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Reconciling the academic and enterprise perspectives of Design Thinking

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Abstract. Design Thinking has become popular in the management and innovation context but remains mostly misunderstood, as a result of broad interpretations and the lack of empirical research on the subject. This paper aims to reduce the gap between the academic and industrial perspectives on Design Thinking, by reviewing publications focused on three aspects: (1) studies aimed at defining the concept, (2) empirical case studies about its use or adoption, and (3) models or methods proposed to overcome its main challenges. The existing literature suggests that multiple definitions for Design Thinking coexist with some commonly understood design practices, both among designer and non-designer practitioners alike. The challenge most frequently mentioned is the clash of existing organizational structures with the flexibility and unpredictability of Design Thinking. This paper outlines two different approaches to address such challenge and proposes a definition that brings together the academic and enterprise perspectives of Design Thinking.

Keywords: design thinking, management, innovation, enterprise, organizations

1 Introduction

Design Thinking (DT) is often portrayed as a multi-disciplinary human-centered approach to innovation [1]. In recent years, the term has gradually found its way into business and management literature, suggesting that the practice of designers can be brought into other fields or industries to tackle their own innovation challenges. Professional narratives and project portfolios have become important channels to disseminate this DT knowledge, with the most prominent examples found in the stories of successful product development and service innovations of the consultancy firm IDEO, as told by the founder's brother Tom Kelly [21] and the current CEO Tim Brown [22]. In his widely popular book "Change by Design", the latter of these two authors devotes an entire section under the title "*What is design thinking?*". Despite providing a detailed account of the DT process, desirable characteristics of DT practitioners and examples of benefits achieved by organizations that have used DT, the author falls short of providing a concrete definition of DT *itself*. Thus, the reader can

only construct his own definition by going through the entire book and putting together the different characteristics and descriptions provided. Some of them are attributed to the concept directly (e.g. “*exploratory process*”, “*iterative approach*”, pp. 16-17) while others must be inferred from the text (e.g. “[D]esign thinking begins with skills designers have learned over many decades... *integrating what is desirable... with what is technologically feasible and economically viable*”, p. 4).

In contrast to the image portrayed by popular culture, certain scholars have attributed the “true” origins of the concept to the study of professional designers’ work and practice inside the academic community [5]. The current understanding of DT – or lack thereof – has been criticized for relying too much on the perspective and cumulative experiences of its practitioners, who tend to omit certain formal aspects of the design field [15]. These divergences in discourse suggest that the term itself is still rather loose, has different meanings or is often misunderstood [1]. Furthermore, despite the wide variety of company whitepapers, blog posts and management books describing successful DT project cases, the generalizability and replicability of their processes and results remains unclear. Some researchers even argue that there is no theoretical body regarding DT, because the concept is tightly related to practice [5]. Nonetheless, executives and managers maintain a growing interest on the topic, because their organizations face increasingly complex challenges and they urgently need to broaden their range of strategies to address them [3]. It becomes relevant then to find a definition of DT that can be agreed upon and understood by scholars and practitioners alike, serving as a base for future discussions integrating both sides.

The problems outlined above also suggest that the lack of systematic, empirical research on DT is gradually producing a disconnection between theory and practice. Paradoxically, the same situation may generate certain reluctance among scholars to pursue research on the subject, widening even more the gap between up-to-date sources of information for practitioners and the scientific literature. Some notable examples of institutions aiming to address these challenges are the d.school at Stanford and the Hasso-Plattner Institute in Potsdam. Nevertheless, there are strong reasons to expand the efforts into a broader practice-based research community, in order to reduce the divergences between DT practice and theory.

The goal of this paper is to bring closer the academic and enterprise perspectives on DT, by analyzing previous studies about its conceptual understanding and empirical application inside enterprises. The expected contribution of this secondary study is two-fold: First, to identify the focus areas and recurrent themes discussed in existing literature, highlighting any gaps that could guide a future research agenda. Second, to propose a tentative – and more agreeable – definition of DT, which could be used in the future to bring together the different discourses from scholars and practitioners.

