypes of potential solutions. This kind of experimentation is severely hampered in virtual environments. Hence, such environments not only affect how design thinkers interact with end users but also how they work together as a team.

How Virtual Environments Affect Each Design-Thinking Phase

Using digital tools in a virtual environment affects all phases of design thinking but in different ways. It's particularly important to understand its limitations and opportunities.

In the empathize phase, digital tools constrain insights. To build a rich and comprehensive understanding of users' needs, teams often choose qualitative, ethnographic research methods, which involve observing users in their natural environments and fully immersing themselves in users' day-to-day experiences.

Our findings show that the application of digital tools provides poorer insights in this phase. When trying to understand users' problems, observing what users *do* is equally important, or even more important, than listening to what they *say*. Nonverbal information — an enthusiastic nod, a bored posture, a weary sigh — is largely missing in a virtual interaction.

Design thinkers rely heavily on what users tell them. This may be problematic in virtual environments for two reasons. First, users can only verbalize problems they

understand, not those they either don't see or don't recognize as areas for improvement. Consequently, some opportunities for innovation may go completely unnoticed because design thinkers cannot infer these needs through the screen. A senior innovation manager from Ford Motor Co. noted, "It is so much harder to get a grasp on the actual usage situation in a digital setting. You depend so much on what the user will tell or show you compared to a setting where you can see things for yourself and then start asking questions."

Second, talking through a screen not only affects *what* is said but *how* it is said. Users open up to team members less frequently when they cannot interact with them directly. "It's really difficult to fully see the other one's perspective," said one of our interviewees, a leading design-thinking researcher from the Delft University of Technology (TU Delft). "How can you immerse fully if there is just a digital screen in front of you and you can't sense, smell, or see the full person?" In these scenarios, design thinkers gain a less rich and more abstract understanding of the users' problems.

These limitations of digital tools may undermine the goal of the empathize phase, which is to build a *deep understanding* of the user. Both the breadth of insights (how many unmet needs are identified) and the depth of insights (how well individual needs are understood) often deteriorate. Virtual formats fall short in providing the same rich, contextualized insights that onsite interactions do during the empathize phase, especially for problems that users themselves do not fully understand.

In the define phase, digital tools help in structuring and synthesizing messy data. At this point, design thinkers begin to make sense of the vast amount of material collected in the empathize phase in order to correctly frame the design challenge — and start defining potential solutions. The data gathered typically includes

not only users' verbal statements from the interviews but also information about their body language, pictures of their home or their possessions, and video recordings of them using a product, service, or software. Bringing together many disparate data points into a coherent whole and separating the wheat from the chaff is often a challenge. Design-thinking teams must be careful not to get bogged down in any single observation.

Our interviews across various product and service contexts — such as building materials and software subscriptions — show that digital tools help design teams transition through the define phase more effectively and efficiently. In this phase, design teams need to structure the data, cluster key findings, and synthesize their ideas in succinct problem statements. Shared digital whiteboards help visualize these workflows and facilitate documentation, allowing for easier collaboration in identifying common themes and patterns in the data. In comparison, organizing this information on physical whiteboards or pinboards is more time-consuming because it requires the data to be available in a physical format. When all of the data gathered in the empathize phase is available at one digital location, team members can also retrace their own thought processes more easily and move more quickly into repeated learning cycles. Consequently, as one design-thinking coach from the Hasso Plattner Institute School of Design Thinking told us, it's easier to get an accurate understanding of the design challenge: "What people love about digital whiteboards is that the whole journey is right in front of you — the whole learning experience, all the Post-its, everything the participants have shared and thought about from Day 1 to the last. It's just really good for learning that you can go back and reflect."

Digital tools not only affect how design-thinking teams work through their data but also how they look at that data in the first place. During the synthesis process, design thinkers often need to take a step back from their findings and make sure they understand the entire problem, not just parts of it. What's essential in this step is the ability to abstract from individual observations and to integrate all observations into a coherent whole. As noted above, working with digital tools — having video discussions with other team members or sketching out ideas on a whiteboard on an online platform — likely fosters greater psychological distance and a more analytical, abstract mindset. This can be very beneficial in the define phase because it focuses the team's attention on the proverbial forest rather than the trees.

