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Design thinking for organizational change: A systematic review of enablers and barriers

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ABSTRACT

This systematic review explores the use of Design Thinking (DT) as a human-centered methodology to support organizational change and innovation in complex, dynamic environments where traditional change management often falls short. A systematic search of PubMed, Scopus, and Web of Science identified studies published between January 2014 and December 2024, and nineteen studies met the inclusion criteria. Quality assessment used Mixed Methods Appraisal Tool, and data were extracted following Joanna Briggs Institute guidelines. Thematic analysis synthesized the findings. Eight enablers were identified: knowledge dissemination and cultural fit, leveraging external partnerships, process enablers, organizational and team dynamics, organizational support and resources, stakeholder engagement and trust, training and capacity building, and individual-level enablers. Four barriers emerged: operational constraints, stakeholder challenges, organizational resistance, and individual-level barriers. These findings inform open innovation and change management by highlighting the need for context-sensitive, iterative alignment of strategy, culture, and people, and for addressing systemic barriers to sustain DT adoption.

1. Introduction

In today's socio-economic landscape, marked by digitalization, global interdependence, and rising socio-environmental complexity, organizations must constantly transform to survive and thrive (Türk, 2023 Jan 4). Change has evolved from episodic disruption to a permanent condition, making its effective management a necessity (Gutiérrez-Iñiguez et al., 2023). Traditional approaches to change management, such as Classic models, like Lewin and Kotter, provide useful structures (Hagl et al., 2024; Carreno, 2025), but often fall short in unpredictable contexts shaped by human needs and interactions (Hagl et al., 2024). Many initiatives fail not from poor planning, but due to resistance, weak stakeholder engagement, or inability to adapt strategies during implementation (Kotter, 1995; Khokhar and Akhlaq, 2022; Armenakis and Bedeian, 1999).

Although Design Thinking (DT) is increasingly adopted in organizations, academic literature on its role in change remains fragmented (Johansson-Sköldberg et al., 2013). Existing studies address team dynamics, emotional intelligence, or isolated innovation cases, but lack systematic evidence on DT's role in broader organizational change (Heldal, 2023; Utriainen and Valtonen, 2022). Few examine factors that enable or hinder its implementation (Ramanujam et al., 2021); moreover, these factors are scattered across different studies (Carlgren et al., 2016a; Butler and Roberto, 2018; De Paula et al., 2019; Coco et al., 2020). This gap limits generalizable conclusions, hinders theory building, and creates uncertainty for practitioners (Johansson-Sköldberg et al., 2013). Recent works stress the urgency of bridging this gap through integrative, theory-informed approaches to DT as a change-enabling practice (Engmann et al., 2024; Schlott, 2024). Furthermore, this topic is also relevant to the field of open innovation, where knowledge flows, boundary-spanning collaboration, and co-creation are central mechanisms of transformation (Bogers et al., 2018). Understanding DT from this perspective can help explain how participatory approaches scale across organizational boundaries (Huizingh, 2011).

This systematic review aims to gather, synthesize and integrate empirical findings on the enablers and barriers of DT in organizational change and innovation (Rösch et al., 2023). Unlike prior reviews focused

Abbreviations: DT, Design Thinking; JBI, Joanna Briggs Institute; MeSH, Medical Subject Headings; MMAT, Mixed Methods Appraisal Tool; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

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on education or teams, it addresses DT as a strategic resource for managing complex transformations across diverse contexts (Marx, 2022).

The review contributes academically and practically by presenting in an integrative way conditions reported in the literature that enable or limit DT in organizational transformation. By consolidating fragmented findings into a thematic frame, it offers insights for decision-makers pursuing agile, participatory, human-centered strategies. Clarifying how DT supports adaptation advances evidence-based practice and the broader debate on innovation, cultural alignment, and empathetic, creative, and measurable change.

To guide the review, the following research questions were addressed:

- What factors facilitate the implementation of DT in organizational change and innovation?
- What barriers hinder its application in these contexts?
- How do these enablers and barriers shape DT implementation in organizations?

2. Background

2.1. Organizational change and change management

Change management is the discipline of guiding individuals, teams, and organizations from a current to a desired future state (Hagl et al., 2024). Its core components include communication, leadership, stakeholder involvement and alignment between purpose and action (Mabasa and Flotman, 2022). Despite its importance, many organizations struggle to implement change (Hagl et al., 2024), often due to human factors (emotions, identity, culture, and habits) rather than technical or strategic issues (Tajuddin, 2025).

2.2. Design thinking

DT has emerged as a human-centered approach suited to current organizational needs (Elsbach and Stigliani, 2018a; Kim et al., 2017; Dunne and Martin, 2006; Dunne, 2018). Rooted in design disciplines, DT emphasizes empathy, collaboration, creativity, and iteration (Gonen, 2019; Buchanan, 1992). DT encourages organizations to understand stakeholder experiences, reframe problems, generate solutions, and test them rapidly through prototypes (Daymond and Knight, 2023a). By fostering exploration, flexibility, and learning from failure, DT helps address ambiguity and resistance (Heldal, 2023). Increasingly, DT is being applied not only in product and service development but also in strategic decision-making, cultural transformation and change management initiatives (Schlott, 2024; Calderon-Monge and Ribeiro-Soriano, 2024; Philippart, 2022; Liedtka, 2015).

2.3. Desing thinking in organizational change

DT supports organizational change by humanizing transformation processes (Schiuma et al., 2024). Its iterative logic enables safe experimentation and course adjustment before large-scale implementation (Rösch et al., 2023). It also fosters cross-functional collaboration and democratizes problem-solving, empowering individuals often excluded from traditional decisions (Rösch et al., 2023). In this sense, DT complements established change models by adding agility, emotional intelligence, and co-creation to transformation efforts (Daymond and Knight, 2023a).

However, applying DT in change management and innovation is not without challenges (Dunne, 2018). While some organizations report gains in engagement, creativity, and alignment, others struggle to sustain practices or embed them into routines (Schlott, 2024; Kabra and Mukerjee, 2025). Outcomes vary by context, indicating DT is not a universal solution but one effective under specific conditions (Rösch et al., 2023).

3. Methods

The methodology for this systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Liberati et al., 2009).

