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Authors

Elsbach, Kimberly D
Stigliani, Ileana

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Design Thinking and Organizational Culture: A Review and Framework for Future Research

Kimberly D. Elsbach

University of California–Davis

Ileana Stigliani

Imperial College

Design thinking comprises an approach to problem solving that uses tools traditionally utilized by designers of commercial products, processes, and environments (e.g., designing a new car or the layout of a new airport). While design thinking was originally introduced as an approach that would work best when infused into the culture of an organization, most early studies of design thinking focused on identifying the specific tools and methods that might be used to solve management problems. Only recently have researchers examined how the implementation of design thinking might relate to organizational-level constructs, such as organizational culture. In this review, we examine empirical research (mostly from the past decade) that relates the practice of design thinking to the development of culture in organizations. Through this review, we identify how the use of specific design thinking tools supports the development of specific organizational cultures and vice versa. In addition, we identify how using design thinking tools produces emotional experiences and physical artifacts that help users to understand why and how specific cultures support the effective use of specific tools. Together, our review findings suggest that the experiential nature of design thinking tools and cultures (i.e., that they require people to actively engage in hands-on work) allows them to support one another. On the basis of this insight, we develop a general framework for organizing design thinking research and identify a number of avenues for future research that might advance our understanding of design thinking in organizational contexts.

Keywords: *design thinking; design; organizational culture; experiential learning; artifacts; emotion*

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Corresponding author: Kimberly D. Elsbach, Graduate School of Management, University of California–Davis, 540 Alumni Lane, Davis, CA 95616, USA.

E-mail: kdelsbach@ucdavis.edu

Introduction

How design can foster innovation and generate a competitive advantage for organizations has, over time, attracted increasing interest among management scholars (e.g., Buchanan, 1992; Cross, 1982; Perks, Cooper, & Jones, 2005; Ravasi & Stigliani, 2012). Building on frameworks of product and architectural design (e.g., the design of buildings, furniture, clothes), early proponents of this mind-set suggested that “thinking like a designer” (Simon, 1969) to solve “wicked problems” (Buchanan, 1992) could be best leveraged in organizations by “infusing” design into the fabrics and cultures of these organizations (e.g., Dumas & Mintzberg, 1989, 1991).

Despite this initial theorizing, most early empirical studies of design approaches in organizations focused on the team level and defined the specific tools that these teams could use to “think like designers.” This research identified a systematic approach to problem solving that employs design tools such as rapid prototyping, user observation, visualization of ideas, and brainstorming (see summaries in Brown, 2008; Liedtka & Ogilvie, 2011; Liedtka, Rosen, & Wiltbank, 2009).¹ Over time, the use of such “designerly tools” to solve a wide variety of organizational problems evolved into a new discipline called “design thinking” (Brown, 2008; Vogel, 2009). Research on design thinking, thus, has traditionally emphasized the practical implications of using design tools to solve business problems (e.g., Ben Mahmoud-Jouini, Midler, & Silberzahn, 2016; Matthews & Wrigley, 2017; Porcini, 2009; Rylander, 2009) but has largely overlooked the potential benefits of incorporating design as a key component of organizational culture.

As a consequence, despite early theorists’ notions about the value of incorporating design thinking into the culture of an organization, we lack an understanding of how a design thinking perspective might be most effectively leveraged as a broader component of organizations. We, therefore, propose that it is time to take a second look at the value of design thinking as more than a set of tools and, instead, as a cultural component of organizations. We argue that this second look is timely in light of the breadth and depth of recent empirical studies (mostly from the past decade) that provide insight into design thinking as an actual organizational phenomenon.

In this paper, we review empirical research on design thinking in organizations with the goal of understanding the relationship between the tools of design thinking and the culture of what we call a “design thinking organization,” that is, an organization that most effectively leverages those tools. Our findings suggest that design thinking tools and organizational cultures are tightly linked. Furthermore, our review suggests that an experiential learning framework (Kolb, 2014) provides a useful means for understanding these links and for organizing extant and future research. Before presenting these findings, however, we will provide some definitions and boundary conditions to our review—spelling out what we included in our review and how it was performed.

Definitions and Boundary Conditions for Our Review

Origins and Evolutions of Design Thinking

Appendix A (in the online supplemental material) provides a description of the design thinking process in terms of its phases and main tools (see Table A1), as well as a comparison

between design thinking and traditional, analytic problem solving (see Table A2). While many of the advances in the field of design thinking happened in parallel, and a strict ordering of events is impossible, we provide below a rough outline of how the field has progressed from its roots.

The origins of design thinking date back to the 1960s—the so-called design science decade—and are rooted in the early works of design methodologists who drew distinctions between the science of design and the natural sciences (e.g., Alexander, 1964; Gregory, 1966; Simon, 1969). These scholars portrayed design as a scientific method aimed at creating new forms, new artifacts or more generally, new knowledge. Thus, while natural sciences dealt with the analysis of existing reality, the science of design dealt with “the transformation of existing conditions into preferred ones” (Simon, 1969: 4).

Later conceptualizations of design challenged the positivist doctrine characterizing the “design science” movement and embraced a more constructivist stance to design as a practice. In particular, Schön (1983) criticized Simon’s (1969) view of a “science of design” as being based on approaches to solving well-formed problems while recognizing that professional designers have to face and deal with messy and problematic situations. He, thus, emphasized the artistic, intuitive nature of the processes that design practitioners use to understand and solve problems in situations of uncertainty, ambiguity, and instability. Schön conceptualized these processes as “reflective practice.”

Building on Schön’s (1983) theorizing, other design scholars unpacked the specifics of these so-called designerly ways of knowing (e.g., Cross, 1982, 2007) in terms of the nature of the design problems (e.g., Buchanan, 1992; Goldschmidt, 1997) and the designers’ attitude to solve such problems (e.g., Boland & Collopy, 2004; Lawson, 1994; Rowe, 1987). Differently from thinking of problems as well-defined “puzzles” to solve, design problems were described as ill defined, ill structured, or “wicked” (Buchanan, 1992). Furthermore, they were described as open ended and, initially, as highly ambiguous and presenting multiple plausible solutions (Goldschmidt, 1997). Therefore, the designer’s task was identified as producing an appropriate solution by “organizing complexity [and] finding clarity in chaos” (Kolko, 2010: 15) through a process of patterned synthesis of aesthetic, cultural, and technology trends and consumer and business needs. This process of synthesis was described as an abductive thinking process aimed at collecting, organizing, pruning, and filtering data in order to produce a potential solution (Kolko, 2010). In contrast to deductive and inductive reasoning, which were defined as approaches for finding correct solutions, abductive reasoning was said to rest on designers’ efforts to find plausible solutions.

At the same time, interest in how designers work and think progressively moved from the purview of designers and architects to the field of management, where scholars focused on identifying the design tools that could be used to solve management problems. In this manner, designerly problem-solving tools were advocated as effective approaches for businesses seeking to innovate (Brown, 2008, 2009) and gain a competitive advantage (Martin, 2007, 2009). For example, Brown (2008) explicitly labeled the way that the design and innovation consulting firm IDEO worked as “design thinking” and introduced this concept to audiences that included more than just designers. In his book *Change by Design*, Brown (2009) portrayed design thinking as a loosely structured organizational process, based on a set of tools that fostered innovation, and advocated the use of design thinking by business people and social innovators who needed to solve abstract

and multifaceted problems. In a similar manner, Martin (2009) conceptualized design thinking as the interplay of analytical thinking and intuitive thinking. Building on the metaphor of the “knowledge funnel,” he described design thinking as a way of thinking that balanced both the exploration of new knowledge (innovation) and the exploitation of current knowledge (efficiency). Martin argued that this balance was what allowed businesses to systematically develop breakthrough innovations and to gain sustainable competitive advantages.

In support of these ideas about the relevance of design thinking for business and management, scholars started to provide evidence that design thinking could positively influence firm performance in terms of growth and profitability (e.g., Chiva & Alegre, 2009; Gemser & Leenders, 2001), stock market prices (e.g., Hertenstein, Platt, & Veryzer, 2005), and innovation capability (e.g., Filippetti, 2011; Menguc, Auh, & Yannopoulos, 2014). Furthermore, given its benefits for business performance, design thinking was promoted as a necessary skill for managers to possess (e.g., Boland, Collopy, Lyytinen, & Yoo, 2008; Kelley, 2001, 2005; Liedtka & Ogilvie, 2011; Martin, 2009). Thus, contrasting the “decision attitude” (typical of managers) to the “design attitude” (typical of designers), Boland et al. (2008) suggested that managers combine both attitudes when dealing with indeterminate organizational issues and when leading organizational change. Boland et al. argued that similar to designing, managing was rooted in intuition and synthesis and, thus, that managers could benefit from developing a design attitude that went beyond rational decision-making.

As a whole, then, extant research provides consistent evidence that design thinking may be beneficial for business and casts light on the increasing relevance of design thinking for the practice of management and management innovation (e.g., Brown & Martin, 2015; Cooper, Junginger, & Lockwood, 2009; Gruber, de Leon, George, & Thompson, 2015; Rauth, Carlgren, & Elmquist, 2015). Nevertheless, despite early theorizing suggesting that design might be best leveraged by “infusing it” into the fabrics of the organizations (e.g., Dumas & Mintzberg, 1989, 1991), we still lack an understanding of how design thinking, as a set of practices, might become an essential cultural component of organizations. That is, researchers have not made a focused attempt to understand how design thinking tools might relate (in both positive and negative ways) to the culture of organizations. Enhancing this understanding represents the main purpose of this review.

