Materializing the Agency of Design in Innovation Practices

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Introduction

Design is central in the processes of developing new technologies and services. In these production processes, human-centered design has emerged as a particular way of designing that acts in the interest of human needs. As a designer who has worked for more than a decade in technological innovation, I have come to question the concepts used in this field to understand design agency. These concepts underscore agency in design as expressing designers' capacity to effect change. However, in the experience of design in practice, these concepts do not explain the designers' capacity, or why some ideas take hold and others do not materialize. How design works remains mysterious. My experiences, and the experiences of designers with whom I engaged during a research project in the United Kingdom (UK), compel me to push our thinking about designing. I propose that we reconceptualize designing as a material practice in which the designers' ideas and their capacity to reconfigure worlds can be traced. My goal is to participate in thinking about design as a practice that materializes ideas, and to inform the practice and research of design.

In this article, I draw on concepts of materiality from design and from practice-based theories. First, I review how we, the scholars and practitioners, think about design. Second, I show the limitations of this conceptualizing by telling about fellow designers and the lack of visibility on the agencies in their design practice. Third, I develop the framework of *configuring artifacts* as a means to trace design agency in material ways.

How We Think About Design

Design has been described as an independent form of knowing that reconciles the dualism of rationality and intuition.[1] Design theorist Nigel Cross outlined these "designerly ways of knowing" as a constructive mode of thinking that can understand, redefine, and solve ill-defined problems.[2] This special designerly form of knowing has been treated as an epistemological paradigm capable of harnessing creative thought for the purpose of generating novel things.[3] This particular understanding of design and designers' ability to transform ideas, artifacts, and environments has propelled design activity into the research spotlight. Many scholars have tried to

1 Bruce Archer, "Design as a Discipline," *Design Studies* 1, no. 1 (1979): 17–20; Walter Gropius, "Teaching the Arts of Design," *College Art Journal* 7, no. 3 (1948): 160–64; and John Chris Jones, *Design Methods,* 2nd ed. with new prefaces and additional texts (New York: Van Nostrand Reinhold, 1992).

2 Nigel Cross, "Designerly Ways of Knowing," *Design Studies* 3, no. 4 (1982): 221–27.

3 Tim Brown, *Change By Design: How Design Thinking Transforms Organizations and Inspires Innovation* (New York: HarperCollins, 2009); Richard Buchanan, "Worlds in the Making: Design, Management, and the Reform of Organizational Culture," *she ji The Journal of Design, Economics, and Innovation* 1, no. 1 (2015): 5–21; Kees Dorst, "The Core of 'Design Thinking' and Its Application," *Design Studies* 32, no. 6 (2011): 521–32; David Dunne and Roger L. Martin, "Design Thinking and How It Will Change Management Education: An Interview and Discussion," *Academy of Management Learning & Education* 5, no. 4 (2006): 512–23; and Roberto Verganti, *Design-Driven Innovation: Changing the Rules of Competition by Radically Innovating What Things Mean* (Boston: Harvard Business Press, 2009).

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demystify design. One description of the creative process is "synthesis," which design theorist Claudia Mareis identified as a motif in design research discourses at least since the 1960s.[4] Synthesis is said to be a designerly "sensemaking," the "act of putting the pieces together[5]; through synthesis, designers "organize, interpret, and weave these many strands of data into a coherent story."[6] Mareis notes a narrative that describes design as "holistic" and designers as mediators who are capable of integrating other domains of knowledge, such as scientific and humanist traditions, or thinking and doing, or theory and practice.[7] An important trope in design theories is the synthesis of time: Design has been discussed as capable of synthesizing the present and the future.[8] For example, Herbert Simon describes design as changing "existing situations into preferred ones."[9] As part of the synthesis of time, designers visualize possibilities by mediating present realities and possible futures.[10]