3.1. Search strategy

Primary study collection occurred between October 1st and 21st, 2024, in PubMed, Scopus, and Web of Science databases, using the following search keys and MeSH (Medical Subject Headings) terms:

- PubMed – *(("Design Thinking"[MeSH Terms] OR "Human-Centered Design"[MeSH Terms] OR "User-Centered Design"[MeSH Terms] OR "Co-Design"[MeSH Terms] OR "Design Thinking" OR "Human-Centered Design" OR "User-Centered Design" OR "Co-Design") AND ("CHANGE MANAGEMENT "[MeSH Terms] OR "Organizational Change"[MeSH Terms] OR "Management of Change"[MeSH Terms] OR "Organizational Innovation"[MeSH Terms] OR "Change Leadership" OR "CHANGE MANAGEMENT " OR "Organizational Change" OR "Management of Change" OR "Organizational Innovation"))*.
- Scopus and Web of Science – *(("Design Thinking" OR "Human-Centered Design" OR "User-Centered Design" OR "Co-Design") AND ("CHANGE MANAGEMENT " OR "Organizational Change" OR "Management of Change" OR "Organizational Innovation" OR "Change Leadership"))*.

These databases were selected because they offer broad and complementary coverage of peer-reviewed literature on DT and organizational change.

3.2. Eligibility criteria

General eligibility criteria included date of publication (from January 2014 to December 2024); language of the article (English, Spanish and Portuguese), and article type (peer-review original research articles and qualitative evidence published in indexed scientific journals; full-text access to manuscript). The period of publication was limited to studies published in the past 10 years to focus on contemporary empirical work in this field.

Inclusion and exclusion criteria were defined according to the PICOS strategy (Eriksen and Frandsen, 2018), as shown in Table 1.

3.3. Selection process and quality appraisal

Articles resulting from the application of the search strategy were transferred to Rayyan software which was used throughout the selection process (Ouzzani et al., 2016). Subsequently, all duplicate articles were eliminated. Afterwards, the three reviewers (ASC, JVC and GV), decided article inclusion/exclusion based on the application of the eligibility criteria, first by analyzing title, then by analyzing abstract and finally by reading the full article. In these three phases selection was made independently and blindly among reviewers.

Following article selection, anonymity was lifted, and discrepancies were discussed and resolved unanimously, according to the eligibility criteria. Thereafter, selected articles were independently assessed for their quality by two reviewers (JVC and GV). Considering the study designs and methodologies included in this review, quality assessment was performed using MMAT (Mixed Methods Appraisal Tool) version 2018 (Pluye and Hong, 2014; Hong et al., 2018a, 2018b; Noyes et al., 2019). Following individual quality assessment, discrepancies were resolved unanimously among reviewers.

3.4. Data extraction and synthesis

In accordance with the Joanna Briggs Institute (JBI) guidelines (JBI, 2019; Stern et al., 2020), data from individual articles was extracted by

Table 1
PICOS inclusion and exclusion criteria.

PICOS[a] Components	Inclusion Criteria	Exclusion Criteria
Population(P)	Organizations undergoing change or aiming to undergo, involving employees, managers, and/or stakeholders.	Studies involving irrelevant populations not undergoing organizational change or innovation processes.
Intervention(I)	Studies analyzing the use of DT as a tool for change management and innovation processes.Studies characterizing the potential and limitations of applying DT in organizational change and innovation contexts.	Studies without explicit use of DT for change management and innovation processes.Studies that were not published between January 2014 and December 2024.
Comparison (C)	Not applicable	Not applicable
Outcome (O)	Evidence of effectiveness, challenges, impacts, and integration of DT in innovation and change management processes.	Studies that do not present specific outcomes related to the impact of DT on innovation and change management processes.
Study design (S)	Qualitative studies. Observational Studies (cohort, case-control, cross-sectional, prospective longitudinal studies).Descriptive studies (Case studies).Randomized controlled trials.	Systematic reviews, narrative reviews, scoping reviews or meta-analyses.Commentary or perspective articles.Non-peer-reviewed publications, and purely quantitative studies without qualitative insight.

[a]PICOS: Population, Intervention, Comparison, Outcome, Study design (Eriksen and Frandsen, 2018).

the first reviewer (ASC) into a data extraction table, including the following characteristics: authors and year of publication; country of publication; study objective; methodological approach; organizational context; description of intervention; and main results.

An inductive thematic analysis was then conducted, beginning with line-by-line coding of relevant content from the results, discussion, and conclusion sections of the included studies (Braun and Clarke, 2006a; Thomas and Harden, 2008). This approach was selected to accommodate the methodological and contextual heterogeneity among the studies, allowing for the identification of recurring patterns and themes grounded in the original data (Thomas and Harden, 2008; Braun and Clarke, 2006b).

Codes were iteratively developed and clustered into descriptive subthemes (subcodes) capturing recurring patterns across studies (Braun and Clarke, 2006a; Fereday and Muir-Cochrane, 2006; Clarke and Braun, 2017). These subthemes were first grouped into broader thematic codes, which were subsequently synthesized into two overarching analytical categories: enablers and barriers to DT implementation, reflecting nuanced enabling and constraining factors.

The process was supported by MAXQDA (version 2022), a qualitative and mixed-methods data analysis software that enables the systematic organization, coding, and analysis of textual data, thereby supporting a transparent and reproducible thematic analysis (Thomas and Harden, 2008). Coding was initially performed by the first reviewer (ASC) and subsequently reviewed by the second and third reviewers (JVC and GV) to ensure consistency and analytical rigor.

The final synthesis followed the thematic synthesis approach described by Thomas and Harden (2008), enabling the integration and interpretation of findings across studies through the development of higher-order constructs grounded in the data (Noyes et al., 2019). Results were presented narratively, organized by analytical themes (enablers and barriers), and further broken down into thematic codes and subcodes. Representative quotes were used to illustrate each subtheme and highlight contextual nuances.

3.5. Ethical considerations

As this study involves secondary analysis of published literature and does not involve human subjects or animal studies, formal ethical approval was not required. Efforts to minimize bias included independent and blinded screening by multiple reviewers. All procedures followed established academic standards, and all data were extracted and reported with a strong commitment to transparency, accuracy, and integrity, ensuring faithful representation of the original sources.

4. Results

4.1. Included studies

The search retrieved 164 references: 45 from PubMed, 71 from Scopus, and 48 from Web of Science (Fig. 1). After removing 55 duplicates, 109 remained for title and abstract screening, which excluded 68 articles. Forty-one advanced to full-text review, where 14 were excluded, leaving 27 for quality assessment. Eight were excluded for insufficient rigor (Supporting Information S1). Although this review focused on qualitative evidence, two studies used mixed methods. Therefore, 17 were classified as qualitative descriptive and two as mixed methods. Nineteen articles were included in the review (Carella et al., 2024; Culver et al., 2022; Farmer et al., 2018; Magistretti et al., 2022a; Teo et al., 2023; Felder et al., 2023; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Eines and Vatne, 2018; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021; Picanço and dos Santos, 2022; Selloni and Corubolo, 2017; VanGronigen et al., 2023; Dosi et al., 2023; Victorino et al., 2022; Zuber and Moody, 2018; Herranz et al., 2024). Fig. 1 illustrates the selection process, including the reasons for article exclusion, according to the PRISMA flowchart (Page et al., 2021).