Boundary Conditions of Our Review

In the last decade, design thinking has been the subject of several review articles (i.e., Beckman & Barry, 2007; Garbuio, Dong, Lin, Tschang, & Lovallo, in press; Garbuio, Lovallo, Porac, & Dong, 2015; Glen, Suci, & Baughn, 2014; Hassi & Laakso, 2011; Johansson-Sköldberg, Woodilla, & Çetinkaya, 2013; Kimbell, 2011, 2012; Ravasi & Stigliani, 2012). These articles have taken a critical look at the growing discourse about design thinking in both the design and the management literatures (Hassi & Laakso, 2011; Johansson-Sköldberg et al., 2013; Kimbell, 2011, 2012; Ravasi & Stigliani, 2012) and have emphasized the positive implications of design thinking for innovation (Beckman & Barry, 2007), strategic option generation (Garbuio et al., 2015), and management education (Garbuio et al., in press; Glen et al., 2014).

Our review uses an approach distinct from all of these prior articles by taking a critical look at empirical evidence suggesting that design thinking could be leveraged as a cultural

component of organizations. To this end, we purposefully focus on scholarly, empirical research providing insight into how design thinking relates to organizational culture.² In particular, we selected articles for review on the basis of a combination of protocol-driven methodology (where the search strategy is defined at the beginning of the study on the basis of the purpose of the review) and of a “snowballing” technique (where the search strategy partly emerges as the study unfolds). Thus, we first looked for business and management research using the keywords “design thinking” and “organizations” (i.e., through databases such as EBSCO Business Source, JSTOR, and PsycInfo) over a time span from 1995 to 2017 (the time frame in which we found most empirical research on design thinking in organizations to be published). We then extended our search over this time span to prominent journals in the fields of design management (e.g., *Design Management Journal*) and design studies (e.g., *Design Issues*, *Design Studies*) not captured by our initial search. Given our focus on empirical research that relates design thinking to organizational culture, we then filtered this set of articles for those that included empirical data (e.g., case studies, interviews) that mentioned some aspects of organizational culture (i.e., keywords such as “cultural values,” “norms,” or “assumptions”).

This search process led us to identify and review 86 empirical articles (i.e., including data in the form of case studies, surveys, interviews, and archival documents) that related design thinking and culture.³ This large number of empirical studies is unique to our review and contrasts with extant reviews that have included a minority of empirical studies (e.g., the review by Johansson-Sköldberg et al., 2013, includes 19 articles out of 100 reviewed that were classified, in whole or part, as “empirical” or “case study”).

Appendix B in the supplemental material lists the 86 empirical articles included in our review, along with the study context and the type of evidence identified in each article, the type of evidence linking design thinking to culture in each article, and the specific links identified in each article. We used Web of Science to identify the primary research area covered by each of the journals included in our review (we used the journal’s home page description if it was not included in the Web of Science list). Using this methodology, as indicated in Appendix B, the articles in our review were sorted into the following categories: Business/Economics = 62; Art/Architecture = 15; Engineering = 3; Public Administration = 3; Environmental Sciences = 1; Education = 1; and Computer Science = 1. Finally, as shown in Appendix B, 79 of the articles in our review used case study methodology to examine a total of 299 cases, while the remaining 7 articles employed either survey or interview methods. In addition to these empirical articles, we examined 45 conceptual articles, essays, and books, shown in Appendix C in the supplemental material, to provide a broad overview of the field of design thinking.

In performing our review of empirical articles, we followed Rousseau, Manning, and Denyer’s (2008) approach of “synthesis by explanation,” which seeks to create explanations for phenomena by discerning patterns in published articles and, thus, does not look like a typical literature review. Because these empirical articles included, almost exclusively, case studies, the evidence we collected from our review includes, almost exclusively, qualitative quotes and excerpts of texts from these case studies, rather than numerical findings from statistical analysis (as is found in more quantitative studies). Furthermore, following Rousseau et al., we relied on the authors’ own interpretations and language in assessing findings, and we searched for general patterns across papers (rather than exact matches in findings) to develop insights. For example, in defining types of cultures that support design thinking, we rely on the authors’

own language (summarized as brief parenthetical definitions) in defining terms such as “user-centric” or “risk taking.” We discuss the primary insights revealed in our review next.

How Design Thinking Tools Relate to Organizational Culture: A Review of Empirical Research

Our review of design thinking research in organizational settings revealed three insights about the relationship between design thinking tools and organizational cultures. First, we found that the effective use of design thinking tools in organizations had a profound effect on organizational culture—where we define organizational culture as comprising the underlying norms, values, and assumptions that define the “right way” to behave in an organization (Schein, 2010). Thus, we found that the use of specific design thinking tools (e.g., experimentation or prototyping) helped in the development and support of specific types of organizational cultures (e.g., cultures defined by values, norms, or assumptions related to experimentation or openness to failure).

Second, and in a reciprocal manner, we found that organizational cultures influenced (both positively and negatively) the use of design thinking tools. Thus, we found that cultures that were defined by values, norms, and assumptions such as collaboration and experimentation supported the use of specific design thinking tools (i.e., tools of prototyping, cocreation, and customer journey mapping), while contrasting cultures defined by productivity, performance, and siloed specialization impeded the use of these tools.

Together, these first two findings suggest a recursive relationship between the use of design thinking tools and the development of cultural values, norms, and assumptions. That is, our findings suggest that causality runs in both directions between the use of tools and the development of culture. In this way, our findings bring together research on cultural change (Trice & Beyer, 1984) and “cultural fit” (Ansari, Fiss, & Zajac, 2010; Schein, 2010) by suggesting that work practices may both change organizational cultures and be adapted to fit preexisting cultures. Thus, they support Canato, Ravasi, and Phillips’s recent argument that there exists a “recursive relationship between organizational practices—understood as patterns of day-to-day activities (what people do)—and culture—understood as a set of beliefs that people use to make and give sense of what they do” (2013: 1749).

Third and finally, we found that using design thinking tools produced both physical artifacts (e.g., prototypes, drawings, design spaces) and emotional experiences (e.g., the experience of empathy or surprise/delight), and that reflecting on these artifacts and emotional experiences helped organizational members to understand why and how design thinking tools were effectively used in their organizations. As a result, these artifacts and emotional experiences were instrumental in linking design thinking tools and organizational cultures. We review evidence of these three insights in the following sections.

The Use of Specific Design Thinking Tools Supports Specific Organizational Cultures

There are perceived values and effects of working with DT [design thinking] in an organization that go beyond innovative output per se. What is missing from the DT literature are aspects such as the feeling of democratization, and the more social aspects of companies being more open to different personalities; how it helps people connect with like-minded individuals, and the impact

on norms and culture, and reducing unhealthy cultural elements that can hinder design and innovation. (Carlgren, Elmquist, & Rauth, 2014: 418)

In support of the above quote, our review revealed 33 empirical studies showing that the use of design thinking tools in organizations does more than solve specific design and innovation problems. We found that using such tools may have a significant influence on the cultures of the organizations in which they are used by affecting the norms, values, and underlying assumptions about the right way to work in those organizations.

To understand the influence of design thinking tools on organizational culture, we must first define the different types of tools we encountered. In general, the design thinking tools encountered in our review fell into three categories, which follow a framework discussed by Seidel and Fixson (2013). These categories were (1) needfinding tools (i.e., tools such as ethnographic observations, in-depth contextual interviews, or customer journeys used to empathize with and understand the needs of end users), (2) idea-generation tools (i.e., tools such as brainstorming and cocreation/codesign used to generate possible solutions to problems), and (3) idea-testing tools (i.e., tools such as rapid prototyping and experimentation used to test ideas on a small scale to determine their desirability, technical feasibility, and business viability). We define these tools in more detail in Appendix A, Table A1 in the supplemental material.

As we discuss next, our review revealed that each of these types of tools influenced the specific norms, values, or underlying assumptions that composed the cultures of the organizations where they were used.

Needfinding tools contribute to user-centric cultures. Needfinding has been defined as “a set of activities for determining the requirements for a novel concept, drawing on a user-focused framework” (Seidel & Fixson, 2013: 20). Needfinding tools typically included in-depth contextual interviews with potential users of a design solution (e.g., interviewing potential customers of a ride-sharing service), ethnography (e.g., observing and shadowing employees of a firm to develop initial requirements for a new human resource management system), or developing a holistic understanding of user experience through customer journey mapping (e.g., engaging in an actual customer experience to better understand its strengths and weaknesses, such as flying with a certain airline prior to redesigning their on-board customer experience).

A common feature of these tools is that they require individuals to empathetically engage in learning about the user experience. As a result, we found numerous cases suggesting that using these tools contributed to the development of organizational cultures that were user-centric (i.e., focused on the needs of users, first and foremost; e.g., Bailey, 2012; Beverland, Wilner, & Micheli, 2015; Deserti & Rizzo, 2013; Kleinsmann & Valkenburg, 2008; Kumar, Lodha, Mahalingam, Prasad, & Sahasranaman, 2016; Liedtka, 2014b; Price & Wrigley, 2016; Rau, Zbiek, & Jonas, 2017; Smith, 2015).