The theme of designers as mediators also emerges in human-centered design literature. I will briefly mention how designers' mediating activity is featured in this area of literature. Designers are understood to mediate tangible and intangible experiences; technological and social matters; objective and subjective conditions of knowing; and thinking and doing: User experience (UX) designers challenge the view that value is solely in the physical product. They emphasize that value can be in the experience of using technology, such as in the use of a bike in mountain biking.[11] Here, the aim is to capture both the tangible and the intangible aspects of use practices. User interfaces (UIs) of technologies are seen to matter in how they fit into people's lives and their environments.[12] Designers here seek to bridge objective technological conditions with the users' social and subjective needs. Objective reality and subjective experience are described as co-existing.[13] Lean startup or agile design approaches emphasize that thinking and doing cannot be separated. The tracing of the trajectory from an initial concept to an accomplished painting, like Da Vinci's Mona Lisa, is repeatedly used as an example to illustrate that successful ideas are not conceived as finished items, and then merely implemented in the true likeness of the conception, but that they emerge in a process of simultaneous doing and imagining.[14] The lean startup or agile approaches focus on the integration and mediation of thinking and doing in the design process.

Further to this motif of design activity as synthesis and mediation, Mareis observes in the design literature "naturalized" understandings of the world—that "meanings" and "orders" are naturally inherent properties of the world, and the understanding that designers have the natural ability to facilitate these conditions.[15] Design ability is described as "tacit," as an "unspoken" knowledge

4 Claudia Mareis, *Design Als Wissenskultur: Interferenzen Zwischen Design-Und Wissensdiskursen Seit 1960* [Design as a knowledge culture: Interferences between design and knowledge discourses since 1960] (Bielefeld: transcript Verlag, 2011).

5 Jon Kolko, "Abductive Thinking and Sensemaking: The Drivers of Design Synthesis," *Design Issues* 26, no. 1 (Winter 2010): 15–28.

6 Brown, *Change By Design*, 69.

7 Mareis, *Design Als Wissenskultur* [Design as a knowledge culture], 196, 202–9.

8 Ibid., 205.

9 Herbert A. Simon, *The Sciences of the Artificial*, 3rd ed. (Cambridge, MA: The MIT Press, 1996).

10 Harold G. Nelson and Erik Stolterman, *The Design Way: "Intentional Change in an Unpredictable World"* (Cambridge, MA: The MIT Press, 2012).

11 William Buxton, *Sketching User Experiences: Getting the Design Right and the Right Design* (San Francisco: Morgan Kaufmann, 2007).

12 Marc Hassenzahl et al., "Needs, Affect, and Interactive Products – Facets of User Experience," *Interacting with Computers* 22, no. 5 (2010): 353–62; and Marc Stickdorn et al., *This Is Service Design Thinking: Basics – Tools – Cases* (Hoboken, NJ: Wiley, 2011).

13 Hassenzahl et al., "Needs, Affect, and Interactive Products," 9.

14 Jeff Patton, *User Story Mapping: Discover the Whole Story, Build the Right Product* (Cambridge, MA: O'Reilly, 2014).

15 Mareis, *Design Als Wissenskultur* [Design as a knowledge culture], 68–9.

that remains muted and cannot be put into words.[16] This naturalization makes design even more invisible and mysterious. The way we think about design does not tell us how design works.

The Limitations of Our Thinking About Design

I illustrate the limitations of our thinking about design and its agency—the capacity to effect change—using ethnographic accounts of interaction designers who work in digital innovation. The data were collected during a study on design practices in the UK through observations and interviews with designers.

David is a UX designer who works in a team on the UI of a web application. David also works with a user group, so he has a good idea of what these users need. He knows which elements, icons, and abbreviations in the UI the users can understand, and which ones they can't, because he has done many user tests. According to these insights, he has created a visual UI design with Sketch, a prototyping tool. A software developer implemented the design and put it on the test server for David to review. After his review of the implementation, David created a to-do list itemizing the issues he found and noted any deviations from his original Sketch prototype. For example, there were supposed to be 10-pixel margins around certain boxes, but the implementation did not have them. David explained that a developer would pick up the list of issues and fix each of them. David was confident that each item in the to-do list would get implemented because the consensus among the team members was that UX design work adds value, and that the UX designer's evaluation of the state of the design counts. How David and his designs managed to become so influential was not apparent from the situation. However, in the next example, why a design initiative does *not* work is just as puzzling.