In the ideate phase, being in the same room matters. When design thinkers begin exploring a variety of ideas and solutions, they often rely on techniques

THE RESEARCH

- The authors conducted 41 semistructured interviews with design-thinking experts in 2021 and 2022. The experts were from various industries (including Ford Motor Co., Henkel, IBM, Pfizer, Salesforce, and SAP), consultancies (including IDEO, Deloitte, and HYVE), and academic institutions (including the Hasso Plattner Institute School of Design Thinking and Delft University of Technology).
- They also conducted a field study in which design-thinking teams alternated between physical and virtual formats and then reported on their experiences.
- The authors have participated in design-thinking projects as part of consulting engagements with companies including Deutsche Post DHL, Deutsche Telekom, Ford, and T-Systems, which informed their analysis.

such as brainstorming and storyboarding. Visualizing ideas is particularly important in this phase to overcome the ambiguity of abstract, verbal explanations. However, the effective use of creativity-inducing tools is severely restricted in digital sessions. Our findings show that the creative thought process and the ideas that emerge from it are adversely affected.

Creativity is not purely an activity of the mind. Designers often pace around a room, use pen and paper to write down ideas, and rearrange sticky notes on a board in the process of thinking. Physical activity can kick-start creativity, but in virtual sessions, physical activity is curbed and mostly reduced to typing.

Creative solutions are also more likely to emerge when team members feed off of one another's energy. The environment where such interactions take place can encourage or discourage playfulness and inspiration. For team members to figuratively think outside the box, they physically need to leave their own box. Working from home and interacting with team members through a screen are hardly inspiring and playful experiences. "Random, spontaneous conversations are much less common online," noted an innovation manager at Saint-Gobain, a company that conducts design thinking for innovative building materials, such as sustainable glass and insulation. "While online meetings can be convenient, they can undermine this process. In fact, a little inefficiency can be beneficial for developing ideas."

One may be tempted to downplay the importance of the physical environment in the process of ideation. But our research shows that virtual settings adversely affect the results. An innovation manager from the Munich-based consultancy HYVE observed that physical ideation sessions generate a greater number of ideas: "Not every idea can be brilliant, but through the law of large numbers, through the flow, through the quantity, you have a lot more possibilities to build on things and think about them further. This happens more often in physical sessions."

Our findings show that participants in virtual sessions not only generate fewer ideas but also tend to produce more abstract ones. These effects mirror those observed in the initial empathize phase. Given that the core aim of design thinking is to create effective, actionable, and human-centered solutions, a shift to virtual formats is a significant drawback for ideation.

In the prototype phase, designers need to handle physical objects; at the same time, digital tools are good for iterating. The prototype phase focuses on creating tangible representations of the generated ideas. A key advantage of prototyping is that it enables design thinkers to visualize and experiment with ideas

that have not yet been refined.

Our research shows that shifting the prototype phase to a virtual setting can have both adverse and beneficial effects. Building and exploring a physical prototype — whether it's the basic interface of an app for preparing tax declarations or the complete interior of an airplane cabin for a redesign of the long-distance flight experience — allows design thinkers to "think with their hands" and helps them understand whether a prototyped solution is viable. In virtual settings, such physical explorations are severely restricted. An innovation manager from Ford noted, "Unless an idea has been developed into a concrete product or prototype, different people can interpret it in completely different ways. I think this challenge is even greater in the digital world." Even advanced digital tools such as virtual reality systems cannot adequately reproduce the experience of physically interacting with a prototype. In a virtual space, it can be more difficult, too, to get a read on a team member's hesitancy. A consequence of this lack of physical interaction is that it is more difficult for design-thinking teams to gain a shared understanding and converge on an effective solution.

However, digital tools can help to spur along the prototype phase. Modifying physical prototypes across multiple iterations is often a lengthy process that requires the efforts of many designers. Digital prototypes have an advantage here because they can be rapidly amended. This is particularly important in the early stages of the prototyping process, when design-thinking teams want to get quick feedback on the basic viability of an idea.

The bottom line in the prototype phase is that design-thinking teams must balance effectiveness and efficiency: Physical prototypes allow for deeper exploration and more meaningful insights, while digital prototypes enable quicker iteration. Therefore, for rapid feedback on the basic viability of ideas — especially in early prototyping stages — virtual prototypes are ideal. In later stages, when the designers are refining the details, transitioning to physical prototypes and in-person sessions is more appropriate.