For example, in their study of Deutsche Bank’s incorporation of design thinking in their information technology (IT) division, Vetterli, Uebernickel, Brenner, Petrie, and Stermann discussed how customer journey mapping helped employees to better understand the customer experience, which led to a more customer-centric focus throughout the firm:

Inferring concrete actions from the end-customer’s journey helped the IT division to more holistically understand the customer’s situation (motivation, beliefs, triggers), which meant it

could see things from the end customer's perspective, not just from Deutsche Bank's perspective. This holistic view ensured that customer-centricity was institutionalized throughout the complete design thinking cycle for innovation projects. (2016: 46)

Further, Vetterli et al. indicate that over time, the user-centric focus became integrated into the *basic, underlying assumptions about the right way to work* (a primary component of organizational culture according to Schein, 2010). In this case, the basic assumption that changed was related to the importance of including the customer perspectives in new projects at Deutsche Bank:

Diffusing design thinking as a customer-centric approach into regular project structures took six years. However, the experience of using design thinking over time helped to position the approach as a dominant way of challenging long-held assumptions. As a member of the innovation community stated, "design thinking helped our team to constantly challenge the assumptions that we had built over the years; now, finally, we know that design thinking guarantees the continuous integration of the customer's perspective in every project." (Vetterli et al., 2016: 48)

In another case study of design thinking integration into the Australian taxation office, Body (2008) describes how design tools such as customer journey mapping and in-depth interviews with users led employees to want design to be part of the decision-making process and basis for organizational culture. As one top manager reported about the integration of design thinking tools into the organization:

Establishing a design capability in an organization is not simply a matter of bringing in some designers. We wanted to build a sustainable capability, but to do this we had to establish several dimensions. Supporting the whole initiative, we needed a continuously developing knowledge base of design. This included the techniques, methods, case studies, skills, and induction programs. It also included the technical tools to store and share information about design. (Body, 2008: 60)

In turn, the taxation office developed a number of new roles that were to employ these design thinking tools, including "user researchers" who were assigned to perform "contextual research to identify the strategic context for design and the key user segments" (Body, 2008: 61). As a result of these new tools and roles, the taxation office developed a number of new principles that defined their evolving culture as more user-centric:

We are committed to taking a user-centered approach, creating products and services that are easier, cheaper, and more personalized. . . . We are committed to working collaboratively in interdisciplinary teams ensuring that changes to the tax system are fully integrated. . . . We are committed to mapping the user pathway and other layers of design upfront to create a coherent blueprint for change. . . . We are committed to building a shared understanding of intent, ensuring that, when change is implemented, the user experience reflects that intent. (Body, 2008: 62-63)

Additional examples of these types of influences of needfinding tools on organizational culture are given in Appendix D, Table D1 in the supplemental material.

Idea-generation tools contribute to cultures of openness to ambiguity, risk taking, and collaboration. In the studies in our review, idea generation was primarily accomplished through the tools of group brainstorming and customer cocreation/codesign of initial ideas.

In terms of brainstorming, Osborn (1957) identified four rules in his initial conception of this process: (1) offer all ideas that come to mind, no matter how wild; (2) no criticizing of ideas; (3) shoot for quantity of ideas; and (4) combine and build on ideas given. While experimental studies of brainstorming have provided mixed reviews of its effectiveness for idea generation (Paulus & Nijsted, 2003), other research suggests that when employed in a field setting, the technique can be effective in generating creative ideas when used as part of a larger design thinking approach (Litchfield, 2008; Sutton & Hargadon, 1996).

In our review, we found evidence suggesting that the use of brainstorming for idea generation supported the development of organizational cultures defined by openness to ambiguity and risk taking (i.e., willing to work without an initial clear direction and willing to take on projects that lack high probabilities of success; Body, 2008; Hoyt & Sutton, 2016; Kimbell, 2015; Liedtka, 2014a; Sutton & Hargadon, 1996; Wattanasupachoke, 2012). For example, in their study of design thinking used by the San Francisco Opera (SFO), Hoyt and Sutton (2016) described how the use of brainstorming with people outside of the opera world—including organizers of an experimental theater, a youth program director, and a venture capitalist—led to the development of an idea for a new type of opera event:

These conversations energized the SFO team, who realized that they usually communicated and learned from within the opera community. . . . The group brainstormed . . . and began to conceive a dramatic new prototype that would enable them to attract a new, younger audience. (4)

To further refine this idea, the SFO staff gathered feedback from the general public by creating a few interactive experiences based on their original brainstorm. This interaction helped them to better understand potential customers and their preferences. As Hoyt and Sutton reported:

To gain insights into audience perceptions, SFO team members approached strangers near San Francisco's Ferry Building and asked if they would be willing to give 5-10 minutes of their time for some feedback. Once they agreed, they were given tickets and told to walk through some imaginary doors. . . . This exercise taught the team that people in different age groups have very different needs, and also that there's much variability within age groups. For instance, among people in their 30s, parents were vastly different than singles. They also learned that audience involvement . . . was far more powerful than previously anticipated. (2016: 4)

These types of idea-generation tactics led the SFO team to depart from a "drive for perfection ingrained in its culture" (Hoyt & Sutton, 2016: 3) and move toward a "liberated" culture that was open to ambiguity and risk taking. Furthermore, this culture was made evident through the use of physical artifacts, such as a quick mock-up of a website and logo that made visible the new emphasis on risk taking. Thus, Hoyt and Sutton describe how, in a few hours, the team came up with a new form of "pop-up" opera through brainstorming:

They came up with a name, Barely Opera, at a brainstorming session 10 days before the event, involving all 20 people from the teams. . . . As soon as the name was chosen, the engagement team bought a URL, developed a website, created a logo—all within a few hours, and without having to go through the approval process normally required for decisions at the opera. The SFO teams found this autonomy liberating. (2016: 5)

Over time, project leaders from the SFO noted how such cultural changes had infiltrated the entire organization, making it an organization that was much more open to change.

In terms of cocreation, Deserti and Rizzo (2013) described how, at the toy company LEGO, this needfinding tool was used to build a new “Technic 30” line of toys in collaboration with their customers. As Deserti and Rizzo report, working closely with these customers required some changes in the company’s approach to innovation:

Accepting this new relationship with the customer base meant that LEGO needed to change its philosophy and approach to innovation processes, moving from a model in which innovation is created by internal functions (e.g., R&D and Marketing) to a model of open innovation strongly based on interactions with a community of hackers, developers, and designers who were literate in LEGO products and technically competent. (47)

In turn, using cocreation as a design thinking tool led to changes in the underlying values and basic assumptions that defined LEGO’s culture. In particular, it led designers to be open to risk taking (being less protective of ideas) and to working with customers as collaborators. As Deserti and Rizzo report:

The case perfectly shows the potential effect of a new product development process on the culture of a company: In this case, a dramatic shift occurred, from the traditional protection of copyright and intellectual property toward open innovation and co-creation practices. The value of co-creation at LEGO cannot be related to the traditional concept of customization. Instead, it has much more to do with a series of changes at the company: in the mentality and mind-set of its management. (2013: 47)

Additional examples of these types of influences of idea-generation tools on organizational culture are given in Appendix D, Table D1 in the supplemental material.

Idea-testing tools contribute to cultures of openness to experimentation, openness to failure, and design-oriented strategic thinking. Idea-testing tools in our review included rapid prototyping (i.e., developing quick and dirty models on a small scale to test ideas) and experimentation (i.e., testing some parts of a solution with actual users or internal testers). A number of empirical studies suggested that the use of these tools supported the development of organizational cultures focused on experimentation, openness to failure, and design-oriented strategic thinking (i.e., defined by a willingness to try new things and fail and by thinking of design processes as part of the overall strategy of the firm; Michlewski, 2008; Rauth et al., 2015; Steen, Buijs, & Williams, 2014; Vetterli et al., 2016; Yoo & Kim, 2015).

For example, Yoo and Kim described how the CEO of electronics giant Samsung used design thinking in the mid-1990s to change the innovation capabilities of the firm:

In 1996, Lee Kun-Hee, the chairman of Samsung Group, grew frustrated by the company’s lack of innovation and concluded that in order to become a top brand, Samsung needed expertise in design, which he believed would become “the ultimate battleground for global competition in the 21st century.” He set out to create a design-focused culture that would support world-class innovation. (2015: 76)

Achieving this goal, however, was not easy in a company that had an existing culture focused on efficiency and engineering perfection. Furthermore, this was an organization where designers had not been an important part of the staff and were seen as lower status compared

to managers and engineers. In this culture, the CEO needed to help engineers and business managers to “see” how design thinking could improve their products. In this way, the use of prototypes proved to be an effective tactic for testing the idea of their new Galaxy Note smartphone. As Yoo and Kim reported:

If [designers] want to persuade decision makers to take a chance on their radical visions of the future, they need to adopt a managerial mindset. Visualization is a powerful tool for bridging the two ways of thinking and getting skeptics to support new ideas. . . . [As the CEO noted,] “The development of the Galaxy Note provides a case in point. . . . People told us, ‘It won’t sell.’ ‘You cannot hold it in your hand.’ ‘How can you put that thing next to your face?’” . . . The team was able to prevail by reframing the conversation: It prepared a mock-up of the product demonstrating what eventually became the widely imitated “smart cover,” which connects with the user-experience software to display an interactive screen when the cover is closed. The mock-up looked more like a pocket diary, and those present at the design review realized that when it was thought of in that way, the new phone did not look so big. (78)

The elevation of designers’ status in the organization also enabled them to begin to change the mind-set of the firm to be more open to experimentation and design-led strategic thinking. As Yoo and Kim noted, “The designers also developed a capacity for strategic thinking and a tenacity that enabled them to overcome resistance [from other parts of the firm] over the long term” (2015: 77). This shift led, over time, to a new strategic and innovation-focused culture at Samsung that became evident not just in the customs of the firm but also in the development of a Corporate Design Center that holds strategic meetings focused on envisioning Samsung’s future.