Alan and Charlotte, two interaction designers, worked on a pattern library, a collection of reusable UI components. They also used Sketch, and they presented in a mock-up all UI components of the pattern library. They discussed the "select box," which is a list of selectable options that can be opened and closed. The software developers implemented it with a 25-pixel height, which bothered them because it was too big in their eyes, and they wanted to make it smaller. But Charlotte said that there was nothing they could do. After talking to the developers, she found that because of the way the code was implemented, the height of the select box was tied to the height of the list entries. The designers did not want to make the list entries smaller, so she reported that the height could not be changed. In Alan and Charlotte's organization, the interaction designers were highly regarded because their work relates to user needs, which is seen as very important. However, they did not find a way to influence the implementation of the select box to make it smaller.

16 Claudia Mareis, "The Epistemology of the Unspoken: On the Concept of Tacit Knowledge in Contemporary Design Research," *Design Issues* 28, no. 2 (Spring 2012): 61–71.

The concept of design as synthesis is illustrated in these examples, which show how designers mediate user needs, visual interfaces, and code implementations. However, this concept does not explain the different agencies at work in these two design situations. Why David has the capacity to get the designs changed according to his ideas, and why Alan and Charlotte are not successful in effecting changes to the design cannot be explained. New tools are needed to analyze these agencies of design. Why did the UI designs follow these particular trajectories of change, and how were they influenced by the actions of the designers? Design agency is the capacity to effect change. Accordingly, design requires a tool to understand how change is effected and how designs materialize.

Toward a New Framework that Rematerializes Concepts of Design

Designers use "imagination as a step to preferred situations."[17] For designers, to "imagine new realities" is not only a mental activity, but also a material activity—one through which possible futures can be explored.[18] By rematerializing the concepts of design, we may be able to understand how ideas can effect changes. In the following text, the designers' imaginations are derived as material *imaginaries* from literature on design practice. The quality of these imaginaries is then illustrated by following Olivia and an account of her design practice.

The activity of design synthesis is the *relating* of things in novel ways. A *relation* can be conceptualized as some *thing*. The relation as a material effect can be traced in concepts used by design. Ambiguity in design is used to describe functions, meanings, and purposes of objects as they emerge and materialize in relation to the practices of which they are a part.[19] The concept of affordances in design discusses the material qualities and properties of objects as they emerge in their relation with other objects.[20] Often, material objects are understood to be endowed with fixed properties that afford different uses and functions. However, Gibson's concept of affordances illustrates that object qualities are relative. A surface may afford stable support for an animal body relative to its weight, but it also may be "sink-into-able" if the animal body is relatively heavy.[21] This concept informs us about how material conditions change as objects enter various relationships. Another example that uses relation as a concept is design fiction, which emphasizes that fact and fiction are "imaginative ways of linking ideas to their materialization."[22] The fact–fiction relation materializes the future by material "speculations on what the next 'now' will be like."[23]

A *re*materialized concept of designers' imaginations takes inspiration from this material *relating* activity of different things, such as objects, meanings, purposes, spaces, bodies, possibilities,

17 Herbert A. Simon, *The Sciences of the Artificial*, 3rd ed. (Cambridge, MA: The MIT Press, 1996), cited in Ilpo Koskinen et al., *Design Research Through Practice: From the Lab, Field, and Showroom* (Amsterdam: Elsevier, 2011), 42.

18 Koskinen et al., *Design Research Through Practice*, 42–3.

19 William Gaver et al., "Ambiguity as a Resource for Design," in Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (Ft. Lauderdale, FL, April 5–10), 2003, 233–40.

20 James J. Gibson, *The Ecological Approach to Visual Perception: Classic Edition* (1979; New York: Psychology Press, 2015).

21 Gibson, *The Ecological Approach to Visual Perception*, 119.

22 Julian Bleeker, "Design Fiction: A Short Essay on Design, Science, Fact and Fiction," *Near Future Laboratory* 29, https://blog.nearfuturelaboratory.com/2009/03/17/design-fiction-a-short-essay-on-design-science-fact-and-fiction/, (2009), 86.

