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ORIGINAL ARTICLE

# Framing the microfoundations of design thinking as a dynamic capability for innovation: Reconciling theory and practice

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## Abstract

Design thinking (DT) is gaining ground among academics and practitioners as a means to improve the innovativeness of organizations. However, with few exceptions, DT studies are most entrenched in practice rather than theory-driven research. This weak tie between theory and managerial practice calls for delving into the dynamics of DT for innovation to build stronger foundations for future studies. Therefore, this study provides a theory-based framing of DT for innovation and a critical review of the DT literature to reconcile theory and practice. To this end, we propose framing and advancing DT as a dynamic capability for innovation rooted in lower-level aspects, namely microfoundations. Based on our theoretical framework, we conduct a systematic literature review that unveils the dynamics of DT and the context-specific capabilities to innovate. The contributions of the paper are twofold. First, we provide a theory-based framing of DT and combining it with existing theories in innovation and management (i.e., dynamic capabilities and microfoundations). Second, we review the extant literature on DT for innovation to reconcile previous studies with these theoretical lenses to, hence, guide future research. Based on this interpretation, we then define a number of avenues for future research, thus reconciling practical evidence with theories that can further explain how DT relates to firm innovativeness.

**KEYWORDS**

design thinking, dynamic capabilities, innovation, microfoundations, systematic literature review

## 1 | INTRODUCTION

Interest in how designers work and think has progressively moved from the purview of industrial design to the broader management field (Gruber et al., 2015). Indeed, "designerly thinking" and "designerly tools" (human centeredness, prototyping and experimentation, storytelling and engagement, and the bring-build-buy map) can help nondesigners (e.g., managers, R&D staff, policymakers) address wicked and ill-formulated challenges that go beyond traditional design issues (e.g., Brown & Katz, 2011; Elsbach & Stigliani, 2018; Seidel & Fixson, 2013). This logic evolved into a new problem-solving approach called design thinking (DT) (Brown, 2008; Martin, 2009; Vogel, 2009). More formally, founded on

designers' sensibility and methods, DT can be conceived as a way of framing, reframing, and enacting actions to solve various problems by harmonizing user desirability, economic viability, and technological feasibility (Brown, 2008; Liedtka, 2015; Micheli et al., 2019). Numerous domains have benefited from DT applications, such as education, as in the case of the development of (new) learning initiatives, facilitating meetings and improving the efficiency of workshops, aligning stakeholders in strategic planning, and policymaking to better manage complexity (Liedtka et al., 2020).

Among the many contexts benefiting from the use of DT, problem solving based on designers' sensibility and methods to solve wicked problems is particularly salient in the innovation domain (Johansson-Sköldberg et al., 2013). As such, DT has been implemented in many firms for innovation purposes (e.g., IDEO, IBM, Samsung, SAP, P&G, Intuit, Bank of America, Google) (Gruber et al., 2015; Micheli et al., 2019) leading to breakthrough innovations (e.g., Savioke Robot, Slack, Google Inbox) (Knapp et al., 2016). Enthusiasm for DT is evident among executives as well as scholars. Notably, a wealth of research has scrutinized the link between DT and innovation, including the influence of DT tools, practices, and/or more comprehensive approaches to new product/service development, balancing exploration and exploitation, process reconfiguration, and learning (Beckman & Barry, 2007; Carlgren et al., 2014; Koomans & Hilders, 2016; Knight et al., 2019).

Notwithstanding this, two relevant shortcomings emerge. The first is the paucity of theory-driven empirical DT research, even in academic studies (Cousins, 2018; Kurtmollaiev et al., 2018). Apart from some exceptions (e.g., Elsbach & Stigliani, 2018; Kurtmollaiev et al., 2018; Liedtka, 2015, 2020), most contributions offer evidence based mainly on a few successful cases not specifically rooted in any theoretical lens (Carlgren et al., 2014). This has led to numerous process- and practice-based depictions of DT that lack coherence in what DT is and its key constituents. The recent review of Micheli et al. (2019) acknowledges this issue and sheds light on the DT conceptualizations, emphasizing the more practical "doing design thinking," although without linking DT to innovation and management theories. Furthermore, as DT research and related contributions are most entrenched in a practical perspective, the theoretical and practical perspectives have yet to be reconciled (Johansson-Sköldberg et al., 2013).

The second shortcoming is the fact that most DT representations are "normative and essentialist in nature" (Carlgren et al., 2016b), with DT mainly conceptualized as a set of tools and methods (Beverland et al., 2015; Carlgren et al., 2016b; Dell'Era et al., 2020; Martin, 2009). Such conceptualization scantly accounts for the dynamic nature of management and innovation problems or the idiosyncrasies of the different organizational contexts in which DT is implemented (Liedtka, 2015). This has led to the (adverse) consideration that pursuing the same DT processes and using the same DT tools may work equally over time and among different companies, hence limiting the possibility of unveiling the relationship between DT and innovation outcomes (Seidel & Fixson, 2013). This also departs from the more recent explanatory view of DT acknowledging that differences in performance outcomes lie in how DT methods and tools are recombined and reconfigured to face a given innovation challenge (Hobday et al., 2012b; Liedtka, 2020).

Evidence supports the view that DT is not a unitary way of adopting specific design principles to face challenges. Indeed, different "kinds" of DT emerge depending on the objectives of the organization that adopts this approach and the intertwined psychological, organizational, and strategic aspects characterizing the organization's resource commitment (Dell'Era et al., 2020). For instance, if the aim is to boost digital transformation, as in the case of Google, a different approach to ethnographic and deep immersion in user needs is required (Magistretti et al., 2020). Instead, if the focus is more on departing from the current offering and business model, a more radical view of DT is required, leveraging speculation and future thinking, as in the case of some

**Practitioner Points**

- DT should combine the analytic and creative phases to innovate, in contrast to the conventional narrow, technical, and product-centric way of thinking.
- DT should not be considered as a linear methodology based on the adoption of specific activities/tools that can be isolated, adopted, and replicated following a universal scheme, but as a context-specific dynamic capability for innovation that manifests and evolves differently among firms and over time.
- DT entails sensing, seizing, and reconfiguring dynamic capabilities throughout the innovation process.
- While there are several interpretations of DT, a rigorous analysis of its microfoundations (individuals, processes and interactions, and structure) might better guide its adoption and diffusion because these allow understanding how DT as a dynamic capability for innovation works within an organization.
- The heterogeneity among innovation performances and capabilities is (also) a reflection of the DT microfoundations.
- The individuals, processes and interactions, and structure underlying DT for innovation are strongly intertwined and should not be seen as standalone traits of the DT approach.

consultancies (Deloitte Digital, Tangity by NTT Data, or IBMx). Nevertheless, a more dynamic view of DT is scantly found in recent literature reviews either. As an example, Micheli et al. (2019) summarize the DT tools, but without showing which DT tools can be used at different times, what calls for the use of a given tool, and the adoption of a tool in combination with others.

Overall, such nuances within the DT panorama show that DT is evolving and requires further efforts to be properly understood and mastered. Specifically, conceptualizing and examining the role of DT for innovation is both an open theoretical and practical question. Herein lay the challenges and contributions of the current study: (i) How can DT be conceptualized based on theories to unveil its relationship with innovation? (ii) Rooted in a theory driven rather than a practical approach, how does DT relate to a firm's innovativeness?

To answer these questions, based on the design capabilities (e.g., Dong et al., 2016; Swan et al., 2005) and dynamic capabilities literature (e.g., Teece et al., 1997), we propose a comprehensive theoretical framework that considers DT a dynamic capability for innovation rooted in microfoundations (i.e., lower-level aspects characterizing dynamic capabilities) (Eisenhardt & Martin, 2000; Felin et al., 2012) compared with the conventional normative and static view of DT. In identifying and providing the theoretical underpinnings of DT, we make recourse to the DT for innovation literature using a theory-based lens to guide the future DT academic debate. Indeed, based on our theoretical framework, we conduct a systematic literature review (Tranfield et al., 2003) that may better unveil the DT dynamic and context-specific capabilities to innovate in organizations. We then define several avenues for future research, hence reconciling practical evidence with theories that can further explain how DT relates to firm innovativeness.

In sum, the key contributions of the paper are twofold. First, we provide a theory-based framing of DT, combining this approach with existing innovation and management theories. Second, we review the DT for innovation literature to reconcile previous studies with these theories, thus guiding future research.

## 2 | THEORY-BASED FRAMING OF DT AND THEORETICAL FRAMEWORK

In the following, we present the theoretical underpinnings of the framework conceptualizing DT as a dynamic capability rooted in certain microfoundations. We start by recalling the dynamic capabilities literature and its link to innovation. We complement this discourse by underlining the role of the microfoundations of dynamic capabilities. We then provide an overview of DT. Finally, we combine these arguments and propose our theoretical framework.