In a similar way, Carlgren et al. (2014) described how the use of rapid prototyping was central to changing the cultures of several companies they studied in the United States and Germany. For example, in one firm, an employee who had used rapid prototyping to get quick feedback from clients remarked how this tool opened her eyes to learning:

You build something and then the user will say oh this sucks, but that, I like, and you are like oh OK. It goes completely against your own, your own pace or whatever you want to call it. So . . . you end up with ideas and concepts and observations that are not, they are really different from where you started, so that is usually a good surprise, because you learn things. (Carlgren et al., 2014: 413)

In turn, this type of experience slowly changed the culture of the firm to being more open to experimentation and failure. As Carlgren et al. reported, “The use of DT was perceived to contribute to people becoming less risk-averse, and to diffuse the idea of failure as sometimes acceptable and awkward ideas as something valuable” (2014: 415). Additional examples of these types of influences of idea-testing tools on organizational culture are given in Appendix D, Table D1 in the supplemental material.

Summary. Our review of empirical studies that linked the use of design thinking tools to organizational cultures suggests that using specific tools supports the development of specific values, norms, and assumptions that formed (and influenced) the foundation of organizational culture. In particular, we found evidence that the use of needfinding tools, such as ethnographic interviews and customer journey mapping, supported the development of

cultures defined by the value of user focus. We also found evidence that the use of idea-generation tools, such as brainstorming and cocreation/codesign, supported the development of cultures defined by norms of collaboration, risk taking, and ambiguity. Finally, we found evidence that the use of idea-testing tools, such as rapid prototyping and experimentation, supported the development of cultures defined by the values of experimentation, learning from failure, and design-led strategic thinking. In the following sections, we describe additional evidence from our review that suggests a reciprocal relationship between design thinking tools and organizational cultures.

Organizational Cultures Support or Impede Specific Design Thinking Tools

Our review provides evidence that organizational cultures defined by specific values, norms, and underlying assumptions support the use of specific design thinking tools. Furthermore, these relationships appear reciprocal to those described in the previous sections. Thus, as shown in Appendix B in the supplemental material, we identified 38 empirical studies showing evidence that cultures defined by values of collaboration and experimentation supported the use of design thinking tools. Conversely, we identified 25 empirical studies showing evidence that cultural values, norms, or assumptions related to productivity, performance, and siloed specialization inhibited the use of these design thinking tools.

Cultures that support the use of design thinking tools. First, our review indicates that the use of design thinking tools may be supported by organizational cultures that value collaboration with users (e.g., Body, 2008; Boland et al., 2008; Chen & Venkatesh, 2013; Kolko, 2015; Michlewski, 2008; Stigliani & Ravasi, 2012; Tischler, 2009; Wilkie, Gaver, Hemment, & Giannachi, 2010). One of these examples involved Chen and Venkatesh's (2013) comparative case study of 13 firms that introduced design thinking into their marketing departments. This study showed that several of these organizations cultivated what they called "organic" cultures, which were defined by flexibility and the free flow of ideas between different functional groups, as well as between users and marketers. As one of Chen and Venkatesh's informants described the collaborative culture of his organization:

You don't have any sort of structure where you can't go talk to the boss or talk to anyone so it's a very family kind of knit organisation, which allows you to accomplish a lot. Everyone here is given a lot of tasks and a lot of responsibility. It migrates into different areas which is beneficial for a lot of the projects we work on. (1690)

Chen and Venkatesh suggested that as a result of this collaborative culture, these organizations supported the use of design thinking tools, including cross-functional collaborations and user cocreation:

Overall, these findings provide evidence that organic, organisational forms enhance design thinking. . . . The breakdown of barriers between disparate organisational functions allows for cross-pollination of ideas and solutions, a key ingredient for innovative design thinking. (1690)

Second, our review indicates that cultures defined by norms and values related to experimentation may also support the use of many design thinking tools (Bicen & Johnson, 2015; Candi & Saemundsson, 2008; Ewenstein & Whyte, 2007; Hargadon & Sutton, 1997; Kimbell,

2015; Kolko, 2015; Stigliani & Ravasi, 2012). For example, in their study of the design firm Continuum, Stigliani and Ravasi (2012) found that the firm's culture—which was defined by the assumption that experimentation was a normal part of the innovation process—led the firm to use rapid prototyping tools including thumbnailing (small freehand drawings by individuals), group sketching (working as a group on a larger drawing), and the creation of story boards (creating a story of a proposed solution through collections of visuals and text). As Stigliani and Ravasi reported about the use of “thumbnailing” as a form of prototyping:

Our informants considered the production of thumbnails—or thumbnailing—an early step in the elaboration of ill-formed ideas, preceding the attempt to give these ideas verbal expression, and used them as “building blocks” to develop more refined interpretations. As an informant insightfully put it, thumbnails allowed them to combine cues, which had been “sitting in the back of their minds,” into tentative ideas and helped them “capture” these ideas before they were “lost” in the flow of thoughts. (1246)

Furthermore, they noted how these “thumbnail” ideas flowed from the assumption that experimentation was a normal part of the innovation process. As one of Stigliani and Ravasi's informants put it:

In the end, there are a lot of good ideas, and I think there's a lot of ways that we could have solved this problem. We could have probably picked any of those big ideas and done a different version of it, but to me the idea isn't as important to the client or to me as the whole story of “Why that idea?” (HR, Strategy Group). (1247)

Similarly, in their study of 10 start-up firms, Bicen and Johnson (2015: 286) found that the most successful of these firms subscribed to a similar set of underlying assumptions about innovation, including the assumption that innovation requires experimentation. In turn, their analyses suggest that this assumption led, naturally and necessarily, to the use of the design thinking tools of experimentation and rapid prototyping. Additional examples of organizational cultures that support the use of design thinking tools are given in Appendix D, Table D2 in the supplemental material.

Together, the above evidence suggests that there is a reciprocal and reinforcing relationship between organizational cultures and the use of design thinking tools. That is, the use of design thinking tools supports the development of specific organizational cultures, which in turn further support the use of these tools, as well as encouraging the development of new versions of these tools. These reciprocal and reinforcing relationships between design thinking tools and culture were discussed in many of the studies in our review. As Bailey noted in his study of design thinking at one firm:

[The firm] aims to embed [design thinking] as the norm across the institute. In this way the organisation is validating the use of the new design-led processes. . . . [In turn,] when staff are confident in applying design thinking and the use of design tools they will naturally begin to re-interpret and re-design the tools and the application of them as required to fit new situations. At this point, staff members are no longer following guidelines but responding to the needs of each situation, adapting and designing the tools they will need and how they will be used to achieve a proposed outcome. (2012: 37-38)

Cultures that impede the use of design thinking tools. In contrast to the organizational cultures described above, we found a number of studies suggesting that cultures defined by values and norms of productivity, quantitative performance, and siloed specialization could impede the use of design thinking tools (e.g., Berk, 2009; Boland et al., 2008; Chang, Kim, & Joo, 2013; Goffin & Micheli, 2010; Lee & Evans, 2012; Veryzer, 2002). For instance, in another study of culture change at electronics giant Samsung, Chang et al. (2013) describe how initial attempts to implement collaboration and cocreation between intuitive thinkers (e.g., designers) and analytical thinkers (e.g., engineers) failed. The authors attribute this failure to the presence of a culture defined by siloed specialization (instead of cross-functional collaboration). As Chang et al. explain:

Nurturing a collaborative culture was challenging, however, because the intuitive team and the analytic team tended to perform the same task in dramatically different ways. Therefore, firms that select this path often experience the so-called “illusion of design thinking,” in which creativity is sacrificed for efficiency and inter-team balance is not established or maintained. . . . The forced collaboration produced challenging decision-making conflicts—the types of conflicts that are difficult to resolve without a moderator. Instead, decisions were made exclusively by the intuitive team or exclusively by the analytic team. This issue explains why Samsung has performed well in design awards, but has not yet introduced an iconic product like the iPhone. (30)

Similarly, in their cross-case study of design thinking at six large firms, Rauth et al. (2015) explain how in organizations with a numbers-driven culture of productivity, the implementation of design thinking tools proved challenging to firms whose cultures valued productivity over innovation. As they noted about one such firm, “Some interviewees also mentioned that managers and co-workers perceived the focus on having fun as a signal that DT was not ‘serious’” (50). In addition, Rauth et al. reported, “Even though interviewees acknowledged that DT would speed up later stages of the development process, they reported a perception that it might extend early project phases, mainly due to the use of ethnographic studies” (50). Clearly, in these cases, the tools of design thinking did not fit with the cultural assumptions, values, and norms in place.

Finally, in a case study of the iconic apparel firm Levi’s, Lester, Piore, and Malek (1997) described how organizational culture may have impeded the use of design thinking tools of codesign and experimentation in the late 1990s. As Lester et al. describe, these tools were critical to staying on top of emerging trends in the industry:

Getting jeans with the desired features into retail stores in a timely manner requires close and continual collaboration among the designers and manufacturers of the garment, the textile mills that supply the denim, the laundries that perform the finishing, and the machine shops that produce the equipment used by the laundries. Experimentation with new techniques is constant, both to create new effects and to reproduce effects already achieved in other ways. . . . The combination of changes in fabrics, techniques, and equipment can itself produce new and unexpected effects, leading to further discovery, further experimentation, and further change. (91)

At the same time, Lester et al. describe how the overly formalized and performance-oriented culture of Levi’s may have impeded the use of such design thinking tools:

Why did Levi's miss the emerging trend [in jeans fabric choices]? One reason may be that its fast-growing fashion-jeans division has become more structured and formal and has lost some of its earlier flexibility and receptivity to new fashion ideas. (1997: 93)

Additional examples of organizational cultures that undermine the use of design thinking tools are given in Appendix D, Table D2 in the supplemental material.