23 Bleeker, "Design Fiction," 25.

ideas, materials, nows, and futures. The relating of things is an "act of metamorphing" in which "designers envision and realize concepts by objectifying and manipulating a variety of representations."[24] A. Telier design researchers call these representations the "objectification of ideas" which bring the "object-in-design" into being.[25] The design object is "a thing that does not yet exist."[26] It is shaped, and comes into existence—it materializes—following a "trajectory through multiple representations and their translations."[27] The representations of the object are its "constituents," and they give it a material handle in design practice. The constituents evoke the qualities of the object.[28] From this perspective, the materialization of ideas is effected through constituent artifacts. The shaping of ideas can be traced through these artifacts and their trajectories of change. This concept leads to an understanding of design practice as a material handling of ideas and possibilities. The artifacts express relationships of ideas and materials. The *relations* in synthesis are *material–idea imaginaries*. These imaginaries are representations of possible futures that are handled in design practice.

The following narrative describes Olivia's work with imaginaries and illustrates an abstraction of the design imaginary and its qualities. Olivia is a UX designer who works on the interface of a medical assessment tool. In her work, she cares about people's well-being. Even more, she describes herself as a user advocate who cares about "accessibility" to make the application available to "people with as many conditions and different scenarios as possible,… making sure that it's readable, usable to people who have cognitive, visual, hearing, all sorts of disabilities." She creates mock-ups of the application interface, which she then passes on to the developers to code. These imaginaries are representations of the application interface. They contain text, navigation, and form elements, such as checkboxes, text input fields, and buttons. They also contain the idea that users need to be protected and cared for, that their abilities need to be matched with certain features in the interface. On one of my visits, Olivia was working on a spreadsheet containing the order, flow, and wording of questions that are shown to patients in the interface during their assessment. The layout of the spreadsheet represents the logic of the software program. It is chosen as a representation format that can be accessed by the whole design team: the interaction designers, the developers, and the medical experts. Olivia was careful not to alter the logic of the flow of questions or the medical expert knowledge contained within them, but she edited the wording "to improve readability and comprehension" for everyone, including "someone with an elementary education...." For example, she changed "less than 50%" to "half or less." The spreadsheet, as an imaginary, is a dense intersection of material qualities and ideas. It comprises a dozen sheets, and each sheet

24 Thomas Binder et al., *Design Things* (Cambridge, MA: MIT Press, 2011), 79.
25 Ibid., 83, 15.
26 Ibid., 51.
27 Ibid., 14.
28 Ibid., 60.

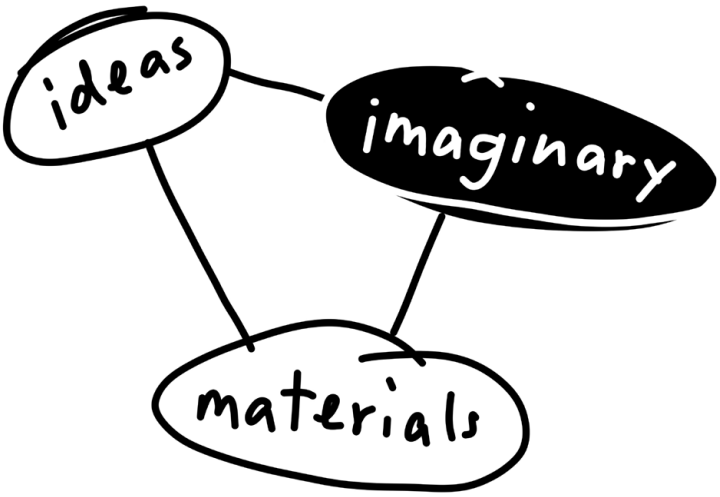

Figure 1
Configuring artifacts as imaginaries that emerge from ideas and material conditions. Image by author.

contains many hundreds of rows and columns of questions, closely tied in with technical expertise, medical knowledge, and ideas about abilities and education.

The spreadsheet, as an imaginary, is an artifact comprising many different ideas and materials. It contains different knowledges—the logic of program flows, medical knowledge, and the designers' knowledge about user abilities. The imaginary is an artifact comprising material components and conceptual components. The imaginary is formed in the hands of the designer and then passed into the hands of colleagues and back. Thus, the process slowly and incrementally shapes the object-in-design.