### 2.1 | Dynamic capabilities and innovation

The literature distinguishes between two important classes of capabilities: ordinary and dynamic (Eisenhardt & Martin, 2000; Laaksonen & Peltoniemi, 2018; Teece, 2014; Winter, 2003). Ordinary capabilities, also referred to as best practices, foster efficiency (doing things right) in well-delineated operation, administration, and governance tasks; they are usually imitable and do not vary much in environments open to global competition. Conversely, dynamic capabilities allow achieving congruence with technological and business opportunities as well as latent customer needs over time (doing the right things at the right time) by creating, extending, and/or revising ordinary capabilities and resource configurations (Drnevich & Kriauciunas, 2011; Laaksonen & Peltoniemi, 2018). This notion extends the resource-based view of the firm (Barney, 2001) and underlines that it is not (only) owning resources and best practices that explain the competitive advantage and performance heterogeneity, but (also) how these resources and competences are mobilized and recombined (Felin & Hesterly, 2007). Specifically, the value of dynamic capabilities lies in the "potential for helping the organization do this repeatedly, thereby helping to create a durable competitive advantage" (Bingham et al., 2007; Eisenhardt & Martin, 2000; Teece, 2014, p. 335; Teece et al., 1997), especially in high-velocity, competitive markets, which hinder the contribution of ordinary capabilities (Drnevich & Kriauciunas, 2011).

In other words, ordinary capabilities are the "hard" part of a business, with little connection to creativity, vision, or imagination, whereas dynamic capabilities help "identify latent customer needs and the most promising technological opportunities, then orchestrate the resources needed to innovate, or co-innovate" (Teece, 2014, p. 332). Accordingly, innovation studies have increasingly relied on the dynamic capabilities literature, because firms today struggle with increasingly broad and complex innovation challenges in the rapidly changing environment (Beckman & Barry, 2007; Mazzucchelli et al., 2019). In response, organizations must continuously manage the essential dynamic capabilities of sensing, seizing, and reconfiguring (Teece, 2007): sensing relates to identifying new technological/market opportunities in the environment, seizing refers to configuring and mobilizing resources/competences to address the identified opportunities by favoring innovativeness, and reconfiguring concerns the continued recombination and reconfiguration of resources/competences to attain repeated and reliable innovation performance, distinct from entirely ad hoc problem-solving activities.

While it is argued that dynamic capabilities and innovativeness are linked, this relationship lies in the microactivities that organizational agents perform in combining and reconfiguring resources and competences (Felin & Foss, 2005; Felin & Hesterly, 2007; Ghezzi et al., 2020; Winter, 2003). Put differently, as dynamic capabilities are context-specific and embedded within organizations (Bingham et al., 2007; Helfat & Martin, 2015), the firm-level effects are deemed to be rooted in lower-level aspects. This stresses the role of specific (micro-)mechanisms through which dynamic capabilities operate and are built over time (Salvato & Vassolo, 2018; Teece, 2007), whereby overstating macro-level aspects relative to lower-level ones may lessen the explanatory power of the dynamic capabilities perspective (Winter, 2003).

In this vein, Teece et al. (1997) and Teece (2007) incorporate organizational routines as key constituents of dynamic capabilities. Although it is not our intention to add to the ongoing debate on routines, we acknowledge that even though the notion of routines (as repeated actions) confronts that of dynamic capabilities (which call for nonroutinized activities) (Lavie, 2006), there is also evidence of routinized aspects (i.e., ordinary capabilities) underlying dynamic capabilities (Schilke et al., 2018). Therefore, dynamic capabilities can be thought of as working on different levels (Winter, 2003), hence requiring a micro-macro analysis. In particular, an analysis of the routines underpinning dynamic capabilities requires looking at the lower-level organizational aspects, such as context-specific individual skills, procedures, organizational structures, decision rules, and processes (Adner & Helfat, 2003; Helfat & Peteraf, 2015; Teece, 2007). Consequently, distinguishing the microfoundations of dynamic capabilities from the capability itself allows deepening and broadening our understanding of the effectiveness of dynamic capabilities for innovation (Schilke et al., 2018; Teece, 2007, 2012). Indeed, "[m]icrofoundations involve the adjustment and recombination of a firm's existing ordinary capabilities as well as the development of new ones" (Teece, 2018, p. 40).

## 2.2 | Microfoundations of routines and dynamic capabilities

The microfoundations literature highlights that organizational activities should be understood in terms of the underlying characteristics, actions, and interactions of the organizational members (lower-level aspects) involved in the managerial processes, procedures, systems, and structures specific to the organization in which they operate (Teece, 2007). Thus, by examining lower-level aspects (i.e., micro-macro analysis), the microfoundational lens encompasses the macro concepts (Barney & Felin, 2013). Emphasizing the lower-level aspects helps uncover and explain differences in organizational routines for the combination/reconfiguration of resources and, eventually, the formation of capabilities to engage in organizational change (i.e., dynamic capabilities) (Felin & Foss, 2005; Felin & Hesterly, 2007; Grigoriou & Rothaermel, 2013). As a result, microfoundations better reveal why certain firms excel in getting ahead, while others fail in today's complex and dynamic economic environment (Argote & Ren, 2012; Knott, 2003).

A second advantage of the microfoundational lens lies in the fact that "scholars increasingly seek to proffer microfoundations for macromanagement theory" (Foss & Lindenberg, 2013, p. 85), despite that microfoundations are not *per se* a theory (Felin et al., 2012). Indeed, it is theory-based empiricism across a broad array of macro theories (e.g., behavioral theory, psychology, cognition) which favor the reconciliation of theory and practice in the management field by more comprehensively studying the multiple lower-level aspects usually spanning different theory streams. That is to say, a microfoundational lens allows avoiding the prioritization of one theory stream over another when they are complementary to study a given phenomenon, as in the case of dynamic capabilities (Foss, 2011).

The foregoing discussion is also relevant in the context of innovation, as microfoundations are deemed to explain "the 'capacity of an organization to purposefully create, extend or modify' a firm's product or service offerings, processes for generating and/or delivering a product or service, or customer markets" (Felin et al., 2012, p. 1355). Notably, innovation is a socially intensive process where organizational members (not organizations themselves) transform innovative ideas and knowledge into real innovations. Therefore, it is important to examine how they interact, formulate, and determine what problems to solve and how (Grigoriou & Rothaermel, 2013; Helfat & Peteraf, 2015; Mazzucchelli et al., 2019; Slater et al., 2014; Teece, 2007).

That is, the focus on microfoundations does not solely revolve around individuals. Reducing everything to individuals neglects the fact that individual interactions are not additive but take a complex form shaped by the organizational context itself. Therefore, we need to look at individuals and the related unique, interactional, and collective effects (Barney & Felin, 2013). With this in mind, Felin et al. (2012) identify three main microfoundation building blocks: (1) individuals, (2) processes and interactions, and (3) structure. The first category (individuals) includes all the individual-level elements that can affect an organization's modus operandi and collective behaviors, such as individual skills and knowledge, personality traits, cognition, agency, etc. (Felin & Hesterly, 2007; Foss, 2011). The second category (processes and interactions) comprises the combination of formal and informal processes that influence integration, cooperation, and coordination among organizational members. Processes and interactions are relevant in that they not only clarify how routines

and capabilities emerge but also how they evolve (Winter, 2012). The third category (structure) considers the broad structure and design architecture that delineates who interacts with whom and how (Barney & Felin, 2013). Finally, connections exist within and between the three categories (individuals and individuals, individuals and processes, etc.), which "form a second set of effects that contribute to the collective phenomena of routines and capabilities" that should not be undervalued (Felin et al., 2012, p. 1357).

## 2.3 | Design thinking

Designers have long addressed wicked and ill-formulated problems by elaborating professional practices to deal with them. These practices have led to DT (Brown, 2008; Dorst, 2011). Despite that DT originated in the design domain, it is not limited to solving design problems (Dell'Era et al., 2020), but also approaching/solving problems in different contexts, especially innovation (Brown, 2008; Gruber et al., 2015; Martin, 2009; Vogel, 2009). In particular, the relevance of DT for innovation lies in the fact that it allows tackling innovation problems by departing from a narrow, technically oriented, or product-centric way of thinking. DT allows firms to simultaneously consider market and technological aspects in addition to conventional aesthetics (Brown, 2008; Liedtka, 2015). In so doing, DT anticipates new perspectives, integrates different disciplines, favors knowledge sharing, and explores multiple options and ideas earlier in the innovation process (Carlgren et al., 2014). This is eased if the U.K. Design Council framework is taken into consideration, whereby assertion-based solutions (i.e., abductive logic) are considered in addition to inductive and deductive logics (Dong et al., 2016; Micheli et al., 2019). Moreover, DT is problem and solution oriented (i.e., both the conceptualization and application of innovative ideas) and relies on hypothesis-driven practices that emphasize (re)formulating problems before focusing on solutions (Beckman, 2020; Liedtka, 2015). Finally, DT spans the abstract and concrete world to generate innovative ideas, involving rational and intuitive modes of thought as well as analysis (e.g., abstract conceptualization and reflective observation) and synthesis (active experimentation and concrete development) (Beckman & Barry, 2007; Kurtmollaiev et al., 2018). Consequently, DT is deemed to meet/unveil changing and latent customer needs over time (Micheli et al., 2012), better balance exploratory and exploitative innovation activities (Liedtka, 2020; Martin, 2009), and more quickly foster the assimilation and reconfiguration of internal know-how from innovation systems (Acklin, 2010). Accordingly, many leading organizations are approaching innovation following the DT principles. For instance, Google proposed Design Sprint as a methodology to embrace analytic and creative thinking to innovate the Gmail solution (Knapp et al., 2016). General Electric developed the FastWorks approach to expand the problem-solution space, where customers are considered as users engaged in innovative problem-solving activities to generate alternatives by showing their needs (Magistretti et al., 2020). PepsiCo is required to include design and DT principles in its innovation department to spread the culture of discovery and creative confidence in every project (Few, 2015).