Summary. Our above review provides evidence that organizational cultures defined by values, norms, and assumptions related to collaboration and experimentation (what we call "design thinking cultures") supported the use of design thinking tools, while cultures defined by values and assumptions related to productivity, performance, and siloed specialization (what might be thought of as more traditional corporate cultures) impeded the use of these tools. These findings suggest a reciprocal or mutually supportive relationship between design thinking tools and design thinking cultures. In our next section, we discuss findings that reveal how using design thinking tools produced both physical artifacts and emotional experiences that helped users to understand how and why using these tools was effective and, thus, helped them to conceptualize design thinking cultures.

Physical Artifacts and Emotional Experiences Help Reveal How and Why Design Thinking Tools Are Effective

A final finding of our review was that both physical artifacts and emotional experiences that resulted from the use of design thinking tools were important in revealing to organizational members how and why design thinking tools were useful in solving organizational problems. In particular, physical artifacts and emotional experiences helped organizational members to understand the types of cultural contexts in which these tools could be effective. In this manner, these artifacts and emotions helped to reveal what design thinking cultures looked like.

Physical artifacts and design thinking cultures. As shown in Appendix B in the supplemental material, our review identified 22 empirical studies in which physical artifacts (e.g., drawings, prototypes, and physical design spaces) resulted from the use of design thinking tools (Boland et al., 2008; Breslin, 2008; Candi & Saemundsson, 2008; Ewenstein & Whyte, 2007; Kolko, 2015; Seidel & O'Mahony, 2014; Stephens & Boland, 2015; Terrey, 2009; Yoo & Kim, 2015). Findings from studies also indicate that the presence of such physical artifacts helped to reveal to organizational members the specific cultural values, norms, or assumptions that supported effective design thinking in their organizations.

For example, Kolko noted how the display of design prototypes, resulting from rapid prototyping, revealed a culture of exploration and experimentation to members of MIT's Media Lab:

The habit of publicly displaying rough prototypes hints at an open-minded culture, one that values exploration and experimentation over rule following. (2015: 69)

In turn, the lab's motto reinforced these cultural values. Thus, Kolko reported, "The MIT Media Lab formalizes this [culture] in its motto, 'Demo or die'" (69).

One of the key dimensions of such physical prototypes is that they are tangibly experienced by employees, making the cultures that supported design thinking concrete for these

employees. For example, in their study of design thinking at an architectural firm, Ewenstein and Whyte (2007) described how the use of hand drawings helped to communicate dimensions of design solutions that were deeper and more contextual than computer printouts. As one designer in Ewenstein and Whyte's study noted:

Certain things come out of these types of drawings: where you get intensities of colouring because it's been highlighted as important, and people have drawn it several times, or something like that. Through that you get a kind of texture or feeling looking at that drawing, of something more than just "well, there's a line here." Which is what is on the [computer] drawing besides it. And somehow in the translation between this and this [pointing from hand drawing to computer drawing], something's lost. The function will be the same, in that this is a building and this some kind of boundary or something around it. But the actual things that you can start to read into this, which are suggestions of surface texture or a sense of space or tightness or whatever, that start to be suggested by this drawing, really very often are lost into this [emphasis added]. (703)

In turn, this deeper communication of design solutions through hand drawing helped to reveal the cultural assumption that "knowledge comes from people" and their accumulated experience, not from formal documentation of prior projects (Ewenstein & Whyte, 2007: 698). Such assumptions support a culture that values human-centeredness and collaboration.

A similar use of hand drawings was noted in a number of other studies. For example, in a study of the Frank O. Gehry design firm, drawings were used to communicate the iterative nature of their design process, which revealed the cultural assumption that good design requires exploration and experimentation (Boland et al., 2008). In the same vein, in a study of design thinking in a U.K. Policy Lab, Kimbell described how the use of hand drawings helped to reveal the value of collaboration among participants, which then became reinforced through the use of these drawings:

Inviting a group of policy officials from the Cabinet Office to draw rather than speak their ideas enabled participants to work in a different way. Since few civil servants claim to have expertise in drawing, this equalised participants and enabled them to share and build on each other's ideas. . . . But then it was actually quite effective and powerful. Particularly for a couple of members of the team who are not very comfortable speaking out in a group. . . . – Deputy Director, Cabinet Office. (2015: 70)

In addition, there were a few cases in which the presence of physical design spaces (e.g., new design labs or buildings) revealed cultural values of collaboration and learning (Mutanen, 2008; Rauth et al., 2015; Stigliani & Ravasi, 2012). For example, in their comparative case study of design thinking implementation across firms, Rauth et al. (2015) found that the creation of dedicated design spaces, with room for creating and displaying prototypes and interview transcripts, was important to revealing values of experimentation and learning that underlay the firms' cultures. As Rauth et al. reported in regard to one firm:

Interviewees reported the importance of creating dedicated DT spaces. These spaces had a start-up feel and a flexible interior that allowed for DT activities and facilitated group work. For example, the space needed to provide material and tools for prototyping and allow participants to display interview results as well as other gathered information. This was usually done through

the installation of big whiteboards (or walls painted in a special whiteboard color) and with furniture that could be flexibly arranged. As such, the physical space was seen as contrasting to established, sometimes cubical, workspaces. (54)

Additional examples of physical artifacts that result from design thinking tools and reveal design thinking cultures are given in Appendix D, Table D3 in the supplemental material.

Emotional experiences and design thinking culture. In addition to the presence of physical artifacts, as shown in Appendix B in the supplemental material, our review identified 18 empirical studies showing evidence that the experience of emotion resulted from the use of design thinking tools and also helped to reveal the underlying values, norms, and assumptions of design thinking cultures (e.g., Borja de Mozota & Kim, 2009; Ewenstein & Whyte, 2007; Hargadon & Sutton, 1997; Kimbell, 2015; Nixon & Rieple, 2010; Smith, 2015). These emotional experiences were primarily in the form of feelings of empathy or surprise/delight.

Experiences of empathy were most often viewed as key signals of a culture based on collaboration and user-centricity. For example, in Ewenstein and Whyte's (2007) study of design thinking implemented at an architectural firm, the authors describe how empathy helped newly hired designers understand the cultural values and "shared sensibilities" of the firm. As one informant reported:

I think it's true that there is a set of shared sensibilities. Because firstly, in any kind of design practice which has a body of work, people are going to decide that they want to go and work there, having seen the body of work. So there's going to be an empathy with the work even though there's people's own adaptation of that work. (Ewenstein & Whyte, 2007: 704)

Similarly, in his study of Intuit's implementation of design thinking, Smith describes how "Intuit's approach to design thinking, [was] based on deep customer empathy, idea generation, and experimentation" (2015: 38), which reinforced their values of collaboration. Finally, Kolko (2015) explains how organizations that deeply understand design thinking encourage employees in all functions (and not only in the customer-facing ones) to focus on empathy with users. Kolko argues that in these organizations, designers "discuss the emotional resonance of a value proposition [with users] as much as they discuss utility and product requirements" (68).

Emotions of surprise and delight, by contrast, were viewed as signals of a culture that valued experimentation (Carlgren et al., 2014; Kolko, 2015; Michlewski, 2008; Miller & Moultrie, 2013). For example, in their study of design thinking implementation at a number of firms, Carlgren et al. (2014) found that the use of rapid prototyping and the surprise that came from feedback from customers was affirming to the values of experimentation and innovation.

In a similar manner, Michlewski (2008) found that senior designers at firms that used design thinking approaches discovered that experiencing delight was important to revealing a culture of innovation and experimentation that was critical to their success. Furthermore, this experience of emotion was related to interaction with physical prototypes. An informant in the Michlewski study compared this experience of emotion with prototypes to what happens when you look at a traditional PowerPoint presentation:

[A traditional PowerPoint presentation] can be interesting, it can be intelligent and it can be inspiring in a way that you're projecting into the future, but when you look at [a design prototype] that's just wonderful and it makes you smile or makes you laugh, or just excites you—that transcends that kind of rational thinking. And it's the hardest thing to achieve but it's the most gratifying (senior designer). (379)

Additional examples of emotions that result from design thinking tools and reveal design thinking cultures are given in Appendix D, Table D3 in the supplemental material.

Summary. Our above review provides evidence that the presence of physical artifacts (e.g., prototypes, drawings, design spaces) and emotional experiences (e.g., feelings of empathy, surprise, delight) that resulted from the use of design thinking tools were important in revealing dimensions of design thinking cultures. Together, these findings, along with those reviewed in the previous sections, suggest that the use of design thinking tools and the development of organizational cultures are intertwined in important ways. In the following sections, we develop a framework summarizing these insights. We conclude with some directions for future research motivated by this framework.

A Framework for Organizing Research on Design Thinking in Organizations

In general, our review suggests that the use of design thinking tools and the development of design thinking cultures in organizations are mutually supportive. We posit that this mutual support may reflect the *experiential nature* of design thinking tools and cultures—where we define “experiential” in terms of the experiential learning cycle (Kolb, 2014), which suggests that real-life experiences are central to learning.

Our argument is in line with the idea of design as an inherently reflective practice (Schön, 1983), which emphasizes the experiential, dynamic, cyclic, and unfolding nature of the way designers work—also referred to as “reflection in action.” Previous works both in design and in management have, indeed, applied the experiential learning model at the team level to illustrate how teams of designers develop collective understandings about the design problem and the design solution (e.g., Stumpf & McDonnell, 2002; Valkenburg & Dorst, 1998) and how they can innovate more successfully (Beckman & Barry, 2007).