In the test phase, virtual and physical tools are both important. When the design-thinking team assesses the prototypes for their practical usefulness, often in direct interaction with end users, experimentation and iteration are very important.

Again, our findings point to positive and negative effects in shifting the test phase to a virtual format. Similar to the experience in the prototype phase, digital testing environments limit the potential for physical exploration. A user's experience with a digital prototype is not as rich as it would be with a physical one. For instance, a prototype for a new automotive head unit — a dashboard touch

How to Set Up Hybrid Design-Thinking Processes

Effectively combining physical and virtual formats throughout the design-thinking process allows innovation leaders to harness the distinct advantages of each setting. A strategy that incorporates both modes is more likely to yield innovations that are truly focused on user needs.

DESIGN-THINKING PHASE	DOMINANT THINKING STYLE	VIRTUAL VERSUS PHYSICAL ACTIVITIES	HOW TO WORK
Empathize	Divergent	Although they bridge geographical distances and incorporate a more diverse range of users, virtual formats fall short in providing the same rich insights as onsite interactions, especially for problems that users cannot verbalize.	If including geographically dispersed users is not essential for the innovation challenge, go physical.
Define	Convergent	Compared with physical environments, virtual environments can enhance the effectiveness and goal orientation of this phase by helping to separate the important from the unimportant and allowing the team to see the big picture.	Go virtual.
Ideate	Divergent	Virtual sessions not only generate fewer ideas but also tend to produce more abstract ones. Given that the core aim of design thinking is to create effective, actionable, and human-centered solutions, a shift to virtual formats is a significant drawback for ideation.	Go physical.
Prototype	Convergent	Design-thinking teams face a trade-off between effectiveness and efficiency: Physical prototypes allow for a richer exploration, whereas digital prototypes allow the team to move faster through different iterations.	For quick feedback on the basic viability of an idea, especially in the early prototyping stages, go virtual. In later prototyping stages, when refining details, go physical and switch to tangible prototypes and onsite sessions.
Test	Convergent	While virtual testing limits the depth of feedback, it also enables a more analytical, goal-oriented testing procedure and the collection of unbiased responses.	To allow users to deeply experience the prototype in real-world conditions, go physical. To process user feedback, go virtual, because it better facilitates structured and honest analysis.

Source: Daniel Wentzel, Alice Minet, Stefan Raff-Heinen, and Janina Garbas

screen to control the audio system and apps — could be tested virtually, with users clicking through digital mock-ups to navigate through the system as they would use the screen in a car. However, a digital prototype would not allow users to understand whether the head unit would be easy and safe to operate while driving. Hence, users — and designers themselves — may find it difficult to tell whether and to what extent the prototype could be the basis for an effective solution. Moreover, virtual settings restrict the type of information design thinkers can collect. As in the empathize phase, the feedback that teams will get from digital testing will be mostly verbal in nature, and users’ nonverbal reactions will largely be lost. A design-thinking researcher from TU Delft told us, “Digital testing is very shallow compared to real-life testing. When you can’t see someone using a prototype in context, you will never see how it is misused or inter-

preted differently from what you intended.”

At the same time, digital tools can help address a challenge teams often face in testing prototypes: Our research has found that onsite testing is often affected by factors that have little to do with the prototype itself. In onsite presentations, design thinkers may describe a prototype very enthusiastically or defend a prototype against users’ criticisms, which can lead to biased user assessments of the prototype’s actual desirability. Because virtual settings typically trigger a more analytical and goal-driven mindset — or at least one less influenced by an in-person presenter — digital testing procedures may help designers overcome this bias and gain a more objective assessment of a prototype’s appeal.

So the data about which mode is best in the test phase is nuanced. Our research shows that while virtual testing can limit the depth and meaningfulness of feedback, it

also enables the collection of responses that are less likely to be biased by the presenter.

The Right Mix of Virtual and Physical

The digitization of innovation processes is increasing at a rapid pace. But our research has revealed that reducing the question of virtual or physical to an either-or choice is too simplistic. Each mode has specific advantages and disadvantages, opportunities and pitfalls. Neither format is inherently superior to the other, and both offer some advantages that benefit the process. The key question is not whether to prioritize one format over the other but rather how to combine physical and digital design-thinking practice for maximum impact.