4.2. Study characteristics

Regarding publication date, 1 article was published in 2017 (Selloni and Corubolo, 2017), 4 articles in 2018 (Farmer et al., 2018; Eines and Vatne, 2018; Nielsen et al., 2018; Zuber and Moody, 2018), 2 articles in 2021 (Salmi and Mattelmäki, 2021; Komatsu et al., 2021), 5 articles in 2022 (Culver et al., 2022; Magistretti et al., 2022a; Koppel and Sullivan, 2022; Picanço and dos Santos, 2022; Victorino et al., 2022), 4 articles in 2023 (Teo et al., 2023; Felder et al., 2023; VanGronigen et al., 2023; Dosi et al., 2023), and 3 articles in 2024 (Carella et al., 2024; Mortensen et al., 2024; Herranz et al., 2024). All articles were published in English language, except one which was published in Spanish.

As for article origin, 5 articles were conducted in the United States (Mortensen et al., 2024), 1 in Norway (Eines and Vatne, 2018), 1 jointly in Italy and Finland (Komatsu et al., 2021), 1 in Brazil (Picanço and dos Santos, 2022), 1 in Portugal (Victorino et al., 2022), and 1 in Spain (Zuber and Moody, 2018).

The 19 studies reviewed varied in objectives, methods, and contexts. Most used qualitative approaches such as case studies (Clarke and Braun, 2017; Carella et al., 2024; Magistretti et al., 2022a; Eines and Vatne, 2018; Selloni and Corubolo, 2017), action research (Fereday and Muir-Cochrane, 2006; Teo et al., 2023), and ethnographic or exploratory designs (Braun and Clarke, 2006b; Farmer et al., 2018; Mortensen et al., 2024). Two studies used a mixed-methods design (Koppel and Sullivan, 2022; Komatsu et al., 2021), while others focused on conceptual or hybrid models (Culver et al., 2022; Salmi and Mattelmäki, 2021; Picanço and dos Santos, 2022). Settings included universities (Clarke and Braun, 2017; Koppel and Sullivan, 2022), healthcare institutions (Felder et al., 2023; Picanço and dos Santos, 2022; Dosi et al., 2023), public agencies (Farmer et al., 2018; Mortensen et al., 2024; Eines and Vatne, 2018), museums (Teo et al., 2023), and social enterprises (Nielsen et al., 2018). Interventions often involved co-design or participatory workshops aligned with DT (Nielsen et al., 2018; Selloni and Corubolo, 2017; VanGronigen et al., 2023), with some integrating gamification (Braun

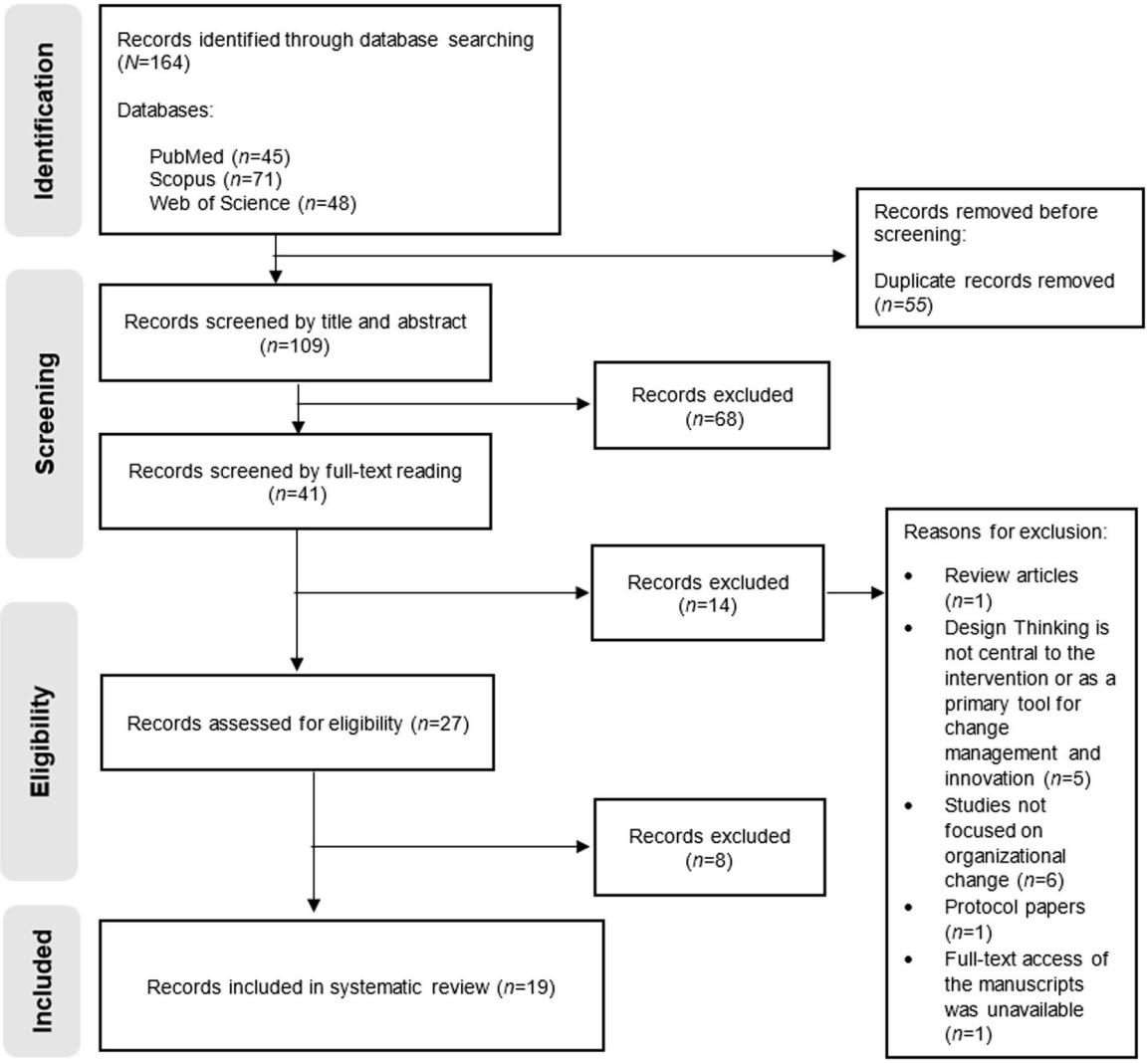

Fig. 1. PRISMA flow diagram (Page et al., 2021).

and Clarke, 2006b; Koppel and Sullivan, 2022), simulation (Picanço and dos Santos, 2022), or digital tools (VanGronigen et al., 2023). Stakeholders ranged from educators and students to nurses, designers, policymakers, and community members. Overall, the studies sought to foster organizational change, innovation, or collaboration through iterative, context-sensitive design processes.