We build on these previous works by using the experiential learning cycle to show the recursive and mutually reinforcing relationship between the team level, where design thinking tools are used, and the organizational level, where cultural norms and beliefs are held. In other words, we suggest (and explain in more detail below) that experiential learning may be a critical process relating the use of design thinking tools and the development of design thinking cultures in organizations. As a result, we suggest that an experiential learning perspective may help to organize our review findings and provide a foundation for future research (discussed later).⁴ Furthermore, we argue that this perspective follows from the unique dimensions of design thinking tools and cultures that make them different from other management tools (e.g., quantitative analyses, such as forecasting or SWOT analysis, which stands for strengths, weaknesses, opportunities, and threats analysis) and cultures (based on values for productivity or efficiency).

The Experiential Learning Cycle and Organizational Culture

Experiential learning frameworks (Kolb, 2014) describe learning as a cycle that begins with a real-life experience along with feedback about that experience (e.g., trying to use a new computer program and being unable to launch the program). Because this experience and feedback often relate to an individual's goal attainment (Finch, Peacock, Lazdowski, & Hwang, 2015), it may also lead to the experience of emotion (e.g., feeling frustrated by not being able to launch the program). In addition to experiencing emotion, the experience is followed by reflection about the experience (e.g., thinking that the computer program was not intuitive and, thus, hard to launch without reading directions carefully), which then leads to general theorizing about the experience (e.g., concluding that most people expect computer programs to be intuitive and not require reading of directions). The final phase of the cycle involves testing one's general theory and modifying it on the basis of this test (e.g., asking colleagues about other computer programs that have been recommended and finding that most are intuitive, thus verifying one's general theory). The cycle begins again with a new experience (e.g., trying to use another new computer program).

Experiential learning processes have been argued to promote the development of general theories about phenomena because they help individuals to better understand *why* experiences occurred (Ng, Van Dyne, & Ang, 2009). Furthermore, if experiential learning takes place in organizational settings, scholars suggest that it may lead to changes in understanding "rules for action" in organizations that help individuals to develop general theories related to organizational culture (Hendry, 1996: 628). In support of this notion, scholars have defined organizational cultures as general theories about the "right way to do things" in organizations on the basis of repeated experiences in the organization over time (Schein, 2010).

Relating Design Thinking Tools and Culture Via Experiential Learning

We suggest that the experiential learning cycle might describe the relationship between the use of design thinking tools and the development of organizational cultures that we discovered in our review. Thus, we suggest that the effective use of specific design thinking tools (e.g., using rapid prototyping and customer journeys to test a new boarding process for airline customers) constitutes the first stage in the experiential learning cycle (i.e., a real-life experience along with feedback about that experience). Next, we suggest that aided by the presence of both physical artifacts and emotional experiences that result from the use of design thinking tools, designers may engage in the second stage of the learning cycle (i.e., reflecting on their experience from Stage 1). In this stage, physical artifacts such as prototypes and emotional experiences such as feelings of empathy with users provide tokens of experience on which they may reflect to understand *why* design thinking tools were effective in solving a specific problem (e.g., using prototypes of electronic boarding cards that direct customers to their seats and tell airline staff when they are seated may lead to the reflection that the cards are easy to use and create empathy about the stress of boarding planes for most customers). Third, we suggest that on the basis of these reflections, designers may form a general theory about the right way to do things in the organization (e.g., customer journeys illuminate the stress customers feel about getting to their airline seats and suggest that reducing stress for customers is an important improvement

airlines can make in their service), which constitutes the third stage in the experiential learning cycle (adopting the cultural assumption that understanding customer views is important to organizational problem solving). Finally, testing of this general theory through the additional use of design thinking tools represents the fourth stage of the experiential learning cycle (e.g., using customer journeys and rapid prototyping to solve a different customer service problem). A general framework depicting this organization of our review findings is given in Figure 1.

This framework is consistent with several observational studies describing the experiential and empathetic way in which designers solve problems through design thinking (e.g., Boland et al. 2008; Ewenstein & Whyte, 2007; Lawson, 2004, 2006; Michlewski, 2008; Schön, 1983) and confirms some of the insights in related theoretical frameworks. For example, when describing design as “thinking by doing,” Lawson (2004, 2006) explains how designers are able to understand things about their clients, their users, and the problem at hand through actual experience with these phenomena. Similarly, in their study of Frank Gehry’s design practice, Boland et al. (2008) discussed how architects pointed to the physical engagement with concrete objects (models or real building sites) as a way to stimulate design insights. Finally, Michlewski’s (2008) study of design attitude presents designers’ ability to visualize and think through their drawings and their empathetic way of solving problems as deeply related to each other. Therefore, rather than being merely a way to represent design ideas, actively engaging with artifacts and empathizing with users play central roles in the way designers experience problems and develop solutions to those problems (Ewenstein & Whyte, 2007).

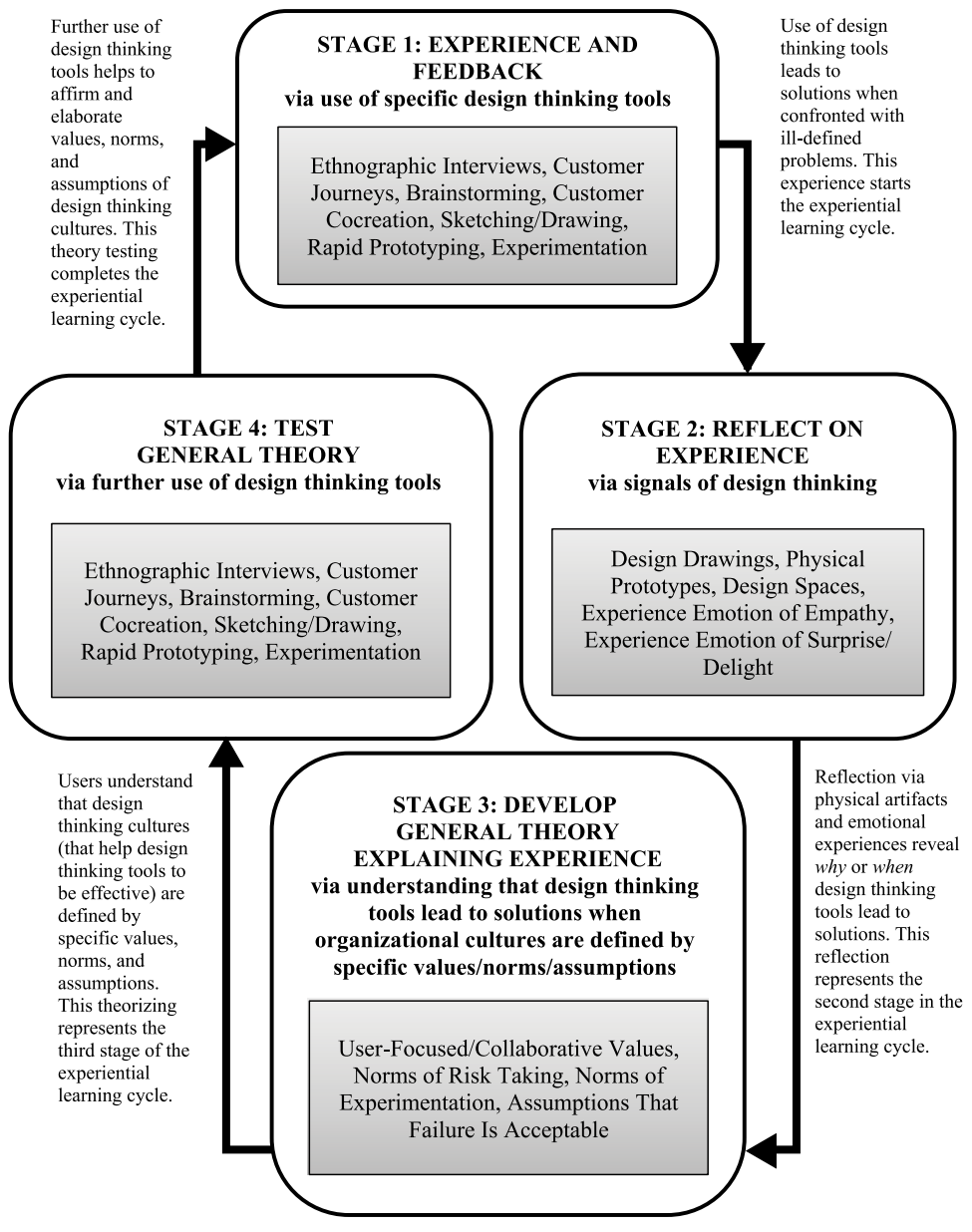
Interestingly, however, the experiential nature of design thinking tools contrasts with many more traditional management tools, which tend to be highly quantitative, rational (i.e., nonemotional), and abstract in nature. For example, tools such as decision trees and forecasting analyses rely on calculating quantitative probabilities for specific outcomes and making rational decisions based on the likelihood of positive outcomes (Anderson, Sweeney, Williams, Camm, & Cochran, 2015). Even tools that rely on more qualitative comparisons, such as SWOT analysis, focus on abstract concepts that do not require concrete and empathetic experience to understand (Valentin, 2001).

In summary, the practice of design thinking we encountered in our review required active, hands-on experience and empathetic engagement and interaction with users and resulted in general theories of organizational culture. Thus, an experiential learning framework for understanding research on design thinking in organizations appears particularly well suited to this form of problem solving. Furthermore, as we discuss next, this framework suggests a number of avenues for future research that build on the very qualitative, concrete, empathetic, and interactive nature of design thinking approaches we identified in our review.

Directions for Future Research

Our experiential learning framework relating design thinking tools and cultures suggests four promising but so far underexplored avenues for future research. Unsurprisingly, the first of these avenues relates to cultural change in organizations. The remaining three avenues build on the link between design thinking and cultural change and suggest that the experiential nature of design thinking may provide insight into other aspects of management.