## 2.4 | Combining DT, dynamic capabilities, and microfoundations: A theoretical framework

In accordance with the previous section, DT tackles multiples aspects of the innovation process (e.g., market, technological, esthetic). This recalls the notion of design capabilities of imbuing new products with new functions, reliability, quality, ease of use, and external design that attracts customers (Ho et al., 2011; Swan et al., 2005; Xue & Swan, 2020). Thus, applying DT can be considered as a (design) capability. In addition, DT goes beyond accomplishing a specific innovation task/project. It plays a pivotal role in creating/improving the ability to repeatedly deal with wicked and ill-formulated innovation problems, from understanding intended/unintended market needs to actually developing innovation. Hence, DT is a source of resource reconfiguration, differentiation between organizations, and competitive advantage in turbulent environments (Brown, 2008; Carlgren et al., 2014; Hobday et al., 2012a; Micheli et al., 2019). As such, it is more dynamic than an ordinary capability (Dong et al., 2016). In particular, a strong link emerges between DT and Teece's (2007) dynamic capabilities of sensing and seizing opportunities as well as reconfiguring the innovation approach (Liedtka, 2020). For instance, DT favors a better understanding of customers, their contexts, and latent needs (sensing), adopting tools/methods such as visualization, storytelling, and prototyping to support rapid testing and innovation development (seizing), and steadily stimulating novel and innovative ideas, different approaches to problem solving, and idea management to cope with changing market needs and technological dynamism (reconfiguring).

Furthermore, just like dynamic capabilities, DT is rooted in the role and characteristics of the organizational members (e.g., experience, skills, cognitive interpretations) that adopt them, as well as the ways and structures characterizing their interaction modes (Brown, 2009; Carlgren et al., 2014, 2016a, 2016b). Relatedly, DT involves multiple aspects (e.g., psychological, organizational, strategic)—each pertaining to distinct literature streams (e.g., organizational behavior, behavioral theory, cognition, agency)—which, however, need to be considered concurrently. In other words, DT (as a dynamic capability) is rooted in the lower-level organizational aspects (i.e., microfoundations) of individuals, processes and

interactions, and structure, whose analysis will likely lead to a better comprehension of the capability to innovate through DT (Micheli et al., 2019). Thus, DT can be reasonably conceived as a dynamic capability for innovation.

In this vein, to reconcile practical evidence on DT for innovation with key innovation/management theories, and hence guide future studies, we propose a theoretical framework that views DT as a dynamic capability. Specifically, we disaggregate DT into the sensing, seizing, and reconfiguring capabilities, each requiring a deeper analysis of respective microfoundation building blocks.

**TABLE 1** Search terms

| Category A | Category B |
|---|---|
| Design thinking (DT) | Innovat* |
| Designerly thinking | |
| Creative Problem Solving | |
| Human Centered Design (HCD) | |
| User Centered Design (UCD) | |
| Managing by Design | |
| Participatory Design | |
| Design Driven | |

## 3 | SYSTEMATIC LITERATURE REVIEW APPROACH

The aim of our theoretical framework is to reconcile the theoretical and practical perspectives of DT for innovation by critically reviewing the literature on this topic. As doing so requires an integrative view of the literature on DT for innovation, we rely on the well-established systematic literature review approach to identify the relevant DT for innovation studies (Tranfield et al., 2003).

First, we define the boundaries of the review. As Scopus is one of the largest and most comprehensive abstracts and citation databases of its kind (e.g., Randhawa et al., 2016), we used the Scopus search engine to generate a list of relevant contributions in core management-related outlets. We considered the following Scopus subject areas: business, management and accounting, economics, econometrics and finance, social sciences, arts and humanities, decision sciences, psychology, multidisciplinary, computer science, and engineering. We only considered academic articles, thus omitting books, book chapters, conference proceedings, and theses, because these types of publications are considered to be less relevant (e.g., Meier, 2011). Moreover, we placed no limit on the time period of articles published, hence searching all potentially relevant articles available online on 26 July, 2019.

We defined ad hoc search terms to ensure the comprehensiveness of the search process and a focus on the topic under investigation. At least one of the search terms had to appear in the title, abstract, or author-provided keywords for an article to be selected. Each search term is composed of the keyword "innovat*" and a keyword related to the DT topic, including some relevant acronyms. Keywords emerged from an in-depth analysis of previous review articles (Elsbach & Stigliani, 2018; Johansson-Sköldberg et al., 2013; Micheli et al., 2019), the authors' experience in the field, and interviews with a panel composed of three industry experts and three scholars in the DT domain (Tasca, 2010). Table 1 presents all the considered keywords.[1] All in all, our search returned 1127 unique hits.

In the second phase, we defined and applied the inclusion and exclusion criteria (see Table 2). This step is important to avoid including articles that are not relevant to the debate on the DT–innovation relationship in terms of quality and fit. Concerning the fit, we acknowledge that some of the selected DT-related keywords (e.g., human-centered design and design driven) are broader concepts that may lead to conclusions that are specific to one of these areas but not DT. Thus, we also defined the inclusion and exclusion criteria to account for this aspect when reading the articles, hence limiting the chance of including articles outside our research scope. To ensure the quality of articles included in our study, we excluded all papers published in journals with no impact factor in the 2018 Thomson Reuters Journal Citation Reports (Randhawa et al., 2016; Shepherd & Rudd, 2014). Following Elsbach and Stigliani (2018) and Micheli et al. (2019), we did not exclude journals related to design topics (e.g., *Design Journal*, *Design Management Journal*, *Design Management Review*). We assessed the remaining 593 articles against the defined inclusion and exclusion criteria by reading their titles and abstracts. After this phase, 176 articles were marked as "check full text" for final approval. Based on the full-text reading, we retained 86 papers (identified with an asterisk in the references). We cross-referenced and consulted with the panel of experts to check for potential papers we might have missed (Micheli et al., 2019). This procedure did not lead to additional articles. Overall, the selection process was collaborative, with discussions on articles that were deemed to not fully meet all criteria (Combs et al., 2010). Figure 1 summarizes the selection process.[2]

In the final stage, we carefully read each article and mapped the selected studies to identify the core themes according to our theoretical framework. Following prior reviews, the content analysis was guided by two combined criteria as follows: (i) the conceptualization of the object of analysis and (ii) the specific research topic and focus of investigation (e.g., Ravasi & Stigliani, 2012). We first categorized articles based on the microfoundation building block to which the article refers as well as the dynamic capability (sensing, seizing, and reconfiguring) to which the microfoundation building block pertains. An article might pertain to different microfoundation building blocks as well as different dynamic capabilities. Next, we

**TABLE 2** Inclusion and exclusion criteria

| No. | Inclusion criteria | Reason for inclusion |
|---|---|---|
| 1 | Theoretical papers | These articles are included because they provide the basis for summarizing and integrating the empirical evidence. |
| 2 | Quantitative and qualitative empirical studies | These articles are included because they provide empirical evidence which is the main interest of this review. |
| 3 | Innovation management outcomes | Examining how firms develop innovation. |
| 4 | Perspective | Examining the interplay between innovation management and design thinking from a microfoundational perspective. |
| **No.** | **Exclusion criteria** | **Reason for exclusion** |
| 1 | Publication type | Excluding books, book chapters, conference proceedings, theses, review articles, articles not written in English. |
| | | Excluding articles published in journals with no impact factor, except for journals specifically related to design topics. |
| 2 | Unit of analysis | Excluding articles whose focus is not on a firm's innovation process (e.g., research centers, public administrations, urban contexts). |
| 3 | Perspective | Excluding articles concerning learning and education, design as an aesthetic dimension, design as style, design as outcome, engineering methods and procedures, regional/national policies, and development of software solutions. |
| | | Excluding articles with specific conclusions related to topics, such as human-centered design, creative problem solving, and design-driven innovation, but not to DT. |
| | | Excluding articles that report examples of specific cases of design thinking implementation but do not provide sufficient information in relation to either what has been done or what design thinking refers to. |

delved into the focus of investigation and the questions driving the research. We then produced a narrative synthesis of the outcomes of the sample articles that show multiple aspects of the same phenomenon, highlighting avenues for further research.

## 4 | MATCHING THE THEORETICAL FRAMEWORK WITH THE DT FOR INNOVATION LITERATURE

In the following, we untangle the constituents of DT as a dynamic capability. Thus, we group and discuss the literature findings on DT for innovation (see the previous section) by unveiling which/how the DT microfoundation building blocks (i.e., individuals, processes and interactions, and structure) shape the sensing, seizing, and reconfiguring capabilities in relation to firm innovativeness.

### 4.1 | The microfoundations of DT as a sensing dynamic capability for innovation

#### 4.1.1 | Individuals

The literature analyzed shows that the role of individuals and some key characteristics/skills are pivotal in the DT process when the scope is sensing innovation opportunities (Basadur, 2004). First, Carlgren et al. (2016b) define user-focus as the first, and among the most important, design thinker traits, that is, design thinkers should always have the user in mind when evaluating innovative opportunities. This is strictly related to the notion of *empathy* (Paton & Dorst, 2011). Indeed, people seeing and understanding the world from the eyes and shoes of end users (i.e., empathizing with the user) are in a better position to envision what they really desire and, hence, suggest solutions that solve their needs (Brown, 2008). Worth noting is that the individual trait of empathizing with users emerges at the individual level but underpins and improves the overall DT process outcomes at a higher level (Magalhães, 2018).