A detailed overview of all study characteristics is presented in Supporting Information S2.

4.3. Thematic codes and subcodes (overview)

The thematic analysis grouped the data into two overarching categories: enablers and barriers to DT implementation in organizations. In total, eight thematic codes with 18 subcodes were identified for enablers, and four codes with 15 subcodes for barriers.

Supporting Information S3 and S4 present illustrative text quotes for each code and subcode related to enablers and barriers, respectively.

Supporting Information S5 provides the full codebook, including definitions for all codes and subcodes.

4.4. Enablers for DT implementation (RQ1)

- *Knowledge Dissemination and Cultural Fit*

A key enabler identified was how DT knowledge was shared and integrated with organizational culture. Under **Knowledge Sharing and Diffusion**, studies highlighted its spread through training, toolkits, workshops, and informal activities such as design lunches and community events (Farmer et al., 2018; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Koppel and Sullivan, 2022; Komatsu et al., 2021; Picanço and dos Santos, 2022). These moments promoted experimentation, reflection, and collective purpose. Mortensen et al. (2024) showed how recurring workshops built "*a kind of cross-institutional community of practice*" (Mortensen et al., 2024), while Komatsu et al. (2021) reported ambassador networks and service libraries that enabled learning across units (Komatsu et al., 2021). Koppel and Sullivan (2022) observed a ripple effect, with directors from other departments requesting training after seeing DT's positive impact (Koppel and Sullivan, 2022) (Table 1).

The subcode **Perceived Compatibility with Existing Practices** shows that DT was easier to implement when introduced as familiar rather than disruptive (Farmer et al., 2018; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021). In healthcare, its iterative logic aligned with clinical decision-making and adaptive problem-solving (Eines and Vatne, 2018; Koppel and Sullivan, 2022), allowing teams to adopt new methods without abandoning existing ones. Komatsu et al. (2021) emphasized DT's effectiveness when building on "*existing design legacies and cultures rather than seeking to make*

revolutionary actions." (Komatsu et al., 2021). Similarly, as Farmer et al. (2018) noted, "*where innovations were successfully implemented they tended to be presented as compatible with existing regimes.*" Framing DT as a natural extension reduced resistance and encouraged wider engagement (Farmer et al., 2018) (Table 2).

- *Leveraging External Partnerships*

Another enabler was leveraging external networks, tools, and collaborations. Under **Gamification Strategies** studies highlighted game-based tools, digital and physical, that supported DT adoption by simplifying decisions, exposing obstacles, and fostering collaboration (Carella et al., 2024; Picanço and dos Santos, 2022). Carella et al. (2024), described a card-based toolkit and online platform that "*served as an accelerator in their understanding of the problem*" and helped teams prioritize efforts. Picanço and dos Santos (2022) reported that gamified activities "*engage the team and to make the environment more appropriate to the exchange of experiences,*" making ideation less tedious and more participatory (Picanço and dos Santos, 2022)(Table 2).

Partnerships with academic institutions and external collaborators, captured under the subcode **Coordinating External Partnerships and Resources** also played a crucial role (Farmer et al., 2018; Felder et al., 2023; Salmi and Mattelmäki, 2021; Komatsu et al., 2021; Victorino et al., 2022; Herranz et al., 2024). These collaborations added legitimacy, fresh perspectives, and workforce support when internal teams were overstretched (Farmer et al., 2018; Felder et al., 2023; Salmi and Mattelmäki, 2021; Komatsu et al., 2021; Victorino et al., 2022; Herranz et al., 2024). Several studies noted benefits from involving university students in DT projects through placements or joint initiatives (Farmer et al., 2018; Komatsu et al., 2021) which reduced workload and enhanced credibility, for instance, "*because the university was involved, certain people were suddenly impressed by what we were doing*" (Felder et al., 2023). Other examples included open innovation calls where students or stakeholders voted on ideas (Victorino et al., 2022), and the co-creation of digital tools to support decision-making and user engagement (Herranz et al., 2024)(Table 2).

The subcode **Strategic Mediation and Networking** highlights the role of individuals who bridged grassroots innovation with institutional or policy decision-making (Farmer et al., 2018; Nielsen et al., 2018; Komatsu et al., 2021). These enablers, sometimes referred to as "*bricoleurs*" connected local projects to broader systems (Farmer et al., 2018), securing funding, aligning ideas with strategic goals, and navigating bureaucracy (Farmer et al., 2018) For example, one enabler linked a dry toothbrushing program with state stakeholders, leading to new funding and wider implementation: "*the facilitator linked them with State dental health agency staff. Quite quickly, this State agency obtained funding to trial dry toothbrushing in other places*" (Farmer et al., 2018). Komatsu et al. (2021) similarly showed that informal strategies, such as "*lunches with top management,*" were key to gaining institutional visibility and commitment (Komatsu et al., 2021). Such connectors ensured DT practices were integrated into broader agendas (Farmer et al., 2018; Nielsen et al., 2018; Komatsu et al., 2021) (Table 2).

- *DT Process Enablers*

Practical actions supported DT implementation, especially through iteration and user involvement. The subcode **Prototyping and Feedback Support** includes strategies like wireframes, mock-ups, simulations, and draft process models that allowed teams to visualize ideas, test assumptions, and adjust based on stakeholder input (Magistretti et al., 2022a; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Eines and Vatne, 2018; Nielsen et al., 2018; Picanço and dos Santos, 2022; VanGronigen et al., 2023; Dosi et al., 2023; Victorino et al., 2022; Zuber and Moody, 2018). Magistretti et al. (2022) described how these representations "*triggered the possibility to obtain feedback and reactions to the new idea conceived.*" (Magistretti et al., 2022a) (Table 2).

Table 2
List of enablers for DT implementation (N = 19).