To create an analytical device, I suggest abstracting this view to construct a representation that consists of material conditions, ideas and concepts, and hybrid material–idea artifacts, named an imaginary (see Figure 1). Imaginaries are representations of possible futures, and they have the capacity to shape these futures and to bring them into being. I next illustrate how they do so using concepts on materiality in practice.

Objects as Emergent Products of Human–Material Relations in Practice

Design work can be and has been recognized as a practice. In concepts of practice, agency—as the capacity to act—is understood to be distributed amid the elements of practice. Human activity in practice can be visualized as networks of material relations within which knowledge, understanding, and ability are generated.[29] In emphasizing the inseparability of people and things in action, we recognize both discourses and technologies as interactive parts of social practices and thus of the reality that is created.[30] The object, or purpose, of a practice is mutually negotiated among its participants.[31] This object-of-the-practice may also be thought about as the object-in-design because it is in constant flux and is continuously remade by the participants in the practice.

29 See, e.g., Silvia Gherardi and Davide Nicolini, *Organizational Knowledge: The Texture of Workplace Learning* (Oxford: Blackwell Publishing, 2006); Wanda J. Orlikowski, "Sociomaterial Practices: Exploring Technology at Work," *Organization Studies* 28, no. 9 (2007): 1435–48; and Lucy Suchman, *Human–Machine Reconfigurations: Plans and Situated Actions* (New York: Cambridge University Press, 2007).

30 Bruno Latour, "Technology Is Society Made Durable," *The Sociological Review* 38 (1990): 103–31.

31 Silvia Gherardi, *How to Conduct a Practice-Based Study: Problems and Methods* (Northampton, MA: Edward Elgar Publishing, 2012).

This view relates to that of John Law, a sociologist and science and technology studies scholar who notes that methods of investigation always shape the object of investigation.[32] In Law's view, collective understandings of reality are created in the action of researching. In a practical sense, the objects of research change shape because they are being researched—specifically, through the methods chosen. Law speaks of "method assemblage" as a creative instrument of reality production.[33] He emphasizes the sketchy character of research objects, which draw up "provisionally stable" realities.[34]

This generative understanding of reality through action, methods, and materials speaks to the problem of design in conceptualizing how realities are transformed. What design can pull from these concepts of practice is that objects and objective understandings of reality are emergent products of networks of humans and materials. Transformations of these objects and objective understandings of reality take place through the changing networks of human–material relations. Viewing design agency in this way takes away the focus on the design object as a rigid "thing," and it envisions design as a practice of "thinging," in which attention is paid to intertwined material relations that continue to evolve and that bring the object-in-design into being.[35] On the one hand, a thing—a design—becomes a fluid concept, and on the other hand, the capacity of effecting change becomes a matter of reshaping a network of relations.

Design Agency as Material Reconfigurations in Practice

How do imaginaries effect changes in these networks of relations? Imaginaries are artifacts, such as mockups, spreadsheets, sketches, prototypes, user journeys, maps, diagrams, and stories. They join materials and ideas. They are "condensed image[s] of both imagination and material reality, the two joined centres structuring any possibility of historical transformation."[36] Further, they are proposals about the future. They materially embody the future, and therefore, they mediate presence and the future. Through these qualities of being both material and idea, present and future, imaginaries bring designs into being by integrating ideas and materials, and presents and futures.

Interaction design scholar Lucy Suchman coined the term, "artful integrations" to describe how practices are made of ecologies of material and discursive relations.[37] Anything entering these relations reconfigures the practices and their relations.[38] Imaginaries are such artifacts, reconfiguring the existing relations of the practice; they create new material–idea configurations. And yet, imaginaries themselves are made of material–idea relations; they are objectified material–idea relations that have been made of materials and ideas. For example, Olivia's spreadsheet is an artifact

32 John Law, *After Method: Mess in Social Science Research* (Oxon, UK: Routledge, 2004).

33 Ibid., 38.

34 Ibid., 2.

35 Binder, et al., *Design Things*, 6.

36 Donna Haraway, "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century," in *Simians, Cyborgs, and Women: The Reinvention of Nature* (London: Free Association Books, 1991), 150.