Figure 1
An Experiential Learning Framework Relating Design Thinking Tools and Cultures



Design Thinking Tools and Cultural Change in Organizations

In the context of the leadership of design, there are still substantial hurdles in the way of design's extending its reach beyond its traditional role in product development to ultimately influence

organizational culture. Within traditional development projects, design has been fixed upon time-dependent, solution-focused, and tangible project outcomes. Such activities may result in innovative and creative solutions, but they may also fall short of connecting with organizational cultural change. Without continued organizational support, the use, implementation, and ultimate effectiveness of design are limited. (Lee & Evans, 2012: 74)

In support of the above quote, one of the most consistent findings from our review was that the effective use of design thinking tools inside organizations relied on organizational cultures that supported and reinforced the use of such tools—what Manzini calls “design culture,” that is:

The knowledge, values, visions, and quality criteria that emerge from the tangle of conversations occurring during design activities (the ones that are open to interaction with a variety of actors and cultures) and the conversations that take place in various design arenas. (2016: 54)

The need to develop organizational cultures that support the effective use of design thinking tools may become increasingly important as more and more organizations adopt these tools as a means to tackle organizational problems (Buchanan, 2015). At the same time, previous research has highlighted that cultural changes usually occur incrementally as a result of organizational life cycle factors, demographic changes, and the exposure of members to broader changes in societal or professional cultures (Meyerson & Martin, 1987; Schein, 2010). Thus, when rapid changes in organizational values and assumptions need to occur (e.g., in the case of a traditional firm adopting design thinking tools), the role of organization leaders, supported by company-wide initiatives (e.g., training, coaching, and role modeling), may be critical to overcoming the natural inertia of organizational culture (Canato et al., 2013).

On the basis of these notions, future research should consider, explicitly, how more traditional business cultures might be adapted to support design thinking tools. As noted in our review, cultures based on the values of productivity, perfectionism, and siloed specialization are likely to impede the implementation of design thinking in an organization. Future research might consider how best to move from cultures with these values to cultures that value a user focus, collaboration, experimentation, and risk taking (which tend to support the use of design thinking tools).

For example, future work might investigate whether there is a preferred sequence in which design thinking tools may be adopted, depending on the preexisting culture of the organization. Organizations that do not already use design thinking tools may find that adopting needfinding tools such as customer cocreation and interviewing (that work best in cultures defined by collaboration and a user focus) is easier than adopting idea-generation or idea-testing tools (that work best in cultures defined by risk taking and an openness to failure). This is because a collaborative and user-focused culture is less controversial than one defined by openness to failure (Storey & Barnett, 2000). By contrast, organizations that already have cultures defined by collaboration and user focus may be ready to adopt design thinking tools that promote more risk taking and learning from failure.

In a related manner, research on cultural change in organizations has recommended change at the subunit or even project level as the place to pilot new assumptions about the right way to work (Schein, 2010). Hendry's (1996) case study of cultural change in an

aerospace company through the use of a tutoring project provides a good example of using such projects to implement new assumptions about work that ultimately influence organizational culture. Consistent with this example, most of the studies in our review also suggest a project-focused avenue for cultural change. However, few of these studies examined the use of design thinking projects as a direct means to change culture (for exceptions, see Carlgren et al., 2014; Hoyt & Sutton, 2016), and none of them examined how design thinking projects might be used to change culture outside of the specific unit in which it was implemented. Thus, future research may need to explore how using design thinking at the project level is an effective means to changing the overall culture of an organization.

Additionally, to help organizational leaders deal with individual-level resistance to cultures supportive of design thinking (which appears to be a relatively common shortcoming of design thinking processes; Beverland et al., 2015), future research may need to examine the identity tensions that might arise among professional workers as design gains status as a discipline (Beckman & Barry, 2007). For example, researchers may need to study the identity work necessary for engineers or managers (not trained as designers) whose organizations adopt a design thinking culture (Kreiner, Hollensbe, Sheep, Smith, & Kataria, 2015). It is well established that designers and managers have different perspectives about their professional identities and how that translates into desirable results. As Goffin and Micheli note:

Designers talk about using technology to create a provocative design statement leading to emotional value and, ultimately, to an iconic design. Managers, instead, talk about good design more in the terms of the commercial success that results from achieving exclusivity, brand recognition, and the right price point. (2010: 33)

Similarly, there may be resistance by nondesigners to adopting a more multidisciplinary approach to work that is a natural consequence of a design thinking culture. Thus, in a number of our reviewed studies, we found evidence that design thinking was resisted by non-design professionals (e.g., marketers, accountants, finance staff) who viewed design thinking tools as expensive and time consuming. For example, in the Beverland and Farrelly (2011) study of design thinking at brand management groups in a variety of firms (mostly consumer products firms making items such as furniture, apparel, appliances, baby gear, and food), they found that in some firms, a “design-led” perspective on marketing turned off brand managers. In these cases, successful designers chose a different approach to reduce this resistance. As Beverland and Farrelly report:

In our interviews, we found that many designers took issue with the phrase “design-led.” For them, this term too easily gave rise to a sense that successful innovations were designer-led, rather than the result of a team effort involving (among others) marketers, researchers, designers, . . . As a result, the term “design orientation” was preferred, implying that design was seen as one function among many that contribute to the long-term success of the organization. We believe that such a stance reflects a deeper understanding of design management—one that requires designers to, when necessary, step outside their own worldview and view innovation problems from another’s viewpoint. Paradoxically, in doing so, designers are more likely to package their ideas in ways that encourage shared understanding and, as a result, generate design-inspired innovations. (70)

Future research should further examine the reasons why nondesigners may resist design thinking tools and identify additional means to reduce this resistance.

In other cases, organizations that have cultures open to the implementation of design thinking might be studied to determine whether there are antecedents that make some organizations more welcoming of design thinking (Manzini, 2016). One antecedent variable that may be of particular interest is industry or field. In our review, some industries were studied frequently. While this finding alone does not indicate that these industries were more accepting of design thinking than others (it merely indicates that these industries were studied more than others), it may provide clues about industries that are open to design thinking. For example, two industries well represented in the studies we reviewed include business consultancies (e.g., IDEO, Malmo Living Labs) and heavy manufacturing (auto and truck manufacturing). On their faces, these two industries could not appear more distinct. Yet a closer examination reveals that both industries deal with tangible products (e.g., furniture and autos) that have evolved to allow more complex user interaction (e.g., computer systems that allow users to customize their interactions). Such features may contribute to the success of design thinking in these industries. Future research should examine, in general, whether these characteristics or others make some industries more suited to the implementation of design thinking than other industries.

Furthermore, future research might consider the current trend of acquisition of design firms by management consulting companies (e.g., McKinsey bought Lunar Design in 2015, Deloitte acquired Doblin in 2014, and Ernst & Young bought Seren in 2015) and how such acquisitions help firms to implement design thinking. This trend illustrates the increasing awareness in the corporate world at large, beyond the tech industry, of the value of design to organizations. At the same time, this trend highlights some unanswered empirical questions regarding organizational culture change. For example, to what extent can the use of design thinking tools help to transmit cultural values and assumptions across firms following a merger or acquisition? Is the integration of design firms inside management consultancies different from traditional merger and acquisition integration? How do larger organizations take over smaller design firms without snuffing out features of design thinking culture?

Finally, and going beyond the remit of design thinking based on our framework, researchers might explore how our current understanding of organizational culture change could be extended by taking an experiential learning lens (see Giorgi, Lockwood, & Glynn, 2015). That is, to establish organizational culture, our framework suggests that organizational members need to have new experiences and be able to reflect on those experiences via physical artifacts and emotions. Future research on organizational culture change, therefore, could test this model empirically in settings beyond design thinking contexts.

Design Thinking and Sensemaking Processes in Organizations

A second avenue for future research suggested by our framework relates to sensemaking processes in organizations. In particular, our framework suggests that future research might examine how design thinking tools serve as triggering mechanisms that initiate sensemaking—that is, the cognitive processes of understanding “what is going on here” (Weick, Sutcliffe, & Obstfeld, 2005)—in organizations. In this way, we follow the lead of recent theorizing that suggests a complementary relationship between experiential learning and sensemaking (Schwandt, 2005).

The notion that design is about “making sense of things” has been well documented in the design literature (Krippendorff, 2006), where design has been described as an abductive

sensemaking process moving from the initial data gathered through the use of needfinding tools to the development of a strong cognitive model of a possible design solution (Kolko, 2010). In a recent study of product designers, Stigliani and Ravasi (2012) provided a fine-grained account of the design thinking process as a prospective sensemaking cycle. In particular, these scholars showed how the experiential and tangible nature of the design thinking tools used by designers facilitated the development of shared understandings about future-oriented solutions to design problems. In other words, they found that the very character of design thinking tools may facilitate and support collective cognition through the experiential processes it promotes. These observations fit with a recent research stream that has pointed to the role of felt bodily experiences (e.g., Cunliffe & Coupland, 2012) and exposure to material cues from the natural environment (Whiteman & Cooper, 2011) in facilitating sensemaking processes. They also fit with the emerging field of “design cognition” (Cross, 2001) that examines the underlying cognitive processes of designers.

Nevertheless, the managerial and organizational implications of the role of experiential learning in sensemaking remains, so far, understudied and undertheorized (Schwandt, 2005). To this end, future studies could try to unpack whether and how the use of design thinking tools (and the experiential learning processes they initiate) facilitate, hinder, or change managerial cognitive processes, such as strategy making, entrepreneurial decision-making, and the planning of organizational change. Furthermore, these studies might draw on the research of design cognition to better understand how experiential learning facilitates managerial problem solving.