Code	Subcode	Studies including enablers (publication time span)	Total, n (% of 19)
Knowledge Dissemination and Cultural Fit	*Knowledge Sharing and Diffusion*	(Farmer et al., 2018; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Koppel and Sullivan, 2022; Komatsu et al., 2021; Picanço and dos Santos, 2022) 2018–2024	6 (32)
	Perceived Compatibility with Existing Practices	(Farmer et al., 2018; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021)2018–2022	6 (32)
Leveraging External Partnerships	*Gamification Strategies*	(Carella et al., 2024; Picanço and dos Santos, 2022)2022–2024	2 (11)
	Coordinating External Partnerships and Resources	(Farmer et al., 2018; Felder et al., 2023; Salmi and Mattelmäki, 2021; Komatsu et al., 2021; Victorino et al., 2022; Herranz et al., 2024) 2018–2024	6 (32)
	Strategic Mediation and Networking	(Farmer et al., 2018; Nielsen et al., 2018; Komatsu et al., 2021) 2018–2021	3 (16)
DT Process Enablers	*Prototyping and Feedback Support*	(Magistretti et al., 2022a; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Eines and Vatne, 2018; Nielsen et al., 2018; Picanço and dos Santos, 2022; VanGronigen et al., 2023; Dosi et al., 2023; Victorino et al., 2022; Zuber and Moody, 2018)2018–2024	10 (53)
	User Research and Needs Exploration	(Magistretti et al., 2022a; Teo et al., 2023; Felder et al., 2023; Salmi and Mattelmäki, 2021; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021; Picanço and dos Santos, 2022; VanGronigen et al., 2023; Zuber and Moody, 2018)2018–2023	10 (53)
Organizational Culture and Team Dynamics	*Inclusive and Safe Environment*	(Felder et al., 2023; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Komatsu et al., 2021; Zuber and Moody, 2018)2018–2024	5 (26)
Support and Resources	*Leadership and Expertise Support*	(Carella et al., 2024; Teo et al., 2023; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018; Koppel and Sullivan, 2022; Picanço and dos Santos, 2022; Zuber and Moody, 2018)2018–2024	7 (37)
	Support Actions	(Farmer et al., 2018; Teo et al., 2023; Picanço and dos Santos, 2022; Selloni and Corubolo, 2017;	5 (26)

(*continued on next page*)

Table 2 (*continued*)

Code	Subcode	Studies including enablers (publication time span)	Total, n (% of 19)
	Policy-Level Support and Alignment	VanGronigen et al., 2023)2017–2023 (Farmer et al., 2018; Felder et al., 2023; Komatsu et al., 2021; VanGronigen et al., 2023; Herranz et al., 2024)2018–2024	5 (26)
	Strategic Planning	(Carella et al., 2024; Teo et al., 2023; Koppel and Sullivan, 2022; Komatsu et al., 2021; Selloni and Corubolo, 2017; Dosi et al., 2023; Victorino et al., 2022; Zuber and Moody, 2018; Herranz et al., 2024)2017–2024	9 (47)
	Communication and Framing Strategies	(Culver et al., 2022; Herranz et al., 2024) 2022–2024	2 (11)
	DT Team Integration	(Carella et al., 2024; Culver et al., 2022; Eines and Vatne, 2018; Victorino et al., 2022; Herranz et al., 2024) 2018–2024	5 (26)
Stakeholder Engagement and Trust	*Engagement and Trust-Building*	(Culver et al., 2022; Farmer et al., 2018; Teo et al., 2023; Felder et al., 2023; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021; Picanço and dos Santos, 2022; Selloni and Corubolo, 2017; VanGronigen et al., 2023; Zuber and Moody, 2018)2017–2023	13 (68)
	Readiness for Change	(Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Herranz et al., 2024)2021–2024	3 (16)
Training and Capacity Building	*Team and Professional Development*	(Farmer et al., 2018; Teo et al., 2023; Salmi and Mattelmäki, 2021; Komatsu et al., 2021) 2018–2023	4 (21)
Individual-level Enablers	*Personal Motivators*	(Salmi and Mattelmäki, 2021; Nielsen et al., 2018; Zuber and Moody, 2018)2018–2021	3 (16)

Note. N = 19 studies included in the review; n = number of studies mentioning each enabler.

In particular, prototyping was often embedded in iterative learning cycles, where participants tested solutions in their local contexts and returned with insights. Mortensen et al. (2024) highlighted how this led to "*repeated loops between local action and more general reflection,*" refining knowledge in practice (Mortensen et al., 2024). This openness to experimentation was essential: "*it is ok if an idea fails. The important part is to try and learn*" (Mortensen et al., 2024). Similarly, VanGronigen et al. (2023) found that testing helped "*lower the need to identify the 'correct' solution in the first attempt,*" supporting flexible, adaptive progress (VanGronigen et al., 2023) (Table 2).

Feedback mechanisms were also valued for surfacing problems early and encouraging rapid iteration (Zuber and Moody, 2018). Participants described how seeing visible progress, even in small steps, helped sustain motivation (Zuber and Moody, 2018). Tangible outputs, user reactions, and structured reflection supported responsive decision-making throughout the process (Zuber and Moody, 2018) (Table 2).

In parallel, the subcode **User Research and Needs Exploration** highlights the role of in-depth user engagement in shaping DT initiatives (Magistretti et al., 2022a; Teo et al., 2023; Felder et al., 2023; Salmi and Mattelmäki, 2021; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021; Picanço and dos Santos, 2022; VanGronigen et al., 2023; Zuber and Moody, 2018). Methods such as focus groups, interviews, empathy mapping, and system visualization were used to uncover user needs, behaviors, and expectations (Magistretti et al., 2022a; Teo et al., 2023; Felder et al., 2023; Salmi and Mattelmäki, 2021; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021; Picanço and dos Santos, 2022; VanGronigen et al., 2023; Zuber and Moody, 2018). For example, Magistretti et al. (2022) conducted wide-ranging focus groups to explore service needs across geographic and demographic contexts (Magistretti et al., 2022a) (Table 2).

These research activities helped teams go beyond assumptions. As VanGronigen et al. (2023) noted, gathering user perspectives led to "*a better understanding of their LEA's challenges.*" (VanGronigen et al., 2023). Tools like systemic maps and visual templates were particularly useful in clarifying complexity and identifying entry points for innovation (Teo et al., 2023). In healthcare contexts in particular, user research translated into more tailored services: *"the model was useful in tackling direct care issues"* (Koppel and Sullivan, 2022) (Table 2).

- *Organizational Culture and Team Dynamics*

Creating an **Inclusive and Safe Environment** was often cited as key for DT implementation, especially regarding team dynamics (Felder et al., 2023; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Komatsu et al., 2021; Zuber and Moody, 2018). Studies described efforts to reduce hierarchy, build psychological safety, and foster open dialogue. Felder et al. (2023) reported how enablers deliberately dismantled hierarchies to allow "*students, researchers, organizational participants and field experts to feel they had the same opportunities to contribute*", framing the space as "*safe yet challenging*" (Felder et al., 2023). Salmi and Mattelmäki (2021) likewise emphasized creating settings "*not too rigid or authority driven*", enabling participants to challenge assumptions (Salmi and Mattelmäki, 2021). Neutral spaces away from routine pressures (Felder et al., 2023) and encouraging candid conversations (Salmi and Mattelmäki, 2021). Psychological safety was vital where fear of failure or judgment hindered experimentation. Zuber & Moody (2018) found that "*participants were fearful of how colleagues and peers would react to their ideas*", stressing the value of trust-building (Zuber and Moody, 2018) (Table 2).