In general terms, the concept of enterprise is defined by the Merriam-Webster, Cambridge and Collins dictionaries as systematic, intentional or purposeful activities, highlighting the importance, risk or difficulty of such project or undertaking [32-34]. In a narrower sense, the same word is commonly used to describe commercial organizations with business purpose. In the context of this paper, the concept of enterprises is understood as equivalent to large organizations or well-established private companies whose size, rigidity and maturity brings them closer to more traditional man-

agement approaches than those found in start-ups or small and medium enterprises (SMEs). The scope of “large commercial business organizations” has been intentionally chosen to narrow down and focus this study on the adoption or implementation of DT under potentially similar conditions (e.g. assuming that larger companies have more hierarchies, well-defined processes, more complexity, less flexibility, etc.). Furthermore, the participation of prominent or well-known companies in previous studies could be considered a factor which increases the relevance and interest on DT inside academia, thus motivating further research – which is one of the main arguments this paper advocates for.

The structure of this paper is as follows: Section 2 provides a description of the research steps undertaken to select and analyze the existing literature, outlining three main questions to guide the review process. Section 3 provides a high-level overview of the key themes found in the selected articles and their coverage of each question proposed. Section 4 provides a detailed description of the findings, which have been grouped according to each one of the review questions. Section 5 reflects on the overall research process and clarifies the limitations of this paper. Finally, section 6 reiterates the main findings of the literature review and presents the contributions of this paper, namely a tentative definition of DT and a future research agenda.

2 Research process

According to Google Trends, the search interest about DT has consistently increased during the last decade [35]. As shown in Table 1, the number of search results obtained at the beginning of 2018 from three online databases of academic publications using the keyword “design thinking” follows a similar trend, which suggests the scholarly community has been also giving increasing attention to the topic.

Table 1. Number of academic publications listed per year for the term “design thinking”

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
ScienceDirect	20	26	29	50	85	117	82	115	229	226	238
Scopus	34	55	80	104	148	175	169	272	308	404	413
Web of Science	18	32	57	50	82	95	104	127	208	288	233
TOTAL	72	113	166	204	315	387	355	514	745	918	884

As Welch and Piekkari [25] point out, qualitative research strives for depth of insight rather than “strongly representative” samples. Thus, “the larger the N” may not necessarily result in better studies, since the richness of conceptual analysis does not always depend on the inclusion of quantitative data collection (e.g. surveys) or statistical analysis methods. Empirical studies in fields such as software engineering are usually too heterogeneous for statistical summaries, but it is still necessary to consider them together with other studies addressing the same or similar questions, in order to interpret their findings with more confidence [26].

Because of the aforementioned reasons, this paper followed a theory-based rather than population-based approach to data selection and analysis. According to Cruzes and Dybå [26-27], research synthesis is the collective term for a family of methods used to summarize, integrate, combine and compare the findings of different studies about a specific topic or research question. Among those methods, the thematic analysis entails the identification, analysis and report of the patterns or themes found within the primary research data [26]. To conduct this process, Thomas and Harden [29] developed an approach called “thematic synthesis”, which facilitates the translation of concepts between studies, even though they may have not been originally expressed using the same words. This method draws on elements from both meta-ethnography and grounded theory, particularly the development of analytical themes comparable to “third-order interpretations” to enable the reciprocal “translation” between studies, as well as the use of an inductive process of constant comparison to develop such themes [27-28]. Unlike grounded theory, the thematic synthesis employs primary studies as unit of analysis rather than the raw data from interview transcripts, field notes or memos [26].

The target primary studies for this paper comprised peer-reviewed academic publications, as well as journals that combine research and industry experience, such as “Harvard Business Review” or “Design Management Review”. Some authors like Garousi et al. [30] have presented strong valid arguments advocating for the use of non-published, non-peer reviewed sources of information like consultancy whitepapers, industry reports or blog posts (the so-called “grey literature”), in order to give a stronger voice to empirical knowledge from software engineering practitioners. Such types of online contents were not included in this paper, to prevent any possible biases due to limited disclosure of project background details, as well as to avoid publications which had the commercial purpose of endorsing professional DT services.

The search query was executed in the online databases ScienceDirect and Google Scholar, using the base term “design thinking” in combination with various equivalent keywords for “enterprise” (i.e. “design thinking AND enterprise”, “design thinking AND large organization” and “design thinking AND industry”). Priority was given to articles with the highest number of citations. The backward snowballing method was used to perform an iterative revision of the title, publication venue and authors of the most relevant articles referenced on each paper. Following the guidelines by Wohlin [31], the abstract of the papers was read first and then any other parts until a definitive decision could be taken to either include or exclude the paper. In addition to the backward snowballing of the reference lists, the Google Scholar profiles of the authors from the selected papers were reviewed to identify any other relevant articles.