The second aspect refers to the fact that design thinkers might have different degrees of knowledge and expertise when approaching a problem with creativity (Li et al., 2018). This may influence, as Li et al. (2018) report, the way individuals collaborate and cocreate opportunities in human-centered design processes. For instance, depending on the goal of involvement, the knowledge of expert individuals might vary, since it may be rooted in pragmatism, the ability to see what does not work, or based on repertoires, so that past expertise can lead to the discovery of new opportunities (Dalsgaard, 2014). Regardless of their expertise and

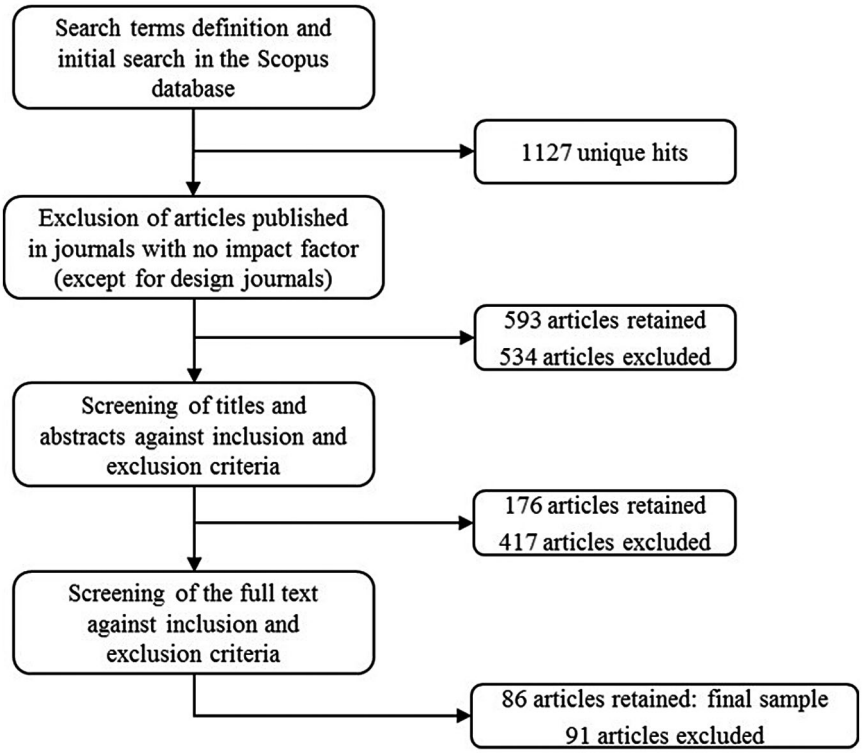


**FIGURE 1** The data gathering process

previous knowledge, individuals in the DT process are usually asked to be part of the DT initiative by adopting a *naïve mind* (Kleinsmann et al., 2017; Seidel & Fixson, 2013), so that scouting market/technological opportunities can occur without preconceptions of the innovation problem (Knight et al., 2019; Vetterli et al., 2016; Yoo & Kim, 2015). In fact, this is corroborated by the broader discourse on the tradeoff between fresh versus knowledgeable minds (Davis et al., 2016).

Individuals with a fresh mind usually sense problems that are rather unexpected ex ante, whereas knowledgeable minds tend to sense opportunities that are deeper in the essence of humans (Peschl & Fundneider, 2014). Moreover, when it comes to mind aspects, academic attention is growing on the mediation role of consultants, a proxy for facilitators in the DT process, and the influence they might have in managing and supporting the naïve mind approach (Brown & Katz, 2011). Indeed, by favoring a methodical approach in the identification of options in the market, consultants can support individuals in sensing latent needs (Verganti, 2011).

Finally, a debate has emerged on the different thinking logics that an individual might adopt, as these affect the capability to sense innovation opportunities (Basadur, 2004). The DT cycle of thinking includes inductive, deductive, and abductive reasoning (Dunne & Martin, 2006). When the focus is on sensing capabilities, the *inductive thinking* perspective, defined as "what is," appears particularly relevant compared with the others (Kimbell, 2012). Indeed, design thinkers embrace an inductive perspective by using cues spotted in analyzing market needs to generalize them as an opportunity for the whole segment under study (Basadur & Hausdorf, 1996). Thus, the opportunity and knowledge gained by looking at the market are foundations for the future development of the solution (Dorst, 2019).

### 4.1.2 | Processes and interactions

Researchers reveal the primary role of users in DT as a source of knowledge for screening and evaluating the market and technological environment. From this perspective, DT processes should be built around the central role of users (Hunter et al., 2008; Taffe, 2018). That is, users should be studied and observed at the beginning of the DT process to spot their needs, and in turn, the market/technological opportunities that may be pursued (Bas & Guillo, 2015; Kimbell, 2012). Specifically, the DT literature shows that relevant insights on wicked innovation problem are usually highlighted by observing users and making design thinkers *empathize* with them (regardless of the fact that design thinkers are empathetic by nature) in the DT process

(Kleinsmann et al., 2017; Paton & Dorst, 2011; Shapira et al., 2017).

Delving more in-depth into the involvement of users in the process of empathizing, a dichotomy in how users can be viewed in the DT processes unfolds. On one side, users are considered as either passive members (i.e., a "subject" to be observed only to gather information) or active members (i.e., people actually involved in the DT process to help sense innovation opportunities) (Carlgren et al., 2016a, 2016b; Kurtmollaiev et al., 2018).

As a matter of fact, the observation of users acting in the outside world enables design thinkers to spot external problems and needs waiting to be solved (Hunter et al., 2008; Peschl & Fundneider, 2014). In this way, the outside-in perspective allows sensing opportunities linked to needs about humans (Clark & Smith, 2008; Kesseler & Knapen, 2006; Koomans & Hilders, 2016). In turn, more ethnographic research is required with users at the beginning of the DT process (Brown, 2008). An alternative view is the inside-out perspective, which highlights the designers' capability to sense and *look for sociocultural trends* that are emerging in society, speculating on them to craft future scenarios (Verganti, 2011). This alternative view sees the centrality of designers in inward-looking knowledge that is hidden in society to propose their personal view in the process of crafting new meanings (Verganti, 2017). This approach seems to lead to a more radical innovation due to its reflective and critical approach toward innovation that changes in a thorough way performances and values (Verganti, 2011).

The literature also shows that the DT process relies on brainstorming and cocreative sessions that enable people to sense new opportunities (Micheli et al., 2012). They allow exchanging and refining ideas, including different perspectives, and identifying new problems to be solved (Micheli et al., 2012; Snyder et al., 2018). Specifically, the DT process for the creation of novel options (i.e., designing new features, solving user needs) is at the core of the debate (Giacomin, 2014; Li et al., 2018). Novel options are usually linked to the backward-looking concept (Eppler & Kernbach, 2016; Noble & Kumar, 2010), grounding the entire decision-making process in *researching past knowledge* and performance that is measurable (Bas & Guillo, 2015). Relatedly, several studies find that some firms look at DT as a method to generate creatively innovations (Li et al., 2018; Smith et al., 2012), also with a focus on resolving longstanding user needs that have never been observed by organizations and that DT can help unveil (Paton & Dorst, 2011).

In any event, DT processes should be always characterized by the *defer judgment* perspective (Buchanan, 2015). In every process, all the activities to ensure sensing new opportunities in the DT process must be nonjudgmental. That is, scholars stress that bias and preconceptions might hinder the DT process by introducing a judgment and perspective that hinder sensing opportunities (Carr et al., 2010; Liedtka, 2015), resulting, for example, in the exclusion of valuable, although more radically oriented innovation opportunities. Accordingly, being able to instill processes that defer judgment in evaluating market/technological opportunities is recognized as a good means to improve project performance in terms of the radicalness and newness of the solutions further developed (Carlgren et al., 2014; Liedtka, 2015).

#### 4.1.3 | Structure

Managers can make the most of DT only by understanding that a structure that supports collective actions and interactions builds an organization, and ultimately, a team able to address innovation problems by sensing relevant opportunities (Chen & Venkatesh, 2013; De Mozota, 2008; McFadzean, 1998). For instance, establishing *creative confidence* (i.e., defined as a sense of belonging and willingness to contribute to the organization's innovativeness by creatively proposing opportunities) within the boundaries of the firm can support sensing (Camacho, 2016; Li et al., 2018; Porcini, 2009). In this vein, a structure calling for a more top-down way of interacting might impede employees from sensing opportunities by hindering creative discovery (Geissdoerfer et al., 2016), whereas a more bottom-up perspective can support sparking more creative ideas (Collins, 2013; Verganti, 2008).

Furthermore, while supporting the sensing of opportunities, the organizational structure should also support divergence (Carlgren et al., 2014). Indeed, companies *encourage wild ideas* as a capability within the organization to foster the exploration of opportunities. In this case, they will be able to diverge better and explore new opportunities hidden in the market that DT can help uncover (Clark & Smith, 2008). Hence, by proposing ideas that are far from imagined in a linear process, DT will help organizations sense opportunities that are outside their traditional comfort zone (Bason & Austin, 2019). Hence, structuring the units within the firm in such a way as to empower people to think outside the box allows sensing valuable opportunities and improving the innovation potential of DT adoption (Wylant, 2008). Table 3 summarizes the findings pertaining to the sensing dynamic capability.