Our general guideline is that innovation leaders should set up hybrid design-thinking processes. Overall, the data indicates that the phases requiring divergent thinking (empathize and ideation) are generally best conducted in physical formats whereas phases involving convergent thinking (define, prototype, and test) may be more effectively completed through virtual formats.

Effective hybrid processes optimize how design teams interact with end users and how team members interact with one another. For example, understanding a user's needs, motivations, and emotions in the empathize phase requires some physical immersion in the user's environment. Running this phase only through digital tools such as Zoom or Teams risks not understanding the full scope of a problem or, of greater concern, missing a problem altogether. While digital tools may be the only viable option in some cases (such as when users are geographically dispersed), companies should generally attempt to run the empathize phase in face-to-face settings. In contrast, in the define phase, digital tools such as Miro or Mural can help design-thinking teams synthesize the fuzzy data from the empathize phase — interview transcripts, personal notes, photographs, and video recordings — and recognize meaningful patterns more readily compared with having to organize this information with whiteboards or pinboards. Analytical and goal-oriented mindsets are tremendously helpful here, and digital tools will facilitate such mindsets.

There are caveats, of course. On a more granular level, companies need to recognize that some phases consist of subactivities that may each require a different approach. In the test phase, for example, design thinkers need to provide users with some form of a prototype and they need to process user feedback on that sample. While the first activity (interaction) is best realized through physical prototypes that users can explore and interact with, the second activity (data collection and review) may be better served through virtual tools that allow for a struc-

tured and goal-oriented analysis. Hence, combining physical and virtual formats during the test phase may yield better results than relying on a single format throughout the phase. (See “How to Set Up Hybrid Design-Thinking Processes,” p. 33.)

To get the most out of their design-thinking processes, companies must also look at them dynamically. Effective design thinking is not a linear process — it goes through multiple iterations. Its iterative nature offers design thinkers the chance to benefit from the unique advantages of physical and virtual formats. In the initial rounds of iteration, designers may be better served by building digital prototypes to gain quick feedback on the basic viability of an idea. In the later rounds of iteration, the viability of an idea is already understood, and design-thinking teams may be well advised to build physical prototypes to gain a better understanding of an effective solution.

Design thinking is a powerful tool for innovation and can help companies develop products and services that address untapped customer needs. This human-centered approach is not at odds with an increasingly digitized approach to innovation. Quite the contrary: Effectively combining physical and digital tools will allow companies to harness the distinct advantages of each approach and come up with innovations that are truly focused on user needs. ■

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REFERENCES

1. T. Brown, “Design Thinking,” *Harvard Business Review* 86, no. 6 (June 2008): 84-93.
2. E. Tippmann, P.S. Scott, and M. Gantley, “Driving Remote Innovation Through Conflict and Collaboration,” *MIT Sloan Management Review*, April 15, 2021, <https://sloanreview.mit.edu>; L. Thompson, “Virtual Collaboration Won't Be the Death of Creativity,” *MIT Sloan Management Review* 62, no. 2 (winter 2021): 42-46.
3. A. Minet, D. Wentzel, S. Raff, et al., “Design Thinking in Physical and Virtual Environments: Conceptual Foundations, Qualitative Analysis, and Practical Implications,” *Technological Forecasting and Social Change* 207 (October 2024): 1-14.
4. “An Introduction to Design Thinking Process Guide,” PDF file (Stanford, California: Hasso Plattner Institute of Design at Stanford University, n.d.), <https://web.stanford.edu>.
5. D. Dunne and R. Martin, “Design Thinking and How It Will Change Management Education: An Interview and Discussion,” *Academy of Management Learning & Education* 5, no. 4 (December 2006): 512-523.
6. Y. Trope and N. Liberman, “Construal-Level Theory of Psychological Distance,” *Psychological Review* 117, no. 2 (April 2010): 440-463.
7. A.M. Glenberg, “Embodiment as a Unifying Perspective for Psychology,” *Wiley Interdisciplinary Reviews: Cognitive Science* 1, no. 4 (July/August 2010): 586-596.

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