The following exclusion criteria were applied: Papers published before 2007 were omitted to reflect only the recent contributions and empirical observations that are most relevant to the current state-of-the-art, influenced mainly by the work of consultants and field practitioners during the last decade. Papers that did not mention explicitly the combined term “design thinking”, but only referred to design in a broader scope (e.g. “design practices” or “design principles”) or in a different context (e.g. “design research”, “user-centered design”) were also excluded.

As suggested by Thomas and Harden [29], following a principle applied in other similar methods aimed at building grounded formal theory, the concepts in a thematic synthesis are to be derived from text grounded in the original context where it was constructed. Three review questions (abbreviated Q1, Q2 and Q3) were proposed as a final filter and primary method for grouping the articles, facilitating a comparative analysis of similarities and differences among those publications which aimed for the same purposes. While enabling a clear separation of "data-driven" themes (which are rather descriptive accounts of the primary studies), the review questions also provided the necessary scaffolding to develop a higher level "theory-driven" analysis, without detaching it entirely from the original source. The three review questions are:

1. What definitions of DT have emerged from academia or industry?
2. How have enterprises adopted or implemented DT during the last decade?
3. What are the main challenges of DT and how can enterprises overcome them?

The author skimmed through the most cited articles obtained and read the key sections such as title, abstract or conclusions, in order to ensure that all publications included in this study covered at least one of the three high-level goals presented by the review questions, either implicit or explicitly stated in text: (1) define the concept of DT according to scholars and practitioners, (2) collect empirical evidence about how DT is actually being adopted or implemented in enterprises, or (3) propose ways to overcome the challenges of DT in an enterprise context.

As a result of the search and filtering process described above, 16 publications were selected for the thematic synthesis, which involved reading them entirely to identify their recurrent concepts or themes. The analysis process consisted of three stages, sometimes overlapping: (1) Line-by-line coding, (2) grouping the codes into "data-driven" descriptive themes, and (3) developing higher-level "theory-driven" analytical themes across primary studies. The latter step represents the two main contributions of this paper: A proposed definition for DT and a future research agenda to reduce the gaps found in literature.

3 Research focus and recurring themes of primary studies

Table 2 presents a summary of the themes found in the articles, organized according to their frequency of appearance. Such frequency should be not interpreted as the level of importance attributed to any given theme in comparison with the others, because the source publications differed in their scientific rigidity and choice of research methods. The themes were classified and grouped around specific "stages" in the process of understanding and implementing DT, positioning them closer to either thought or action, and serving as an indicator of the themes which are more likely to be found in conceptual discussions (i.e. Q1-type of publications), empirical studies (i.e. Q2-type of publications), or both (i.e. either one of the proposed questions). Additionally, each theme was broadly categorized by "type" as a benefit or challenge of DT, depending on whether the concept was described by the author and/or study participants in a positive or negative context, respectively.

Table 2. Recurring concepts or themes in the selected publications

Theme	Publication(s)	Freq.	Stage of DT	Type
Underlying design process/methods	3, 5, 6, 12, 15	5	Understand	Benefit
Ambiguous or diverse meaning	4, 5, 6, 7, 10	5	Understand	Challenge
Can function alongside "traditional" methods	4, 9, 11, 13, 14	5	Implement	Benefit
Used to understand customers better	4, 8, 11, 12, 16	5	Implement	Benefit
Clash or mismatch with existing culture/processes	1, 2, 8, 12	4	Implement	Challenge
Advantages/benefits of tangible prototypes	7, 10, 13, 16	4	Implement	Benefit
No single process	4, 11, 14	3	Understand or Implement	Challenge or benefit
Acceptance of uncertainty and risk	7, 12, 14	3	Implement	Challenge
Cultural change to embed DT in organization	7, 13, 16	3	Implement	Challenge
Adaptation from design into management context	10, 12, 14	3	Understand	Challenge
DT team composition	12, 13, 16	3	Implement	Challenge
Inapplicability in certain contexts	7, 8	2	Implement	Challenge
Problem-solving beyond customer-facing product development	9, 14	2	Implement	Benefit
Relation between DT and IT development	11, 16	2	Understand and Implement	Challenge
Difficulty to communicate value	8	1	Implement	Challenge
Redefine the problem scope	12	1	Implement	Benefit

Table 3 presents a summary of the articles reviewed and indicates with an "X" whether they contributed to answer Q1, Q2 or Q3 for this paper. The scientific rigidity of the publications was categorized into three levels (High, Medium, Low), depending on the clarity of the research methods employed and the use of academic references to support key concepts and findings. An additional distinction worth noting in relation to Q2 is that some authors based their conclusions on primary data collected for that particular study, while others relied on indirect sources to explain how DT has been applied in large organizations. The latter cases are marked with an "I" instead of "X".