37 Lucy Suchman, "Working Relations of Technology Production and Use," *Computer Supported Cooperative Work* 2 (1994): 21–39.

38 Lucy Suchman, "Configuration," in *Inventive Methods: The Happening of the Social*, ed. Celia Lury and Nina Wakeford (Routledge, London, UK, 2012), 48–60.

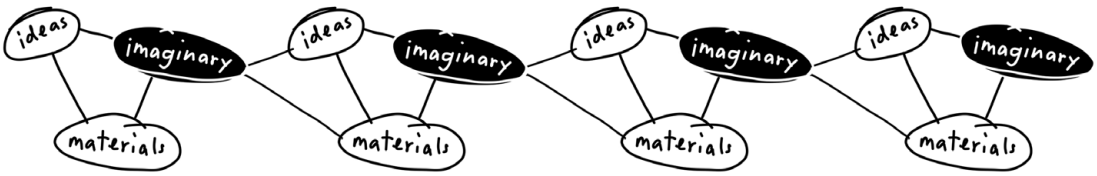

Figure 2
Configuration of material–idea relations as imaginaries, creating and leading to new material–idea relations. Image by author.

made of materials and ideas. One of these ideas is "accessibility," which is a concept about user abilities and the ethics of inclusion. "Accessibility" is itself materially related to another large bundle of material–idea relations, such as a website on comprehensive guidelines, materials, and techniques for creating applications and content for the web.[39]

Imaginaries are representations of ideas, and they materially bring these ideas into being. As Figure 2 shows, imaginaries are made of materials and ideas and they create new materials and ideas. Through their weavings into existing relations, they reconfigure these relations and thus help transform the reality into new conditions. For imaginaries to realize new materials and ideas, they need to tie in with existing materials and ideas. As *configuring artifacts*, imaginaries are active participants in reconfiguring material worlds. The configuration process in Figure 2 indicates that the produced imaginaries reconfigure ideas and materials into subsequent ideas and materials, which in turn have the capacity to produce reconfigured imaginaries. In the next section, I explore *configuring artifacts* as a device of analysis, tracing designers' agencies in effecting the designs they have in mind.

Visualizing Design Agency by Configuring Artifacts

Configuring artifacts as an analytical device can enable visualization of design agency and of how ideas materialize. With this framework, I read the situations of designers David, Charlotte, and Alan, as well as a new designer, Alice, to visualize how they get on with their ideas. The framework makes agency observable by paying attention to the *configuring artifacts* and their relations. In showing the material relatedness, the framework makes observable how some ideas materialize and how others evaporate.

David's design, represented in the Sketch prototype, was tightly embedded in a network of relations. User tests substantiated the material necessities of the prototype, so that when it was handed to the software developers for implementation, it was a materially solidified proposal, woven into a process of review and implementation through to-do lists and test servers. David's design had many ties within the network of relations; it was thus well embedded. Through this implementation, David experienced agency and was effective in getting his ideas across.

39 Web Accessibility Guidelines, w3.org/WAI/.

In contrast, Alan and Charlotte did not relate their pattern library design very tightly within the relations of their and others' practices. They had ideas about the pattern library design that were otherwise not supported by materials, such as user tests, review processes, and to-do lists. Here, the design of the pattern library was more closely tied to the software developers' practices of writing code in a particular way. The design was affected by the established way of doing things by the developers, rather than by the designers' ideas about select box heights. How effective designers were in influencing designs was visible in the material relations they had created for their ideas: David's prototype was an imaginary supported by user tests, the established review process, and the to-do list. Alan and Charlotte's design was supported by their ideas about changes to the pattern library that they merely expressed through discussion. This weak imaginary in the form of a wish was confronted with the strong imaginary of the developers: the codebase that was supported by the logic of code implementation.