- *Support and Resources*

Multiple forms of organizational support were identified as key enablers. The subcode **Leadership and Expertise Support** refers to the role of experienced DT professionals and engaged leaders who guide, model, and legitimize DT practices (Carella et al., 2024; Teo et al., 2023; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018; Koppel and Sullivan, 2022; Picanço and dos Santos, 2022; Zuber and Moody, 2018). Carella et al. (2024) emphasized the importance of internal focal points, displaying examples, and maintaining regular dialogue with senior management (Carella et al., 2024). Other studies reinforced that supportive leadership, including planning, joint decision-making, and flexibility, were crucial to sustaining DT initiatives (Teo et al., 2023; Koppel and Sullivan, 2022) (Table 2).

Support Actions capture practical and symbolic organizational measures that facilitate DT (Farmer et al., 2018; Teo et al., 2023; Picanço and dos Santos, 2022; Selloni and Corubolo, 2017; VanGronigen et al., 2023). These ranged from funding and training opportunities (Farmer et al., 2018), to making tools available, adapting

team structures, and releasing staff time (Teo et al., 2023; Picanço and dos Santos, 2022). Providing dedicated time and space for reflection and engagement was particularly effective in involving diverse staff groups and stakeholders (VanGronigen et al., 2023) (Table 2).

At a broader level, **Policy-Level Support and Alignment** enabled DT initiatives to gain legitimacy and scalability by aligning with institutional or governmental frameworks (Farmer et al., 2018; Felder et al., 2023; Komatsu et al., 2021; VanGronigen et al., 2023; Herranz et al., 2024). For example, Komatsu et al. (2021) noted that design work became accepted "*as a way to bring a new way of doing and thinking into government,*" (Komatsu et al., 2021) while Herranz et al. (2024) described how policy frameworks facilitated evaluation and continuous quality assurance (Herranz et al., 2024) (Table 2).

Finally, **Strategic Planning** refers to structured planning mechanisms that support sustained DT adoption (Carella et al., 2024; Teo et al., 2023; Koppel and Sullivan, 2022; Komatsu et al., 2021; Selloni and Corubolo, 2017; Dosi et al., 2023; Victorino et al., 2022; Zuber and Moody, 2018; Herranz et al., 2024). This included designing training programs, aligning goals with stakeholders, and using data to inform strategic decisions (Carella et al., 2024; Dosi et al., 2023). Communication strategies and incentive mechanisms also played a role in building engagement and maintaining momentum (Zuber and Moody, 2018). As Zuber & Moody (2018) noted, planning for "*quick wins*" and providing clear goals and resources helped foster confidence and drive innovation forward (Zuber and Moody, 2018) (Table 2).

- *Stakeholder Engagement and Trust*

Regarding Stakeholder Engagement and Trust, the subcode **Communication and Framing Strategies** highlights how strategic communication helped legitimize DT efforts. This included repeated storytelling around problem–solution dynamics and the use of multimodal channels to sustain engagement and alignment (Culver et al., 2022; Herranz et al., 2024). As Culver et al. (2022) observed, "*designers continued to share their problem-and-solution narrative… to shape the validity of their recommendations for implementation.*" (Culver et al., 2022). Similarly, Herranz et al. (2024) emphasized the importance of chat-based and multimedia communication tools to facilitate proactive interactions among stakeholders (Herranz et al., 2024) (Table 2).

Under **DT Team Integration**, examples of successful cases showing how embedding DT teams within organizational structures and project timelines facilitated both problem framing and solution execution were included (Carella et al., 2024; Culver et al., 2022; Eines and Vatne, 2018; Victorino et al., 2022; Herranz et al., 2024). Early involvement was seen as particularly beneficial, and internal teams were preferred over external consultants due to lower costs, fewer delays, and greater organizational alignment (Carella et al., 2024; Herranz et al., 2024). Attention to power dynamics also contributed to legitimacy. As Culver et al. (2022) noted, "*a task force commissioned by the college president inherently has more credibility to build consensus.*" (Culver et al., 2022) (Table 2).

Lastly, the subcode **Engagement and Trust-Building** encompasses efforts to cultivate inclusive and trusting relationships with stakeholders, fostering a shared sense of responsibility for the process and its outcomes (Culver et al., 2022; Farmer et al., 2018; Teo et al., 2023; Felder et al., 2023; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021; Picanço and dos Santos, 2022; Selloni and Corubolo, 2017; VanGronigen et al., 2023; Zuber and Moody, 2018). This notion of responsibility was particularly emphasized in one study, where the empathy stage "*brought the people involved in the process closer, making everyone feel process owner and responsible for its improvement*" (Picanço and dos Santos, 2022). Across studies, actions such as open meetings, responsive dialogue, and shared storytelling were reported as responsible strategies to reduce resistance and strengthen collaboration. Teo et al. (2023), for instance, described how storytelling and co-modeling workshops ensured "*ongoing engagement of a wide range of stakeholders across our health system.*" (Teo et al., 2023). In clinical contexts, the involvement of patients, families, and staff contributed to a sense of ownership and sustained motivation (Eines and Vatne, 2018; Koppel and Sullivan, 2022). As one participant reflected, "*they usually come to us with the final solution already… but with this [model] I felt that my voice was valued throughout the entire process*" (Koppel and Sullivan, 2022) (Table 2).

- *Training and Capacity Building*

A recurring theme across studies was the importance of cultivating organizational **Readiness for Change** in DT adoption (Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Herranz et al., 2024). Beyond procedural training, organizations prepared participants to embrace ambiguity, question habits, and adopt exploratory mindsets (Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Herranz et al., 2024). As Salmi and Mattelmäki (2021) described, this involved "*entering into a creative state of 'not-knowing'*." (Salmi and Mattelmäki, 2021). Reflection encouraged leaving comfort zones and reconsidering entrenched behaviors (Mortensen et al., 2024; VanGronigen et al., 2023), fostering adaptability: "*Part of what the process is trying to do is to teach you that it's okay to be unsure if something will work*" (VanGronigen et al., 2023). VanGronigen et al. (2023) added that empathy-based activities became "*a watershed experience*", strengthening DT's emotional and relational foundations (VanGronigen et al., 2023) (Table 2).

Alongside mindset shifts, many organizations successfully invested in Team and Professional Development to build internal capacity for DT (Farmer et al., 2018; Teo et al., 2023; Salmi and Mattelmäki, 2021; Komatsu et al., 2021). Initiatives included tailored training, co-creation experiences, and ambassador networks to spread skills (Farmer et al., 2018; Teo et al., 2023; Salmi and Mattelmäki, 2021; Komatsu et al., 2021). Some developed courses tailored to local needs (Farmer et al., 2018), while others relied on internal DT ambassadors to lead and mentor peers (Komatsu et al., 2021). These initiatives fostered hands-on learning in design tools like user research, prototyping, and systems mapping, while also encouraging cross-team collaboration and mentorship (Teo et al., 2023). Teo et al. (2023) noted such investments supported the rise of "*systemic designers*" in areas like analytics, informatics, and planning, expanding DT beyond service-level innovation (Teo et al., 2023). Generational change also mattered, as younger professionals familiar with DT acted as cultural change agents (Salmi and Mattelmäki, 2021) (Table 2).