Table 3. Contribution of each article to the proposed review questions

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Scientific rigidity	H	H	M	L	H	H	L	M	L	M	H	M	L	H	M	M
Answers Q1	X	X	X	X	X	X	X			X	X	X		X	X	
Answers Q2	X	X		I		I	I	X	X		I	I	X	X		X
Answers Q3								X	X				X			

4 Findings

The following sub-sections discuss the similarities and differences among the publications inside each group, in order to answer the three review questions proposed.

4.1 Q1: Definitions of Design Thinking in academia and industry

Various authors of the selected publications discussed about the many discourses and explanations for the term DT [4-7,10]. The current understanding in management and industrial context has been compared with the academic discussions unfolding inside the design research community decades before. Along this line, Kleinsmann et al. [6] and Liedtka [10] credit the first usages of the term to Archer [20] and Rowe [23], respectively. However, the author of the present paper notes that Archer did not refer explicitly to the term “Design Thinking” in his 1979 article [20], but did mention it in an earlier publication titled “Systematic method for designers” [19]. On the other hand, Rowe [23] certainly attempted to create a “generalized portrait of design thinking”, by identifying common problem-solving patterns in designers’ work, but his primary focus was to develop heuristics for architecture and urban planning.

The studies reviewed have frequently mentioned that DT has ambiguous or different meanings depending on the context in which it is applied [1,11] and thus, it should not be condensed into a single definition [10]. For instance, Carlgren et al. [1] found that some practitioners described the concept using general terms related to user-centeredness and innovation, while others referred to it as a mindset, a set of principles, or as a combination of mindset and practical methods. It was often also explained using the attributes “*iterative*” and “*nonlinear*”. Similarly, Lindberg et al. [11] observed that DT was explained either as methodology or as a mindset, with a more homogeneous understanding at the level of its general goals and principles.

Design researchers have adopted a critical stance regarding the simplified explanations of DT used in managerial practice and other industries [15]. Regardless of the exact wording used, most definitions are built around the notion of translating the skills and knowledge of designers into everyday actions [5-6,15]. Empirical studies have revealed some shared basic notions of DT, even among diverse non-designer practitioners [1,9]. Thus, the existence of an underlying set of design practices seems to prevail as the fundamental and most commonly understood characteristic of DT, despite the variety of areas where it is applied.

Both design and management research have privileged the word innovation as the fundamental concept that connects the various domain discourses on DT [6]. However, DT has been also proposed as a general-problem solving approach for more than just product or service innovation, as various case studies have shown [9,14]. Therefore, innovation could be considered the main goal of DT in the context of customer-facing product and service design, or as a desirable outcome of DT when it concerns more general problem-solving situations.

4.2 Q2: Case studies about Design Thinking implementation

During the last decade, various case studies have explored how DT is understood and adopted by large companies. These studies have shown that DT can be applied with clear strategy and goals [13,16], but also that its value is often not transmitted to stakeholders, who can perceive it as inefficient or as a waste of resources [8]. The seemingly contraposing findings raise attention about the generalizability of the theory provided by these studies. Some consistent results take the form of pre-requisites or conditions that organizations should fulfill, like the commitment and continuous push from several key stakeholders. Another consistent finding is that the success of DT projects and initiatives depends significantly on the mindset of the managers, who need to take less of a pragmatic approach (i.e. perceiving DT just as a toolset) and understand that its principles or ways of working should be embedded in the culture across the entire organization [14].

The selected publications have also mentioned that DT teams should be allowed sufficient freedom and flexibility to experiment, but at the same time they must be effective in communicating their ideas and proposals to get the trust from managers and other stakeholders. In this context, more “tangible” prototypes seem to help in demonstrating progress, gather internal buy-in and keep the relevant team discussions moving forward [7,10,13,16]. An area that could be explored further through empirical research is to identify the specific dimensions that convey the most value to stakeholders, depending on the types of prototypes used. This could be theorized as advice for practitioners on how to build more effective (i.e. persuasive) prototypes.

Research findings also suggest that DT allows to understand better the customers’ needs [4,8,11-12,16], although the benefits of this increased customer-centricity are not always clear. Furthermore, it has been shown that DT can be used in organizations not only for the development of innovative customer-facing products, but also to improve their own internal processes [14,16]. These findings could be loosely related to the field of requirements engineering or systems analysis.