### 4.2 | The microfoundations of DT as a seizing dynamic capability for innovation

#### 4.2.1 | Individuals

Design thinkers make choices about innovation opportunities that are more or less informed and rational (Kleinsmann

**TABLE 3** Summary of research findings for the sensing dynamic capability

| **Sensing** | | |
|---|---|---|
| **Microfoundations** | **Core findings** | **Key references** |
| Individuals | Design thinkers sense opportunities by discovering user needs. Thus, *empathy* with users is recognized in the DT literature as an individual skill crucial to sensing opportunities for problem to be solved by adopting creativity. | Basadur (2004); Brown (2008); Carlgren et al. (2016b); Magalhães (2018); Paton and Dorst (2011) |
| | Design thinkers are characterized by the *naïve mind* approach toward problem solving. They do not look with preconceptions at problems but genuinely unpack the problem and surrounding reality to search for opportunities. | Brown and Katz (2011); Dalsgaard (2014); Davis et al. (2016); Kleinsmann et al. (2017); Knight et al. (2019); Li et al. (2018); Peschl and Fundneider (2014); Seidel and Fixson (2013); Verganti (2011); Vetterli et al. (2016); Yoo and Kim (2015) |
| | Design thinkers embrace *inductive thinking* as the reasoning of what users experience in everyday life. With this mindset, designers sense the opportunity and start to generate new proposals. | Basadur (2004); Basadur and Hausdorf (1996); Dorst (2019); Kimbell (2012) |
| Processes and interactions | The DT process is characterized by many principles. Among these, *empathizing with users* clearly aims at sensing opportunities. Dynamically, the DT process that starts with observing user needs enables discovering and sensing such opportunities. | Bas and Guillo (2015); Hunter et al. (2008); Kimbell (2012); Kleinsmann et al. (2017); Paton and Dorst (2011); Shapira et al. (2017); Taffe (2018) |
| | The DT process can also be rooted in *looking at sociocultural trends* to envision new future directions and come up with innovations. By dynamically sensing the emergence of new trends, the DT process can support the creation of new meanings. | Verganti (2008, 2011) |
| | The DT process in sensing opportunities deeply relies on *researching past knowledge*. The literature shows that the process of looking at past knowledge enables DT to propose novel solutions by reconfiguring past understandings in new products and services. | Giacomin (2014); Li et al. (2018); Micheli et al. (2012); Noble and Kumar (2010) |
| | The DT process is organized to *defer judgment*. The ability to structure the divergent and convergent phases to support creativity can aid sensing opportunities if deferring judgment in the intuitions and insights proposed during the process. | Buchanan (2015); Carlgren et al. (2014); Carr et al. (2010); Liedtka (2015) |
| Structure | Organizations adopt a DT structure to establish the *creative confidence* of employees. Having a structure that allows people to be confident in searching and highlighting opportunities is crucial for the success of every DT initiative. | Camacho (2016); Chen and Venkatesh (2013); De Mozota (2008); Li et al. (2018); McFadzean (1998); Porcini (2009) |
| | Organizations adopt a DT structure to *encourage wild ideas*. Although creativity in its broad term is crucial, the DT structure should embrace this openness of mind by supporting creative people with a clear mindset as the real ability to listen to provocative ideas. | Bason and Austin (2019); Carlgren et al. (2014); Clark and Smith (2008); Wylant (2008) |

et al., 2017). In particular, expert individuals usually support DT with a more informed and rational perspective (Seidel & Fixson, 2013), whereas nonexperts usually leverage more irrational perspectives (Ray & Romano, 2013). This greatly influences the capturing of opportunities and the attitudes of those involved in DT by adopting a playful goal-oriented process in the front-end design phases (Roth et al., 2015). Specifically, the *logical* and *rational* reasoning adopted by

individuals when the aim is to seize opportunities fosters convergence toward the solution (Liedtka, 2015). Even in creative processes, a more conscious way of thinking can prevail over intuitive and visionary reasoning (Kimbell, 2012). Thus, every design thinker is required to be able to visualize thoughts (Carr et al., 2010). This has been studied and recognized as one of the key elements of successfully addressing and solving problems (Kesseler & Knapen, 2006). In other words, making the solution visible through sketching and physical mock-ups enables individuals to converge (Taffe, 2018).

Concerning seizing, the *deductive reasoning* perspective is increasingly adopted and embraced by design thinkers (Dunne & Martin, 2006), highlighting its relevance. Defined as "what should be," deductive reasoning allows better envisioning future scenarios and enacting proper innovation processes based on a previously sensed opportunity (Dorst, 2011; Martin, 2011). Confirmation lies in the fact that individuals are able to converge toward the solution by crafting how the solution should work through adopting a prototyping and testing mindset (Johansson-Sköldberg et al., 2013; Park, 2011; Roy & Warren, 2019).

### 4.2.2 | Processes and interactions

Broadly speaking, *experimentation* processes are relevant for DT projects. Indeed, organizations should create hypotheses and test them by adopting processes that instill curiosity, creativity, and enable converging toward innovations (Buchanan, 2015). As a matter of fact, that being able to craft strong hypotheses, that are coming from concrete and observable information from the outside, and test them with the market and users is crucial for the convergence of any DT processes (Bas & Guillo, 2015). In this context, exploring knowledge exchange processes when adopting the DT approach to innovate is pivotal. To note is that the DT approach can involve a single function or multiple functions, hence influencing the ways of interaction, and in turn, impacting know-how exchange (Buhl et al., 2019; Martin, 2011). In this regard, communicating and transferring knowledge across boundaries is endangered when involving different functions, despite that they bring different knowledge and mental models that can boost the innovativeness of ideas (Dougherty, 1992; Park, 2011), revealing that even the DT approach may suffer from this issue (Davis et al., 2016). Thus, given the DT aim of converging and diverging knowledge management, the processes require very detailed consideration (Buhl et al., 2019), thus formal (i.e., visualizations, templates, and reports) and informal techniques (i.e., talks, notes, and insights) to exchange knowledge among people (Clark & Smith, 2008; Manzini & Rizzo, 2011). In addition, research recognizes that the *brokering of knowledge* outside firm boundaries (i.e., the capability that enables crosspollination across sectors and different knowledge domains) influences the DT process (Dorst, 2011; Jung et al., 2014; van der Bijl-Brouwer & Dorst, 2017). With the advent of digital tools, more and more DT processes are influenced by digital technologies, which are found to influence the seizing of opportunities (Eppler & Kernbach, 2016).

A debate is emerging on prototyping processes. *Prototyping* is defined as the moment when the first type of solution is created (Davis et al., 2016; Kanstrup, 2017). Teams set up DT processes where prototyping is central to allowing the organization to converge by aligning people toward the solutions (Peschl & Fundneider, 2014). The debate on the role of prototyping for team alignment goes under the concepts of boundary objects as solutions that enable convergence through being the means to an end of the discussion (Carr et al., 2010). Recently, new roles of the prototyping process have emerged when dealing with convergence. The growing relevance of prototyping is an example of how visualizing and sharing a solution enable the debate and increase the DT capability to fulfill customer needs.

### 4.2.3 | Structure

A commonly held belief is that undertaking a DT innovation project requires a structure composed of people who facilitate the adoption of tools and templates (Brown, 2008). Relevant in this regard are facilitators who mediate the activities and control the time and objectives of each session (Kesseler & Knapen, 2006). These facilitators may be internal or external to the organizational boundaries (Strike & Rerup, 2016). Internal facilitators are experts in the field and might help out in some circumstances, yet in others (e.g., more radically oriented innovation activities), they might limit the creativity and radicalness of the outputs (Carlgren et al., 2014; Knight et al., 2019; Mitsui & Nagai, 2014). Accordingly, internal facilitators are recognized as helpful when an additional workforce is needed, as they may be knowledgeable of the subject under study (Martin, 2009). Conversely, the emerging *focus on execution* supports the presence of external facilitators (Kimbell, 2012; Knapp et al., 2016; Zeratsky, 2016). The reason is that formally structuring the role of external facilitators might have an impact on the process and task management and push the team to perform the activities faster (Chen et al., 2015; Li et al., 2018) compared with internal facilitators who might be misled by the flow of thoughts.

The DT literature also contemplates how to *develop coexisting alternatives* and propel the processes toward convergence (Zeratsky, 2016). With this in mind, structuring a DT process to enable the proper management of alternatives would boost creativity but also convergence to the solution (De Mozota, 2008).

Thus, having clear roles within the team, and structuring alternating moments of open discussion and debate, allows teams to evaluate alternatives by leveraging their different backgrounds (Paton & Dorst, 2011). Structuring the organization to enable different actors to participate in an egalitarian way enables the convergence of the DT process by employing multiple and different perspectives (De Couvreur & Goossens, 2011). Table 4 summarizes the findings on the seizing dynamic capability.

## 4.3 | The microfoundations of DT as a reconfiguring dynamic capability for innovation

### 4.3.1 | Individuals

At the individual level, problem framing (i.e., the capability to deconstruct the problem) is critical for every design thinker (Johansson-Sköldberg et al., 2013) and is usually associated with the capability of *embracing ambiguity* (Beverland et al., 2016). Design thinkers should be able to accept the fact that solutions are not forever but are a proposal made to the market and continuously updated and modified (Drews, 2009; Li et al., 2018). Linked to the problem of (re)framing by embracing ambiguity is the individual framing and *reframing* capability that design thinkers should have to reconfigure an opportunity or problem (Paton & Dorst, 2011). Indeed, the designerly way of thinking is rooted in not taking anything for granted and in deconstructing and reconstructing, that is, iteratively diverging and converging problems and opportunities to discover the inner elements (Hatchuel et al., 2005; Micheli et al., 2012).