- *Individual-level Enablers*

Personal Motivators emerged as a critical enabler of engagement with DT (Salmi and Mattelmäki, 2021; Nielsen et al., 2018; Zuber and Moody, 2018). In many cases, participants were drawn to these initiatives by a desire to solve meaningful problems, engage in stimulating learning experiences, or connect socially with peers. As Zuber and Moody (2018) highlighted, individuals were motivated by "*learning, social time with people they like, and having a desire to 'fix' something that is not currently working in their personal or work environment.*" (Zuber and Moody, 2018). When participants felt that their contributions were valued and aligned with their own sense of purpose, their commitment deepened (Salmi and Mattelmäki, 2021). In several cases, it was precisely these internal drivers, like curiosity, ownership, and alignment with personal values, which sustained participation and advocacy, even in the presence of structural or cultural barriers (Salmi and Mattelmäki, 2021; Nielsen et al., 2018) (Table 2).

Fig. 2 provides a visual summary of the thematic structure of enablers identified in this review.

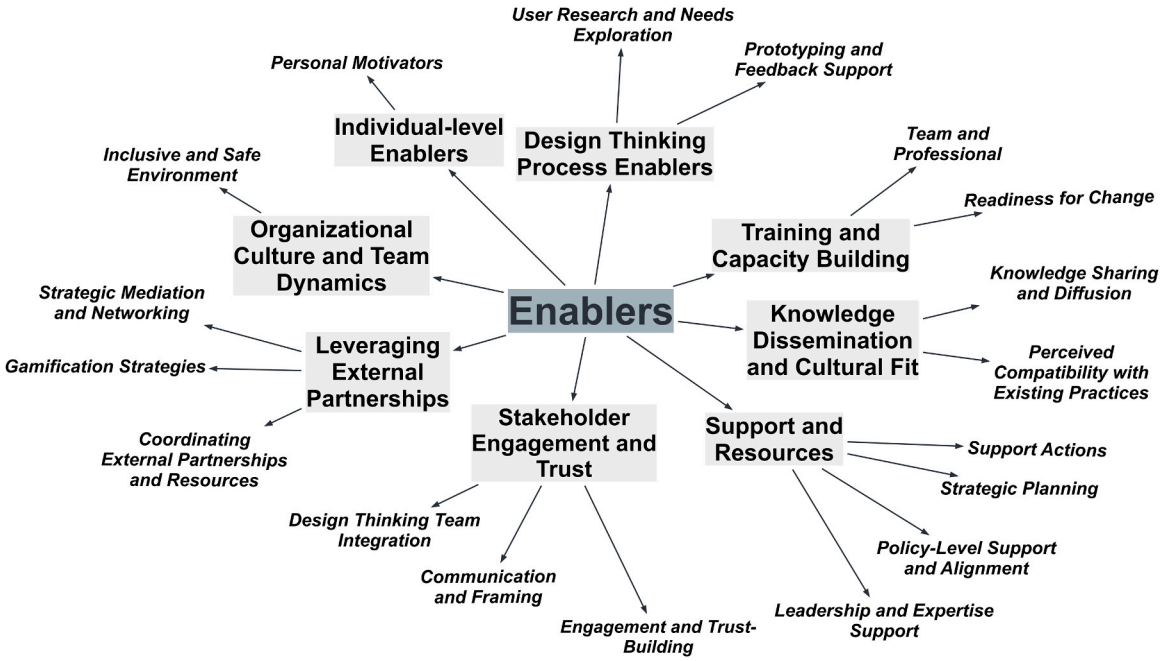

Fig. 2. Thematic structure of enablers for DT implementation.

4.5. Barriers to DT implementation (RQ2)

- *Operational and Resource Constraints*

A recurring barrier to DT implementation was **Dependency on External Resources and Commitment,** marked by reliance on partners or infrastructures not always sustainable (Farmer et al., 2018; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018; Selloni and Corubolo, 2017). Some initiatives depended on universities for student involvement, making progress contingent on external goodwill, enthusiasm, or funding (Farmer et al., 2018). As Farmer et al. (2018) warned, "*if ongoing provision of the service innovation hinges on student inputs, then the initiative relies on maintaining enthusiasm of university staff and finding resources for student travel*" (Farmer et al., 2018). Internal policies, such as data protection, also restricted collaborative digital tools (Salmi and Mattelmäki, 2021). Motivation declined when evaluation or course correction was absent (Eines and Vatne, 2018), while infrastructural demands like physical tools and hardware added challenges in resource-limited contexts (Selloni and Corubolo, 2017) (Table 3).

Another barrier was **Methodological Complexity and Learning Curve**, reflecting the time, effort, and adjustment needed to apply DT effectively (Teo et al., 2023; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; VanGronigen et al., 2023). Teams noted that DT's multifaceted nature, combining diverse tools, challenged newcomers and organizations used to linear, efficiency-driven processes. As Teo et al. (2023) noted, "*HSTP is itself a methodology bringing together many other methods and tools, all requiring substantial practice for skillful usage during health system transformation*" (Teo et al., 2023). Others warned that reliance on digital tools without human-centered interaction limited engagement and cultural change (Salmi and Mattelmäki, 2021). Studies stressed that transformation required experimentation, tolerance for ambiguity, and iteration (Mortensen et al., 2024; VanGronigen et al., 2023). In rigid or unclear settings, the learning curve intensified, leading teams to revert to more intuitive but less transformative approaches (Salmi and Mattelmäki, 2021; Mortensen et al., 2024) (Table 3).

- *Stakeholder-Related Barriers*

Stakeholder-related barriers were frequent, including miscommunication, misaligned expectations, inconsistent engagement, and sociocultural tensions (Culver et al., 2022; Farmer et al., 2018; Eines and Vatne, 2018; Selloni and Corubolo, 2017; VanGronigen et al., 2023; Dosi et al., 2023; Victorino et al., 2022; Zuber and Moody, 2018; Herranz et al., 2024). One key barrier was **Communication Breakdown within Represented Groups**, where designated representatives failed to communicate with those they represented (Culver et al., 2022; Eines and Vatne, 2018; Dosi et al., 2023). Culver et al. (2022) noted union pushback after discovering their representative had not communicated regularly with leaders (Culver et al., 2022). Other cases reflected unclear messaging and lack of feedback: "*lack of information and feedback… made it difficult for the staff to understand the aim of the process*" (Eines and Vatne, 2018). Excluding frontline staff also hindered engagement: "*managers did not inform and involve the lower tiers of the organization in this phase*" (Eines and Vatne, 2018). Limited awareness of interdependencies created further obstacles: "*professionals feel they do not have enough awareness of how their everyday choices impact other departments or colleagues*" (Dosi et al., 2023) (Table 3).