Although this paper was not intended to establish links between DT and software development practices, it is worth mentioning the scarcity of explicit mentions about IT in the context of DT. The primary studies often covered too many interrelated topics with a broader high-level view of DT as a problem-solving approach to innovation, but came short of explaining how it can be mapped into concrete aspects of IT and software development. A notable exception that shows an emerging branch of research in this field is the study by Lindberg et al. [11], which concluded that DT contributes to IT development, overcoming the limitations of traditional approaches (by allowing developers to give more attention to non-technical aspects) rather than fully replacing them. For related research about the potential impact of DT in IT development practices, the reader is referred to another theoretical discussion by Lindberg et al. [17] as well as a case study by Hildenbrand and Meyer [18] which were not part of this review. Nevertheless, the observed research gaps provide an opportunity to study in more detail the points of complementarity between DT and IT, with findings supported directly by field data.

4.3 Q3: Identifying and overcoming the challenges of Design Thinking

Existing literature has analyzed the challenges of DT implementation in enterprises and suggested some approaches to address them. The challenge most commonly mentioned when applying DT was the difficulty to handle the flexibility and unpredictability of DT [1-2,8,12], attributes which may defy the existing structures, roles and responsibilities, particularly in large and strictly rigid companies. Two distinct perspectives to address this challenge have emerged from the articles reviewed: (1) The structure and culture of enterprises clashes inevitably with DT, or (2) DT can co-exist with existing structures, practices or methods until it is assimilated.

In the first scenario, the strategy to overcome the main challenge is to keep a balance between seemingly opposing or contradictory forces: The existing dominant cultures—characterized by a high standardization of processes with predictable outcomes and metrics—on one hand, and the seemingly “chaotic”, iterative and overlapping process of DT on the other [2,4,8]. Under this perspective, Prud'homme van Reine [12] proposed a framework of nine dilemmas or “tensions” which reflect how enterprises with solid traditional cultures deal with the cultural conflicts brought by the DT practice. The assessment of these nine dilemmas inside organizations could work as a metric to evaluate more objectively the development and effects of DT. In other words, the DT-readiness of both companies and their managers can be estimated by observing the ability to keep these “opposing elements” in balance:

1. Analytic thinking *versus* intuitive and creative thinking
2. Product push *versus* user empathy
3. Focus on functional aspects *versus* focus on aesthetics and emotional aspects
4. Closed *versus* open approaches to innovation
5. Innovation as a structured process *versus* “bricolage” (i.e. developing systematically the “one best” solution *versus* finding the “best possible” solution with the resources available at a given moment)
6. Linear thinking *versus* non-linear, iterative and overlapping steps (i.e. planning *versus* experimenting)
7. Individual creativity *versus* group innovation
8. Egalitarianism *versus* hierarchical leadership (i.e. stimulating participation *versus* forcing guidance toward a decision)
9. Short-term *versus* long-term approach to innovation (i.e. immediate gains *versus* exploration of possibilities)

The second type of strategy found in the primary studies does not describe an opposition scenario between DT and the existing organizational structures, practices or methods. Instead, the strategy is to embed or blend DT into the entire organization, generating a new culture that gives more importance to design. For this purpose, a clear definition of roles inside DT teams based on task distribution [16] or an analysis of DT practitioner profiles based on their goals and vision about innovation [6] may facilitate the selection of adequate people to lead the process of cultural change.

Along the same line of thought, Sato et al. [13] sustain that DT gives flexibility to augment the conventional business thinking and tailor existing models to specific

situations. In their publication, the authors combined DT with four different models for organizational change and development (OC&D). This was achieved by mapping the key concepts and principles of each OC&D model into the context of a broader DT “process cycle”, composed by the following elements which are continuously reviewed and refined in no particular order:

- *Intent*: Initial stance on the problem by defining the goal, target customer, expected outcome and metrics
- *Discoveries*: Insights revealing "things as they are" and the reasons why
- *Frameworks*: Hypotheses about patterns and relationships between customer needs, organizational capabilities and business requirements
- *Principles*: Prescriptive guidelines or imperatives derived from the frameworks
- *Solutions*: Ideas that best fulfill the principles and become tangible with prototypes

Some of the findings in the study by Schmiedgen et al. [14] also adhere to the perspective of an orderly or conscious transition toward the adoption of DT, describing four “archetypical places” where DT can be found inside organizations. This idea comes from a previous work by Junginger [24], who presented a bubble-shaped graphic visualization of these stages as a tool to determine where and how is the organization utilizing DT at any given moment. Moving beyond the assessment of individual discrete points in time and observing the entire cultural change process, these “archetypical places” can be also understood as “assimilation stages” to gradually blend DT into the organizational culture:

1. *Periphery*: External resource booked on demand, such as from external consultants
2. *Somewhere*: Applied separately within some internal areas or departments
3. *Core*: Direct contact with the leadership and used for strategic decision-making
4. *Intrinsic*: Established practice and mindset spread throughout the culture of the entire organization, used beyond product and service innovation

The similar views regarding DT adoption suggest that the process cycle model of Sato et al. [13] could be applied in combination with the four archetypes described by Schmiedgen et al. [14]. On one hand, the first model would allow to monitor the five key components that should be continuously refined while blending DT into the organization culture (i.e. process inputs and outputs). At the same time, the latter can be used as a reference to evaluate how much DT has already pervaded into the organization (i.e. current state of the adoption process).

5 Study limitations

As a secondary study which relies on the selection and analysis of existing literature, the present paper has various limitations. First and foremost, the data collection and analysis process was carried out by a single researcher. Even though this paper merely analyzed previous studies performed by various authors, coming from different research traditions and with different perspectives on DT, the possibility of relevant theme omissions and accidental introduction of researcher biases remains. By provid-

ing a clear identification of the aims and methodological quality of each primary study, the readers of this paper become able to judge for themselves whether the actual contents of the referenced articles match the descriptions provided in this review. However, the validity of the findings presented could be further improved with different triangulation methods. For instance, by following up with complementary studies which include new primary data (e.g. collected through scholar and practitioner interviews), or by examining again the same articles presented in this paper but from the perspective of other researchers, in order to find any similarities or differences in the conclusions. Business book sections and “grey literature” have been excluded from this study to avoid biases, but may certainly constitute valuable sources of practitioner knowledge. Future studies which include such publications should also allow comparisons with data obtained from inquisitive or observational techniques, as it is difficult to fully cover the enterprise perspective by literature reviews alone.

Another limitation from this study is related to the unequal distribution of papers among the three focus areas mapped into the review questions. On one hand, many of the selected publications aimed to answer Q1 and provided sufficient material to compare the multiple definitions given to DT. On the other hand, it was more difficult to identify relevant concepts related to Q2 and Q3. The empirical studies about DT implementation provided too detailed accounts of case-specific challenges, mostly related to the difficulty to grasp the meaning of DT, as well as the results achieved in each particular case context. For the reasons mentioned, Q1, Q2 and Q3 could not be covered with the same thoroughness during this study, thus providing a better explanation of the academic perspective on DT than the enterprise one. Given the exploratory nature and limited scope of this paper (to propose a definition and research agenda for DT) this may not be considered a significant issue. Nevertheless, it is the opinion of this author that further cross-case empirical studies will be needed in the future to provide stronger supporting arguments for Q2 and Q3.

Finally, as mentioned in the introductory section, the word “enterprise” was constrained in this paper to “large commercial business organizations”, in order to facilitate the interpretation and analysis of previous studies under a relatively similar context. A recommendation for future research on this same topic is to clarify the scope and tailor it to certain specific types of organizations (e.g. public sector entities, non-governmental organizations, start-ups, etc.), accounting for their complexity, size or mission, among other types of relevant dimensions which could allow to make the findings more comparable between studies.

6 Discussion and conclusions

DT is a concept that emerged from the discussions in design research and acquired fuzzy and diverse meanings under the participation of non-designer practitioners in industry. The diversity of discourses and explanations for DT has been addressed by various authors but there is still no agreement on a single definition, or even on whether such definition should be agreed upon. On one hand, scholars from the design tradition tend to be more critic about the pragmatic use of the term and defend

the value, training and expertise of the underlying design practices. On the other hand, case studies and interviews have shown a basic level of shared understanding among designer and non-designer practitioners, which suggests that a common definition can indeed be built, starting from the essential aspects more often associated to DT.

It is therefore the opinion of this paper's author that any future discussions about DT should at least have some basic generally agreed definition that allows to move the academic discussion forward, improving at the same time the level of understanding about DT in industry. Based on all the primary studies analyzed for this paper and especially building upon earlier findings by Schmiedgen et al. [14], the following definition of DT is proposed:

“Design thinking is an approach generally applied to customer-facing product and service innovation, which can be also used as a general problem-solving approach. It relies on a heterogeneous set of design practices and methods, which depending on the background of each practitioner may be understood more as a toolset (i.e. pragmatic perspective) or as a mindset (i.e. idealistic perspective). Rather than following a structured linear process, it is often characterized to be iterative and user-centered, attributes which tend to facilitate the rapid experimentation of ideas through prototypes.”