The capability of reconfiguring a problem to innovate is supported by *abductive thinking* (Chang et al., 2013; Dunne & Martin, 2006), namely combining different hints, opportunities, and problems by inferring the explanation. Hence, abduction is a crucial element at the individual level to the point that academics reflect on the role of this approach in sensemaking and improving innovation performance (Liedtka, 2015).

Diversity is an additional aspect of characterizing design thinkers. With diversity, scholars refer to the willingness of design thinkers to have different stakeholders with different backgrounds onboard so that they can help DT frame and reframe the problem by leveraging distinct angles and perspectives (Verganti, 2017). This will spark the *critical thinking* capability that will help design thinkers reflect deeper and reconfigure the solutions, without taking the initial assumptions for granted (Carlgren et al., 2016b; Verganti, 2016).

### 4.3.2 | Processes and interactions

Innovative firms might seek more radical innovations, and therefore, the purpose of the process differs completely from resolving longstanding problems (Bicen & Johnson, 2015; Carlgren et al., 2014; Giacomin, 2014). The DT process tends to focus on reframing problems by adopting a forward-looking approach, where the projection of future scenarios guides the more irrational ideation and creative phase. In this sense, managers are less led by myopia, able to envision and *speculate* about future scenarios (Collins, 2013; Drews, 2009; Martin, 2011; Sanders & Stappers, 2008). Thus, the purpose of this DT process aimed at speculating about future scenarios can drive radical innovation, adopting a forward-looking approach to even reconfiguring existing solution (Carlgren et al., 2014; Clark & Smith, 2008; Jung et al., 2014). Overall, the DT processes are not only aimed at solving user needs, but when reconfiguring capabilities are part of the process, the *envisioning* of future scenarios is unleashed (Collins, 2013; Sohaib et al., 2019). Envisioning future scenarios is a typical scenario-building process used in DT to iteratively visualize and see the problem and related opportunity from a different perspective (Moon & Han, 2016). This will enable reconfiguration and more in-depth reflection.

Finally, the DT processes are grounded in the assumption of letting people discuss and *debate* the ideas and intuitions sensed and seized (Verganti, 2016). These enable reconfiguring knowledge, integrating and transferring know-how from different experts in the project (Sleeswijk Visser et al., 2007). The continuous iteration between designing and debating enables the DT process to delve deeper into the essence of the problem and propose impactful solutions.

### 4.3.3 | Structure

The management of the structure in terms of team flexibility and agility in the execution of collective actions boosts innovation through the DT problem-framing approaches (Blanco et al., 2016; Paton & Dorst, 2011). The literature asserts that DT can be adopted when the problem is ill-defined and user needs are imperceptible. However, it can only be effective if the structure and process are clearly defined; otherwise, the problem-solving approach is difficult to sustain (Carlgren et al., 2016b; Dalsgaard, 2014). The structure may differ depending on the DT project's aim (Beverland et al., 2015; Micheli et al., 2012; Verganti, 2008). More radical projects usually require a looser organizational structure, a more *agile* configuration to spark the reconfiguration of solutions (Arrighi et al., 2015; Caughron & Mumford, 2008). Indeed, being agile means embracing a capability that aims at fostering iteration and the reconfiguration of opportunities (Björgvinsson et al., 2012; Hobday et al., 2012b).

Concerning the structure enabling reconfiguration, a second relevant aspect refers to *learning-by-doing* (Beckman & Barry, 2007; Carlgren et al., 2014), the capability of continuous learning through leveraging knowledge generated from

**TABLE 4** Summary of research findings for the seizing dynamic capability

| **Seizing** | | |
|---|---|---|
| **Microfoundations** | **Core findings** | **Key references** |
| Individuals | Design thinkers seize opportunities by relying on *logical and rational reasoning*. Indeed, the literature shows that DT helps in converging and making sense of things through subsequent decision-making and prototyping. | Kimbell (2012); Kleinsmann et al. (2017); Ray and Romano (2013); Seidel and Fixson (2013) |
| | Design thinkers seize opportunities by developing a *deductive thinking* approach toward problem solving. By managing the capability of envisioning future scenarios and focusing on convergence in deducing insights, they are able to seize the opportunity spotted dynamically. | Dorst (2011); Johansson-Sköldberg et al. (2013); Martin (2011); Park (2011); Roy and Warren (2019) |
| Processes and interactions | The DT process is based on *experimentation* routines and capabilities. In seizing opportunities, the DT process relies on the creation of hypotheses, assumptions, and subsequent testing with the market. This also allows testing whether the creative intuitions are correct or not. | Bas and Guillo (2015); Buchanan (2015) |
| | The DT process is based on *brokering knowledge* when the aim is to seize opportunities. The literature unveils the ability to bring varied know-how in the convergence phase to allow the DT process to conclude with a solution that has an impact. | Buhl et al. (2019); Dougherty (1992); Jung et al. (2014); Manzini and Rizzo (2011); Martin (2011); van der Bijl-Brouwer and Dorst (2017) |
| | The DT process deeply leverages *prototyping* techniques to seize opportunities. The capability to craft and mold solutions in prototypes of a different nature (i.e., prototype, boundary objects, MVP) underpins every DT process as a phase for converging on solutions. | Davis et al. (2016); Kanstrup (2017); Peschl and Fundneider (2014) |
| Structure | Organizations adopt a DT structure to support a *focus on execution* when seizing opportunities for innovation. The DT ability to reach the end through prototyping and testing must be enabled by a structure that supports the fail fast and learning dimension that otherwise will hinder focusing on execution. | Chen et al. (2015); Kesseler and Knapen (2006); Knight et al. (2019); Mitsui and Nagai (2014); Strike and Rerup (2016) |
| | Organizations adopt a DT structure to better *develop coexisting alternatives*. Innovation and especially creativity are grounded in the idea of quantity but being able to manage and seize the quantity to advance is crucial to avoid hindering the quality of the output. | De Couvreur and Goossens (2011); De Mozota (2008); Paton and Dorst (2011) |

crafting prototypes, and analyzing feedback from the market. This capability can support the organization in keeping the focus on gaining knowledge, continuously enabling the reconfiguration of skills in a DT project (Hobday et al., 2012a; Koomans & Hilders, 2016). Indeed, from its design origin, DT is grounded in the "doing" dimension. Increasingly emphasized in the literature is the role of DT at the structural level in terms of learning and creating knowledge (Davis et al., 2016; Liedtka, 2015).

A structure that supports openness and a naïve mind is implemented by organizations that are more horizontal and adopt a bottom-up approach (Gobbo & Olsson, 2010). Specifically, depending on the reason for involvement, the overall organization should be shaped accordingly (Beverland et al., 2015). Thus, a flatter organization favors a more flexible creative process determining the mindset, culture, and central themes rather than the sequence of phases of a fair DT process (Dorst, 2019; Stephens & Boland, 2015). Therefore, a culture of shared responsibility and decentralization among employees supports the sharing of personal reflections and the reinterpretation of the issue (Knight et al., 2019). Hence, flatter organizations are usually more able to share knowledge and

foster creativity through less codified processes due to the capability of *decentralizing* responsibilities (Moon & Han, 2016; Zheng, 2018). Table 5 summarizes the findings about the reconfiguration of dynamic capability.

## 5 | DISCUSSION AND CONCLUSION

The present study proposes a theory-based framing of the DT for innovation literature based on our efforts to formally construe DT as a dynamic capability for innovation, further explained by looking at its microfoundations. Consequently, we propose a theoretical framework used to frame the more practitioner-oriented outcomes of the DT for innovation literature, hence reconciling theory and practice.

In this way, we provide new insights and a more comprehensive theoretical view into the emerging nature of DT grounded in innovation and management theories. Figure 2 depicts our framework, showing that DT can be viewed as a dynamic capability for innovation, and the related microfoundations derived from the DT for innovation literature. Specifically, we theoretically strengthen the case for DT as a dynamic capability that involves: sensing new opportunities based on understanding user needs through continuously empathizing with them, seizing the identified opportunities based on managing alternative prototypes and a constant focus on experimentation, and reconfiguring the problem by continually reframing and debating potential future visions and speculations. Each of these is rooted in specific individuals, processes and interaction modes, and organizational structures.

Based on this theory-based review, we next identify potential future developments for the DT for innovation literature.

### 5.1 | Emerging lines of inquiry when considering DT as a dynamic capability

By unpacking the individual, processes and interactions, and structure microfoundation building blocks characterizing DT as a dynamic capability for innovation, this study advances the future development of the DT literature and explains the DT–innovation relationship in a more structured way.