Even more clearly illustrating the potential strength of an imaginary is Alice's case. Alice, a UX designer, joined her organization with the objective to change the organization from being "technology-driven" to being more "user-centered." She designed a new design process model, which she showed to me as a visual diagram on a sheet of paper. This design process model showed a new production process. It also was informed and supported by books about design that Alice had read, some of which she had brought to the studio. The diagram showed groups of activities, ordered from left to right in a temporal hierarchy of work steps. One or more job roles were assigned with each activity. For example, the diagram stipulated that all design work that related to user needs should be carried out before technical design work. This stipulation reflected the idea that human concerns should take priority over technological concerns. Alice managed to negotiate with the software developers so that they waited for UI designs made by designers before implementing designs. Alice emphasized that this approach allowed the production process to "flow more naturally, [and that software developers] wouldn't waste time trying to resolve problems that weren't their job to resolve." She was happy with the change she had achieved in creating a more human-centered production process for her organization.

This example illustrates how designers understand themselves as mediators of different activities and skills and of human and technological concerns. And it demonstrates how the diagram served as a strong imaginary of this idea about design and designers. The diagram supported Alice in effecting a change of relations within the organization—one that reflected her design process diagram. The diagram contained a visual representation of the ordering of relations. However, the diagram was effective not only as a

representation, but also as a materially-related artifact. Alice's imaginary was not simply an idea that waited to be implemented. Instead, it was an artifact that Alice materially related within the configuration of the team's work. The team relations were materially influenced by Alice's idea and the diagram, such as when Alice drew the diagram and disseminated it within the organization. Or when Alice insisted that a work task was hers because the diagram said so. Or when she proposed that another task was to be done after she completed her task, according to the diagram. Or when she backed up the ideas in the diagram with the contents of books. The material relations of the diagram generated the agency that effected the reconfiguration of the organizational situation according to Alice's idea.

The agency of the designers' ideas—their capacity to effect change—is constituted through the strength of the material relations of their imaginaries. Alice's initiative illustrates well the relations of the design process diagram as a persuasive agent in getting her ideas implemented. Designers' imaginaries are not merely reflections of a desired reality, summoning it to become true, but they are artifacts with which designers materially craft the future and configure these realities.

Conclusion

Imaginaries have the potential to reconfigure everyday practices. Tracing the work of designers using imaginaries through the framework of *configuring artifacts* allows us to see the agency of designers' ideas. Imaginaries are deployed within a context of design practices and their material relations. Through the density of their material–idea makeup, these artifacts have agency, and their envisioned future potentially becomes real. Their level of relatedness in practice enhances their capacity to affect the world, according to the ideas they represent.

The agency of design is in the using and the relating of material–idea imaginaries. The power of design lies in understanding the design artifacts as interventional elements that can be used in everyday practices. Imaginaries help designers to reconfigure material and practical relations in which they participate. Therefore, the agency of an idea is not defined only by what it says and means, but also by how it is related within practices. The novelty of this approach is the close attention paid to how an imaginary is perceived as an idea and to how it is materially part of the network of relations of practice.[40] Such material connections may be the drawing, emailing, and printing of a diagram; the reference to a diagram to explain why a certain work should be done before another; or the reason it needs to be done by this person and not that person, as in Alice's case. Other effective relations might be cultivated by user tests and to-do lists in a process of design implementation, as in David's situation.

40 Suchman, "Configuration."

The work of building the framework of *configuring artifacts* must be continued; however, this article's theoretical framing, which pulls together concepts of materiality in design and practice-based theories, builds a basis on which the work can continue. Reading material relations in practice contributes to visualizing the agency of design. Creating an idealized linear representation of this process of design configuration represents my attempt to make this concept useful and succinct. It sharpens the attention to material networks in design practice. Conceptualizing design in this way foregrounds the deliberate cultivating of imaginaries as interventional artifacts within practices.

Rethinking design as the material relating of imaginaries in organizational practices makes it possible for designers to observe the material shaping of ideas. Trajectories become visible of design ideas' effecting and transforming realities in collaborative "hands." Observing the material relations of artifacts with a possible future reveals the agency they have in effecting these possible futures. This perception achieves to some extent what design literature is struggling to demystify—design's showing itself, showing its capacity. Visibility of design can inform practitioners and researchers, as well as design curricula, making design teachable in new ways. This visibility also allows design processes and practices of materializing ideas to be made accountable. Accountability serves the increasing necessity for design to take on responsibility as an agent for human needs in technological innovation. To be able to account for its own agencies makes design a better tool for mediating change.

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