The primary case studies about the adoption of DT inside large companies showed both positive and negative results, putting into doubt whether their findings are generalizable or specific to the organizations where the research took place. There seems to be more clarity in terms of the pre-requisites for a successful implementation of DT, assigning significant responsibility to the change of mindset in the managers. The author of this paper considers that more cross-case studies are needed in the future using the same set of research questions to compare any relevant themes or dimensions of DT in different organizational contexts.

As a major challenge of DT in large organizations, the reviewed publications pointed out consistently the difficulty to handle the flexibility and unpredictability of DT, in contraposition with the existing structures, roles and responsibilities. This challenge can be understood in two ways: (1) The structure and culture of large organizations naturally clashes with DT, or (2) DT can co-exist with existing structures, practices or methods until it gets assimilated. In the first case, the strategy is to keep a balance between permanently opposing forces. In the second scenario, the strategy is to blend DT into the entire organization to generate a design-centric culture. There is an interesting opportunity to test in future case studies the strategies by Prud'homme van Reine [12] and Sato et al. [13] for the first and second scenarios, respectively.

In terms of the broader context where future research about DT could be positioned, a loose connection has been observed between requirements engineering and the increased customer-centricity of DT. Despite the relative broadness of the search keywords and primary study contents, it was a challenging task to find in the selected publications concrete links between DT and other well-established practices in software engineering. DT was mostly described as a problem-solving or innovation approach from a high-level perspective, without establishing theoretical connections with traditional software development practices. Thus, future research about the complementarity between IT and DT should be conducted with more precise data collec-

tion methods and objectives, so the empirical evidence can be traced back into more specific disciplines like requirements engineering or software testing.

The concept of DT carries multiple connotations and a high-level of abstraction. If DT is considered a fuzzy topic and wicked problem on its own right, the lessons learned from DT case studies may be extended to the process of researching DT itself. The concept should be brought down to a level of understanding that allows both academics and practitioners to speak a common language with each other. This is a challenging task, but hopefully also a strong motivation for researchers to start examining the potential impact of DT, or any other “vaguely defined” – yet potentially relevant – emerging categories that could be overlapping with their areas of expertise.

References

1. Carlgren, L., Elmquist, M., Rauth, I.: Exploring the use of design thinking in large organizations: Towards a research agenda. *Swedish Design Research Journal* 11(1), 55–63 (2014).
2. Carlgren, L., Elmquist, M., Rauth, I.: The Challenges of Using Design Thinking in Industry—Experiences from Five Large Firms. *Creativity and Innovation Management* 25(3), 344–362 (2016).
3. Dorst, K.: The core of ‘design thinking’ and its application. *Design Studies* 32, 521–532 (2011).
4. Drews, C.: Unleashing the full potential of design thinking as a business method. *Design Management Review* 20(3), 38–44 (2009).
5. Johansson-Sköldberg, U., Woodilla, J., Çetinkaya, M.: Design thinking: past, present and possible futures. *Creativity and Innovation Management* 22(2), 121–146 (2013).
6. Kleinsmann, M., Valkenburg, R., Sluijs, J.: Capturing the value of design thinking in different innovation practices. *International Journal of Design* 11(2), 25–40 (2017).
7. Kolko, J.: Design thinking comes of age. *Harvard Business Review* 93(9), 66–71 (2015).
8. Le Glatin, M., Le Masson, P., Weil, B.: Measuring the generative power of an organisational routine with design theories: the case of design thinking in a large firm. Potsdam, Germany, s.n (2016).
9. Liedtka, J.: Innovative ways companies are using design thinking. *Strategy & Leadership*, 42(2), 40–45 (2014).
10. Liedtka, J.: Perspective: Linking design thinking with innovation outcomes through cognitive bias reduction. *Journal of Product Innovation Management* 32(6), 925–938 (2015).
11. Lindberg, T., Köppen, E., Rauth, I.; Meinel, C.: On the perception, adoption and implementation of design thinking in the IT industry. In: *Design thinking research*, pp. 229240. Springer-Verlag Berlin Heidelberg (2012).
12. Prud’homme van Reine, P.: The culture of design thinking for innovation. *Journal of Innovation Management* 2, 56–80 (2017).
13. Sato, S., Lucente, S., Meyer, D., Mrazek, D.: Design thinking to make organization change and development more responsive. *Design Management Review* 21(2), 44–52 (2010).
14. Schmiedgen, J., Rhinow, H., Köppen, E. & Meinel, C.: Parts Without a Whole? - The Current State of Design Thinking Practice in Organizations (Study Report No. 97). Hasso-Plattner-Institut für Softwaresystemtechnik an der Universität Potsdam, Potsdam (2015).
15. Tonkinwise, C.: A taste for practices: Unrepressing style in design thinking. *Design Studies* 32(6), 533–545 (2011).