From our review, we have differentiated various aspects of DT pertaining to individuals. At the individual level, the literature shows the centrality of empathy for sensing (Basadur, 2004; Carlgren et al., 2016b), logical reasoning for seizing, and embracing ambiguity for reconfiguring (Beverland et al., 2015; Drews, 2009). In addition, it shows the different thinking styles that individuals should adapt according to the DT objective: inductive for sensing, deductive for seizing, and abductive for reconfiguring (Chang et al., 2013; Liedtka, 2015). Conversely, the DT literature needs more studies on the different characteristics (e.g., psychological traits, cognition, gender, ethnicity, previous experiences) of individuals that can better support the diffusion and adoption of DT. Also important is understanding when and how different individuals should be involved in DT projects, also with respect to the different objectives they pursue (i.e., short vs. long-term outcomes, radical vs. incremental innovation). With specific regard to facilitators, more studies on the similarities and differences among DT facilitators and other servant leaders of innovation methods (e.g., agile-stage-gate, scrum, open innovation) can inform academics and practitioners on the individual microfoundation configurations required for the practical use of DT.

Concerning the microfoundations of DT that pertain to processes and interactions, some differences in DT processes are well renowned, for example, strategic level versus operational level (Collins, 2013; Sohaib et al., 2019) and innovation of direction versus innovation of solution (Brown, 2008; Verganti, 2017). Instead, differences in radical versus incremental innovation processes have yet to be deeply studied despite the renowned differences between the two types of innovation outcomes.

The debate on the role of knowledge exchange in DT projects is still ongoing (Davis et al., 2016). While solving problems by adopting creativity (Dorst, 2011) and brokering knowledge in different phases of the process according to the scope have been empirically studied (e.g., Ray & Romano, 2013), the "how" dimension is still unclear. In other words, how knowledge is codified and transferred among the phases of the DT processes. The exploration of this aspect might lead scholars to discover, for instance, the presence of open versus closed or inbound versus outbound DT processes, which ultimately affect the knowledge search and recombination activities for innovation (Savino et al., 2017). The general gaps found in managing knowledge in the process might impact the three dynamic capabilities differently. In sensing, the search for knowledge is pivotal. Still, there is a lack of understanding of the role it might have in influencing overall project performance. In seizing, the brokering function is recognized as critical, but remaining unclear is how to master this in practice. In reconfiguring, how to reframe knowledge to envision and speculate about the future is still unclear.

Concerning the microfoundations of DT that pertain to structure, the reviewed literature examined different structures. While a hierarchical structure might inform individuals on the organization's direction (Wylant, 2008), it does not sustainably involve and engage those participating in the DT process (Geissdoerfer et al., 2016). Moreover, structures that enable creative confidence (De Mozota, 2008; McFadzean, 1998; Porcini, 2009), focusing on execution (Kimbell, 2012; Knapp et al., 2016; Zeratsky, 2016) or unleashing agility (Arrighi et al., 2015; Caughron & Mumford, 2008), are

**TABLE 5** Summary of research findings for the reconfiguring dynamic capability

| **Reconfiguring** | | |
|---|---|---|
| **Microfoundations** | **Core findings** | **Key references** |
| Individuals | Design thinkers leverage the capability of *embracing ambiguity to reconfigure knowledge. Indeed, by accepting not having everything set, they are capable of iterative change and modifying the assumptions on which they build.* | Beverland et al. (2016); Drews (2009); Johansson-Sköldberg et al. (2013) |
| | Design thinkers base their individual capabilities on the reconfiguring dimension of their *reframing ability. The capability to continually change the perspective adopted and thus reframe the problem and solution over time enable diverging and converging and ultimately creating value.* | Hatchuel et al. (2005); Micheli et al. (2012) |
| | Design thinkers when facing reconfiguring no longer adopt linear thinking but *abductive thinking. The literature shows that the integration of the analytical and intuitive way of reasoning can spark the creativity needed for reconfiguring.* | Chang et al. (2013); Liedtka (2015) |
| | Design thinkers also develop a *critical thinking approach when designing solutions. The developmental criticism mindset allows them to unleash reconfiguration.* | Carlgren et al. (2016b); Verganti (2016, 2017) |
| Processes and interactions | The DT process is based on *speculating* when the aim is to reconfigure the solution. Indeed, the ability to establish a process that by leveraging divergence and convergence allows envisioning future distant scenarios and speculating on these is a crucial element of this approach. | Bicen and Johnson (2015); Carlgren et al. (2014); Giacomin (2014) |
| | The DT process is based on *envisioning* when the focus is on reconfiguring the problem and better framing it; the process must be structured to support designing future solutions that will respond to needs. | Collins (2013); Moon and Han (2016); Sohaib et al. (2019) |
| | The DT process is rooted in *debating*, embracing criticism, and building on the ideas of others. In this way, ideas will be reconfigured by adopting techniques for questioning and valuing different perspectives. | Sleeswijk Visser et al. (2007); Verganti (2016) |
| Structure | Organizations adopt a DT structure in an *agile* way when they want to enable reconfiguring. Indeed, the ability to iteratively change and experiment must be supported by an appropriate and flexible structure. | Beverland et al. (2015); Björgvinsson et al. (2012); Blanco et al. (2016); Hobday et al. (2012b); Paton and Dorst (2011) |
| | Organizations adopt a DT structure in a way that enables the *learning-by-doing approach. Learning is crucial in every business and is becoming more and more valuable in the creative process, where value is not in the output but in the way the output is reached. Thus, the organization should be ready to gather knowledge in every phase.* | Beckman and Barry (2007); Carlgren et al. (2014); Hobday et al., (2012a); Koomans and Hilders (2016) |
| | Organizations adopt a DT structure to *decentralize responsibility. This enables everyone in the firm to propose ideas and support the creative flow of knowledge.* | Gobbo and Olsson (2010); Moon and Han (2016); Zheng 2018 |

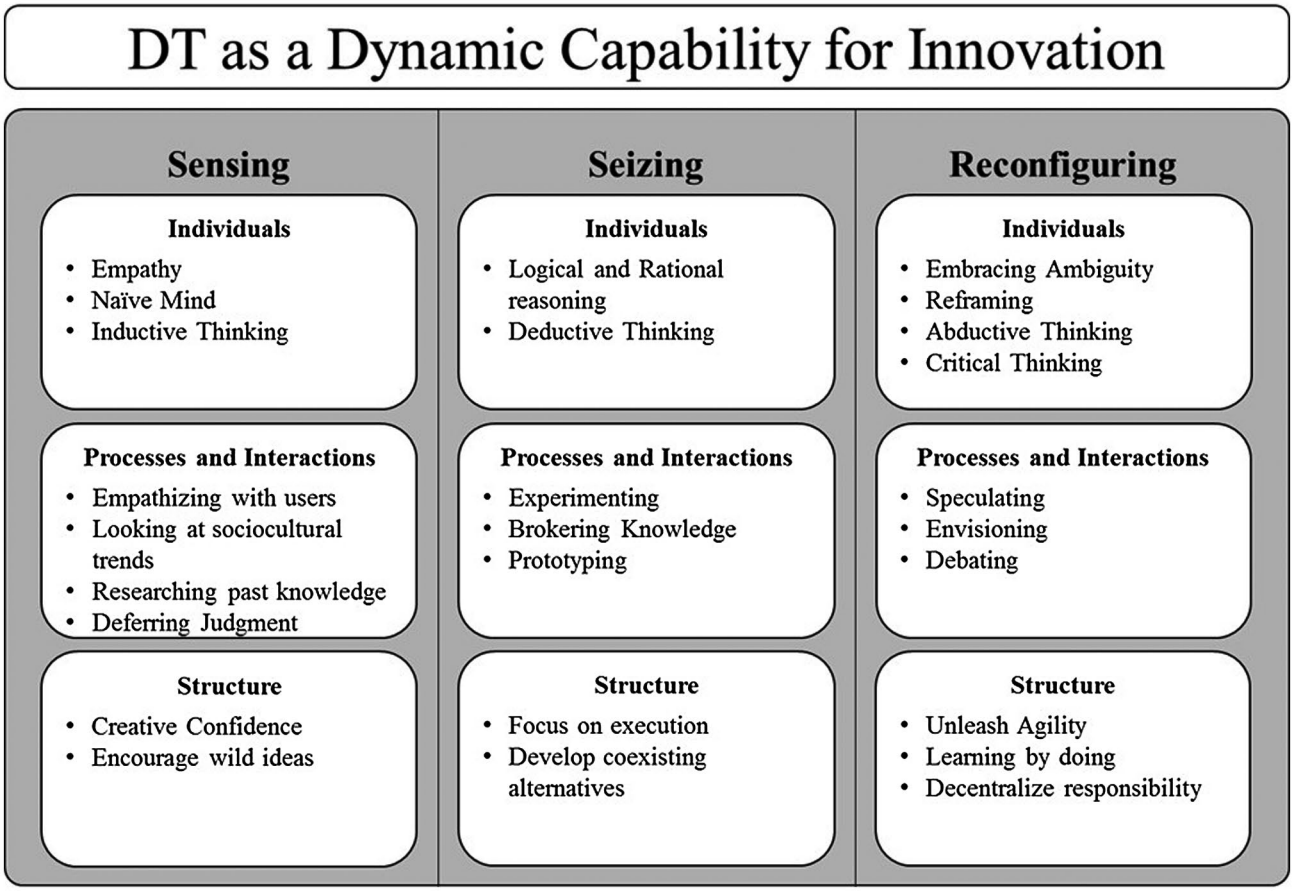


**FIGURE 2** Summary of the existing DT literature for innovation according to the theoretical framing

deemed relevant. Therefore, future research should unpack how these dimensions can be implemented in a DT-centric organization. Moreover, there is a lack of understanding of the role of DT in R&D–centric organizations and how these organizations can leverage different structures to pursue their goals. Hence, a better understanding of how different structures should be adapted to effectively support R&D, and when they might be enacted in a dynamic perspective, might be of value to fully appreciate the role of DT in new product development and innovation management. Finally, the DT literature lacks an understanding of how firms can nurture creativity. How creative confidence can be diffused within an organization through a proper structure, and the levers a firm can employ to structure an organization that enables creative confidence or adopt the learning-by-doing approach are still unclear.