For example, previous studies have portrayed strategy making not as a purely analytical process but rather as an experiential process where tools like PowerPoint slides (e.g., S. Kaplan, 2011) and physical artifacts made with LEGO bricks (e.g., Heracleous & Jacobs, 2008) help shape the strategic knowledge produced by strategists, as well as their perceptions of strategic issues. In this vein, future qualitative studies of strategic decision makers could examine whether design thinking tools, like contextual interviews and cocreation with different stakeholders, facilitate the development of effective strategies or lead to better defined business opportunities and whether the use of rapid prototyping to make organizational visions and strategies tangible helps in communicating and implementing strategic change across organizations. Moreover, future studies may attempt to reveal whether some design thinking tools are more likely than others to facilitate agreement about solutions to organizational problems. In addition, future scholars could investigate whether some specific aspects of the experiential nature of design thinking tools (e.g., holistic sensorial engagement, emotional involvement) facilitate collective cognitive work. Finally, future studies might seek to collect systematic evidence comparing the quality and effectiveness of the managerial sensemaking processes in the presence and absence of design thinking tools.

Design Thinking, Experiential Learning, and Competitive Advantage in Organizations

A third avenue for future research suggested by our framework relates to organizational competitive advantage through experiential learning. In particular, our framework suggests that future research might systematically investigate how the use of design thinking tools may actually lead to superior business performance through its influence on strategic thinking and organizational learning.

As a consequence of recent disruptions in technology and social communications, companies are required to operate in increasingly complex and turbulent business environments. This trend poses unprecedented managerial challenges that cannot be tackled through the use of traditional business tools, originally designed for a very different set of business needs (e.g., improving economic efficiency, maximizing labor and machine productivity, and ensuring that repetitive tasks were completed on time). Thus, research in strategy is increasingly focusing on the sources of innovation, disruption, industry transformation, and business reinvention (Mootee, 2013).

In response to these developments, design thinking has been advocated as a way to help managers and executives make more informed and successful business decisions (Glen et al., 2014; Kimbell, 2011; Liedtka, 2014a; Liedtka et al., 2009). As noted earlier, scholars (e.g., Martin, 2009; Mootee, 2013) have portrayed design thinking as a way of thinking that balances both the exploration of new knowledge (innovation) and the exploitation of current knowledge (efficiency). Thus, design thinking has been compared to strategic thinking and advocated as a new paradigm in business strategy (Liedtka, 2000; Liedtka & Mintzberg, 2006).

Building on these notions, our framework suggests that more innovative strategies may arise in design thinking organizations through the experiential learning cycles (that include both exploration and exploitation) that are triggered by design thinking tools. That is, because design thinking organizations encourage their members to both explore new ideas through the use of experiential tools and exploit insights that result from using those tools, they may produce a balanced form of strategic thinking. Whether this is true in reality, however, remains an empirical question that future studies need to address. In addition, the continuous use of design thinking tools might have positive effects on how members of different teams (and, hence, the organization as a whole) learn. For example, design thinking tools may help people “learn how to learn” (Novak & Gowin, 1984) and when integrated into the organizational culture, may thus contribute to organizational learning (Senge, 2006). In particular, the reliance on rapid prototyping (comparable to fast small experiments) can lead to a more agile organizational way of learning both from successes and from failures, which can help the organization to change its strategic direction accordingly.

However, relying on design thinking tools and on the experiential learning cycles they trigger to develop strategic thinking may not be completely straightforward. For example, experiential learning is likely to produce many different insights from the same experience. This begs a few empirical questions: How are managers to decide which insights are best exploited? Moreover, how are managers to decide how much exploration is needed before an insight can be trusted? Future research, thus, is needed to reveal how design thinking organizations might best leverage the experiential processes they engender to deliver useful business strategies.

A potential danger in adopting any new work practice is that it is implemented in a superficial manner as a response to an innovation “fad.” In this respect, Abrahamson (1991) warns that managers may be subject to a “proinnovation” bias that leads them to favor new management practices (over preexisting practices) when there is uncertainty about what practices to adopt. Such adoption is called a “fad” when firms within a group (e.g., within an industry) merely imitate one another in choosing innovations. Thus, future research should also examine how “fad” adoptions of design thinking tools may influence the strategic and performance effects of these tools.

In addition, future research should address the growing need for measuring the impact of design thinking on overall company performance. Quantitative studies measuring the real value of design thinking in terms of its links with financial and market performance are, thus, necessary. In particular, comparing performance before and after the introduction of design thinking tools could provide tangible evidence of the measurable value and outcomes of design thinking (i.e., its impact on the bottom line; Westcott et al., 2013).

Future research should also try to capture the soft and intangible value that design thinking has on company performance. Our framework points to the role of physical artifacts and emotional experiences as signals of the existence of a design thinking culture. Nevertheless, these cultural signals represent only the tip of the iceberg of more profound changes brought about inside an organization by the introduction of design thinking tools at the level of behaviors, perceptions, and mind-set. Qualitative, in-depth studies, therefore, could capture these changes and provide more fine-grained explanations of the changes in the way organizational members work in teams, frame and solve problems, and perceive themselves and others brought about by the introduction of design thinking tools and whether these changes have an impact on nonfinancial measures of performance (i.e., customer satisfaction, internal business processes, and learning; R. S. Kaplan & Norton, 2005).

Finally, it is important to note that one downside of design thinking in organizations that has been identified is that it may focus strategic attention too much on a human-centered approach to the neglect of other strategic issues. For example, in a study of using design thinking tools to solve problems of environmental sustainability, Shapira, Ketchie, and Nehe (2017) found that designers' focus on human empathy and user-centric solutions may have led them to disregard the ecological impacts of their solutions:

While DT's sense of openness and reliance on intuition provides a great strength to create empathetic, relevant and flexible solutions, it can also be a weakness in regards to ensuring sustainability by neglecting to look at the bigger socio-ecological picture and plan with it in mind. (286)

Shapira et al. (2017) suggest that designers should include a "full systems view" throughout the design thinking process to create greater awareness of potential interactions between human issues and issues of the ecological environment. Extending these ideas, we suggest that future research should examine how managers may include any number of broader strategic goals, beyond human-centeredness, in problem solving guided by design thinking.

Empathy and Design Thinking

A fourth avenue for future research suggested by our framework relates to the role of empathy in understanding the effectiveness of design thinking tools. Empathy is defined as the ability to recognize the feelings of others from the signals they give off (Mayer & Geher, 1996; Salovey & Mayer, 1990). As previously mentioned, empathy represents a key characteristic of the design thinking process, which is stimulated and promoted by the main tools of design thinking (and especially by the needfinding ones). The experience of empathy, we argue, is also an important emotional signal of cultural values of collaboration and "user focus" in organizations.

More recently, empathy has been advocated as the cornerstone of emotional intelligence and a key driver of success and higher performance in the workplace (Goleman, Boyatzis, & McKee, 2013). Research in neuroscience has explained why empathy matters so much in the workplace. In particular, a set of studies has discovered a new class of brain cells—the “mirror neurons”—that seem to be the neural basis of empathy. These cells seemed to map one person’s actions into another’s brain—a kind of imprinting that explains why role models and mentors can be such powerful influences (e.g., Iacoboni, 2009; J. T. Kaplan & Iacoboni, 2006; Uddin, Iacoboni, Lange, & Keenan, 2007). In other words, this research suggests that our brain centers for emotion harbor the skills needed for managing ourselves in social situations.

According to the latest neuroscience research, 98% of people have the innate ability to empathize wired into their brains and, hence, the in-built capacity for stepping into the shoes of others and understanding their feelings and perspectives (Chierchia & Singer, 2016). Furthermore, while most people do not tap into their full empathic potential in everyday life (Krznic, 2014), psychological research suggests that the ability to empathize with others can be nurtured and developed through the dyadic interactions with other human beings (e.g., Burgoon, Stern, & Dillman, 2007).

In a similar manner, our framework suggests that the use of design thinking tools may nurture the development of empathy. That is, given the active empathetic engagement with other people that design thinking tools promote, these tools may lead to an increased level of empathy in the organizational members who use them. So far, though, these links remain mainly speculative, and empirical research is needed to measure whether and to what extent the repeated use of design thinking tools leads to higher empathy.

Conclusion

Our review of empirical research on the use of design thinking in organizations provides new insight into the value of this increasingly popular approach to problem solving. In general, it suggests that the use of design thinking tools in organizations triggers an experiential learning process that ultimately supports the development of organizational cultures defined by a user-centric focus, collaboration, risk taking, and learning, which in turn support the further use of design thinking tools. Importantly, the physical artifacts and emotional experiences that result from the use of design thinking tools provide sources of reflection that help organizations to build such cultures.

Together, these insights suggest that future research may continue to explore the experiential nature of design thinking processes to improve our understanding of cultural change, sensemaking, strategy formation, and empathy in organizations. We hope that our findings provide incentive for management scholars to pursue and publish insights related to design thinking and culture in a broader set of management journals.

Notes

1. Although the term “design thinking” implies a cognitive approach, most empirical research in this area, as well as our focus in this review, relates to the use and application of specific design tools rather than the underlying cognitive processes of designers. A separate area of research called “design cognition” focuses on these underlying cognitive processes (Cross, 2001).

2. It should be noted that although our review focuses on empirical studies, we have selected and read relevant books and conceptual work about design thinking from the early 1960s to the present. These resources, listed in Appendix C in the online supplemental material, have informed the section about the origins and evolution of design thinking, as well as the theoretical framework we develop and provide in this paper.

3. Although most of these articles did not *focus* on the link between design thinking and culture, our reading of these papers revealed these links in the data.

4. It is important to note, however, that our use of the experiential learning model as an organizing framework for our review is not a tested model but an insight that arose from our review.

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