16. Vetterli, C. et al.: How Deutsche Bank's IT Division Used Design Thinking to Achieve Customer Proximity. *MIS Quarterly Executive* 15(1), 37–53 (2016).
17. Lindberg, T.; Meinel, C.; Wagner, R.: Design Thinking: A Fruitful Concept for IT Development?. In: Plattner, H., Meinel, C., Leifer, L. (eds.), *Design Thinking: Understand – Improve – Apply, Understanding Innovation*, pp. 3–18. Springer, Berlin, Heidelberg (2011). doi: 10.1007/978-3-642-13757-0_1
18. Hildenbrand, T.; Meyer, J.: Intertwining Lean and Design Thinking: Software Product Development from Empathy to Shipment. In: Maedche, A., Botzenhardt, A., Neer, L. (eds.) *Software for People*, pp. 217–237. Springer, Berlin, Heidelberg (2012). doi: 10.1007/978-3-642-31371-4_13
19. Archer, B.: *Systematic method for designers*. HM Stationery Office (1965).
20. Archer, B.: Design as a discipline. *Design studies* 1(1), 17–20 (1979).
21. Kelly, T., Kelley, D.: *Creative confidence: Unleashing the creative potential within us all*. Crown Business (2013).
22. Brown, T.: *Change by design: How design thinking transforms organizations and inspires innovation*. HarperBusiness (2009).
23. Rowe, P. G.: *Design thinking*. MIT press (1987).
24. Junginger, S.: Parts and Wholes: Places of Design Thinking in Organizational Life. *Strategic Design Journal* 2(9), 23–29 (2009).
25. Welch, C., Piekkari, R.: How should we (not) judge the ‘quality’ of qualitative research? A re-assessment of current evaluative criteria in International Business. *Journal of World Business* 52(5), 714–725 (2017).
26. Cruzes, D., Dybå, T.: Recommended Steps for Thematic Synthesis in Software Engineering. In: 2011 International Symposium on Empirical Software Engineering and Measurement (ESEM), pp. 275–284. IEEE (2011). doi: 10.1109/ESEM.2011.36
27. Cruzes, D., Dybå, T.: Research synthesis in software engineering: A tertiary study. *Information and Software Technology* 53(5), 440–455 (2011). doi: 10.1016/j.infsof.2011.01.004
28. Barnett-Page, E.; Thomas, J.: Methods for the synthesis of qualitative research: a critical review. *BMC Medical Research Methodology* 9(1), (2009). doi: 10.1186/1471-2288-9-59
29. Thomas, J.; Harden, A.: Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology* 8(45), (2008). doi: 10.1186/1471-2288-8-45
30. Garousi, V.; Felderer, M.; Mäntylä, M.V.: The need for multivocal literature reviews in software engineering: complementing systematic literature reviews with grey literature. In: *Proceedings of the 20th International Conference on Evaluation and Assessment in Software Engineering (EASE)*, p. 26. ACM (2016)
31. Wohlin, C.: Guidelines for snowballing in systematic literature studies and a replication in software engineering. In: *Proceedings of the 18th International Conference on Evaluation and Assessment in Software Engineering (EASE)*, p. 38. ACM (2014)
32. Definition of Enterprise by Merriam-Webster, <https://www.merriam-webster.com/dictionary/enterprise>, last accessed 2018/04/19
33. enterprise Meaning in the Cambridge English Dictionary, <https://dictionary.cambridge.org/dictionary/english/enterprise>, last accessed 2018/04/19
34. Enterprise definition and meaning | Collins English Dictionary, <https://www.collinsdictionary.com/dictionary/english/enterprise>, last accessed 2018/04/19
35. “design thinking” – Explore – Google Trends search, <https://trends.google.com/trends/explore?date=2007-01-01%202017-12-31&q=%22design%20thinking%22>, last accessed 2018/04/06.