In addition to the gaps regarding the specific microfoundation building blocks, some wide-ranging limitations in past studies may hinder the study of DT as a dynamic capability for innovation. That is, despite covering a broad range of different industries and national settings, most studies are qualitative, with only a few adopting a longitudinal design to study the phenomenon. Hence, three main (general) gaps should be addressed.

First, large-scale *quantitative studies* are scarce. We acknowledge that constructing a large enough sample to conduct, for instance, econometric studies at the firm level is difficult and time-consuming. However, defining the microfoundations of DT for innovation based on actual data is a necessary starting point. An initial solution to data collection issues may be found in focusing on the project level. Instead of using the firm as the unit of analysis, data might be collected in relation to different projects even if conducted in the same company. This would at least reduce the number of organizations to interact with and is consistent with the microfoundational lens, which favors micro-macro analysis. However, to control for the multilevel nature of the resulting models (i.e., multiple projects nested within a few firms), hierarchical linear modeling techniques should be considered (Aguinis et al., 2013). Thus, we propose the following research questions: *Which microfoundations influence project performance? How do different microfoundations of DT as a dynamic capability interrelate and generate value? and What are the (distinct) benefits to DT project performance when leveraging sensing, seizing, or reconfiguring?*

Second, future studies should adopt a longitudinal lens. Organizations and innovation problems, as well as their constituents, evolve, thus calling for studies on how such changes

affect the DT innovation approach. This is also in line with the view of DT as a dynamic capability. Finally, the DT for innovation literature emphasizes the "how" (i.e., how to implement DT) and "who" (who is involved in DT) questions. Instead, the "when" question is largely neglected. Hence, to increase our understanding of DT as a dynamic capability in innovation, some of the following questions are proposed: *When (i.e., at what stage) should DT be implemented in the innovation process? Does DT mainly pertain to the fuzzy front-end of the innovation process or it is also relevant to introduce it dynamically at later stages (i.e., implementation, production, commercialization)? Which factors drive the decision to implement DT earlier or later in the innovation process, and Which are the more relevant microfoundations according to the specific stage?*

Third, people within organizations change over time in terms of their experience, know-how, relational aspects, position, and so forth, thus also changing the sensing, seizing, and reconfiguring capabilities to innovate. Therefore, assessing changes in characteristics, beyond the direct effect of a characteristic *per se* that remains unchanged, may be a significant improvement. Despite empirical evidence of the different types of individuals involved in a DT project, increasingly relevant is *understanding the traits of individuals* who should and must take part in such projects. This might be interesting for organizational and human resource-based research as well as measuring performance to assess how different individuals involved in the process might generate different innovation outcomes. For this third dimension, and to enhance DT research, we propose the following questions: *How does a change in people or their know-how affect dynamic capabilities? Which dynamic capability benefits/suffers the most? Are there characteristics that influence dynamic capabilities differently? How do the different individual microfoundations of DT as a dynamic capability for innovation influence project performance? and What are the structures and processes that better support individuals in proposing solutions to ill-defined problems?*

## 5.2 | Implications for innovation theories

The contributions of this paper are fourfold. First, over time, DT has been viewed as a linear methodology composed of a set of activities/tools whose elements can be isolated, adopted, and replicated, but with potential only for incremental change and innovation (Nussbaum, 2011). This has its roots in some management theorists and practitioners calling for the adoption of systematic processes and a replication logic to pursue DT for innovation (Beverland et al., 2016; Martin, 2009). Instead, in line with some previous studies (e.g., Liedtka, 2020; Yoo & Kim, 2015), we formally advance a more active view of DT as a dynamic capability to (steadily) innovate, further framed by looking at the microfoundations of dynamic capabilities.

Second, contrary to the majority of academic concepts, DT suffers from having high practical relevance yet lacking robust theoretical development (Micheli et al., 2019). With this in mind, we rely on the dynamic capabilities literature and the microfoundational lens to reconcile theory and practice and make the theory more relevant to managers by anchoring and framing the more practitioner-oriented outcomes of the DT for innovation literature. In light of our view of DT as a dynamic capability for innovation, this choice particularly recalls that "in factors like dynamic capabilities, … routines that are linked to firm-level performance are seen to be lacking in explanatory power" (Storbacka et al., 2016, p. 3009), which is where microfoundations come into play (Teece, 2007).

Third, we believe that the proposed framework and the gaps identified are a relevant starting point for DT scholars, especially considering that these gaps are rooted in well-defined innovation and management theories, hence reducing the likelihood of developing the DT concept as a collection of "ad hoc, atheoretical and noncumulative studies" (e.g., Goodman et al., 1983, p. 164; Micheli et al., 2019).

Furthermore, while there are some "traits" considered representative of DT in general (e.g., the adoption of inductive, deductive, abductive thinking), our framework allows a better understanding of when these traits are actually representative of DT. As an example, while the three thinking modes mentioned are well recognized by previous studies, these did not clearly highlight when they are used. Instead, we can clarify to which specific dynamic capability (sensing, seizing, or reconfiguring) they pertain. Following this rationale, we also highlight that there are some traits not conventionally related to DT that are still necessary in specific cases. For instance, arguing that design thinkers seize opportunities by relying on logical and rational reasoning may seem to contradict the existing literature because DT does not usually rely on logical and rational reasoning. However, we identify the need for logical and rational thinking for the seizing capability when specifically discussing the individual microfoundation building block. Overall, the framework allows, on one side, an understanding of the useful DT traits and their purpose; on the other side, clarifying the presence and persistence of conventional approaches to innovation that could be useful to DT.

The last contribution more broadly relates to the innovation management literature. Although with a specific focus on DT, we believe that this paper adds to the relatively limited efforts to analyze "the potential determinants of innovation capabilities, taking into account lower-level entities" (Mazzucchelli et al., 2019, p. 243).

## 5.3 | Managerial implications

From a practical perspective, we advise managers that DT should be considered neither as a sporadic approach to solve a given innovation task/objective nor a static set of tools/methods that if applied according to defined rules will (certainly) lead to the desired innovation outcome. That is, DT should be considered as a means to develop/improve overall innovation capabilities, implemented as an overarching approach that combines the analytic and synthetic phases to innovate, in contrast to the conventional narrow, technically oriented way of thinking.

Furthermore, the heterogeneity among firms adopting DT for innovation can be identified in the lower-level aspects of firms, that is, the microfoundations underlying the sensing, seizing, and reconfiguring capabilities enabled by DT. These microfoundations relate to the individuals, processes and interactions, and structure of an organization. Specifically, managers should be aware that there are key "types" of individuals that make the DT approach work, namely users, team members, consultants, and facilitators. They can mainly be characterized in terms of their active versus passive role, their fresh versus more mature knowledge/attitude, and the internal versus external nature of their membership. Still, some necessary traits of individuals involved in the DT processes are empathy, problem framing, visualization, and experimentation.

Concerning the processes and interactions, managers are advised that different DT processes must be developed depending on the objectives of the innovation project, in accordance with the notion that there is no well-defined modus operandi underlying DT. For instance, different processes must be developed when aiming to create novel options (i.e., incremental innovation objectives) or envision new scenarios (i.e., more radical innovation objectives; new design features). Backward-looking processes are more suitable in the former case and forward-looking in the latter. Also related to the innovation objectives are interaction issues among individuals in the DT processes, with particular regard to knowledge exchange. Knowledge exchange is of course pivotal, even if the DT approach suffers from the problem of managing communication and transferring knowledge across individuals with different backgrounds, roles, and functions, thus stressing the role of mediators and facilitators. In this context, digitalization is deemed to relax these tensions, but conclusive results are still lacking.

Executives should also focus on the structure when implementing DT. Key insights reveal the need to design a flexible, agile structure, even if the degree of flexibility ultimately depends on the radicalness of the innovation project. In addition, our findings show that a bottom-up way of interacting, pulling together heterogeneous individuals, constitutes a more effective structure.

Finally, worth stressing is that the individuals, processes and interactions, and structure are strongly intertwined and cannot be seen as standalone features of the DT approach. Of course, this shows a more complex view of DT, hence requiring managers to adopt an integrated view of what DT is and how to implement it.

## CONFLICT OF INTEREST

All authors declare that they have no conflict of interest.

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## ENDNOTES

[1] Specifically, we initially considered "Design Thinking", "Creative Problem Solving", "Human Centered Design", and "User Centered Design" as the main DT-related keywords. An initial search of relevant articles, alongside the experts' guidance, revealed two additional keywords worthy of inclusion, "Managing by Design" and "Participatory Design". Finally, one of the reviewers, whom we kindly thank, underlined that "Design Driven" innovation (last DT-related keyword) is also related to DT.

[2] Descriptive statistics of the sample articles are presented in the Appendix in Supplementary information, which is only available in the online version of the article.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found online in the Supporting Information section.
Supplementary Material

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