Another barrier concerned **Expectations for Complete Solutions** (Culver et al., 2022). In some cases, stakeholders showed resistance to the iterative nature of DT, expecting instead fully formed and polished outcomes. As Culver et al. (2022) reported, "*several group members noted that some stakeholders were resistant to the idea that the program was only a draft, wanting to have a complete and polished version presented to them instead*" (Culver et al., 2022). These expectations conflicted with the experimental logic of the approach, creating friction during the presentation of early-stage prototypes. In response, the authors suggested that "*teams may benefit from explicitly framing prototypes as rough drafts and giving key stakeholders an opportunity to provide feedback*" (Culver et al., 2022) (Table 3).

A third set of stakeholder-related challenges emerged around **Inconsistent Engagement** (Culver et al., 2022; Farmer et al., 2018; Eines and Vatne, 2018; Herranz et al., 2024). Participation often fluctuated, causing misalignment and reduced continuity. Culver et al. (2022) described how deans, after initially declining involvement, later sought input, complicating the process (Culver et al., 2022). Sustainability was also threatened when key partners withdrew: "*over the longer term, the RTO and the Medicare Local that funded training program development, both disbanded*" (Farmer et al., 2018).

Table 3
List of barriers for DT implementation (N = 19).

Code	Subcode	Studies including barriers (publication time span)	Total, n (% of 19)
Operational and Resource Constraints	*Dependency on External Resources and Commitment*	(Farmer et al., 2018; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018; Selloni and Corubolo, 2017) 2017–2021	4 (21)
	Methodological Complexity and Learning Curve	(Teo et al., 2023; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; VanGronigen et al., 2023)2021–2024	4 (21)
	Communication Breakdown within Represented Groups	(Culver et al., 2022; Eines and Vatne, 2018; Dosi et al., 2023) 2018–2023	3 (16)
	Expectations for Complete Solutions	(Farmer et al., 2018; Felder et al., 2023; Salmi and Mattelmäki, 2021; Komatsu et al., 2021; Victorino et al., 2022; Herranz et al., 2024) 2018–2024	1 (5)
Stakeholder-Related Barriers	*Inconsistent Engagement*	(Farmer et al., 2018; Nielsen et al., 2018; Komatsu et al., 2021) 2018–2022	4 (21)
	Perceived Threat to Status or Role	(Culver et al., 2022; Victorino et al., 2022; Zuber and Moody, 2018)	3 (16)
	Preconceived Problem Definitions	(Culver et al., 2022; VanGronigen et al., 2023)2022–2023	2 (11)
	Weak Partnerships	(Farmer et al., 2018; Selloni and Corubolo, 2017; VanGronigen et al., 2023)2017–2023	3 (16)
Structural and Institutional Barriers	*Insufficient Institutional Embedding*	(Magistretti et al., 2022a; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Eines and Vatne, 2018; Nielsen et al., 2018; Picanço and dos Santos, 2022; VanGronigen et al., 2023; Dosi et al., 2023; Victorino et al., 2022; Zuber and Moody, 2018) 2018–2024	6 (32)
	Organizational Pressures and Misaligned Expectations	(Magistretti et al., 2022a; Teo et al., 2023; Felder et al., 2023; Salmi and Mattelmäki, 2021; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021; Picanço and dos Santos, 2022; VanGronigen et al., 2023; Zuber and Moody, 2018)2018–2023	7 (37)
	Rigid Hierarchical Structures	(Culver et al., 2022; Felder et al., 2023; VanGronigen et al., 2023)2022–2023	3 (16)
	Risk Aversion Embedded in Organizational Culture	(Felder et al., 2023; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Komatsu et al., 2021; Zuber and Moody, 2018)2018–2024	5 (26)
	Scope of Practice Limitations	(Farmer et al., 2018; Salmi and Mattelmäki, 2021; Selloni and Corubolo, 2017) 2017–2021	3 (16)
	Unclear Decision-Making Authority	(Clarke and Braun, 2017; Felder et al., 2023; Eines and Vatne, 2018; Koppel and Sullivan, 2022) 2017–2022	4 (21)
Individual-Level Resistance	*Personal Barriers*	(Carella et al., 2024; Selloni and Corubolo, 2017; Dosi et al., 2023; Zuber and Moody, 2018) 2017–2024	4 (21)

Note. N = 19 studies included in the review; n = number of studies mentioning each barrier.

Staff frustration emerged when involvement decreased in later phases, or after external designers left the project (Eines and Vatne, 2018). A loss of momentum followed the departure of external designers: "*their involvement in the process was reduced after the designers left the project*" (Eines and Vatne, 2018). Practical constraints, such as scheduling conflicts, also limited participation (Herranz et al., 2024) (Table 3).

Another form of resistance was linked to a **Perceived Threat to Status or Role**, where individuals saw DT as a challenge to their identity or influence (Culver et al., 2022; Victorino et al., 2022; Zuber and Moody, 2018). Culver et al. (2022) reported concerns from full-time faculty that the Level II program might undermine their standing; the advisory group responded by clarifying the pilot and emphasizing its flexibility (Culver et al., 2022). In higher education settings, hesitation toward innovation itself was sometimes observed. As Victorino et al. (2022) noted, "*in the academic context, there may also be some resistance to the concept of innovation, as the term is usually associated with entrepreneurship, which connotes a commercial context and may generate an adverse reaction in higher education institutions*" (Victorino et al., 2022). Social and professional dynamics reinforced this tension, as participants feared colleagues' perceptions: "*participants indicated a fear of how colleagues and peers will react to their ideas and experiments. There is a perception that managers see innovators as 'troublemakers'*" (Zuber and Moody, 2018) (Table 3).

Other barriers arose from **Preconceived Problem Definitions** (Culver et al., 2022; VanGronigen et al., 2023). In several cases, stakeholders approached the process with rigid or oversimplified understandings of the problem at hand, limiting openness to reframing. Culver et al. (2022) explain that "*constraints can also be imposed by stakeholders throughout the process, especially because many teams are formed based on preconceived notions of a problem.*" (Culver et al., 2022) During the DT redefine phase, they suggest that "*teams benefit from crafting a narrative that communicates the complexities of the issue to share with stakeholders*," helping them to shift from narrow views to more systemic perspectives (Culver et al., 2022). However, these shifts were not always easily achieved. VanGronigen et al. (2023) observed that "*some participants needed consistent reminders to use an adaptive lens because they were 'still not getting out of the box'*" (VanGronigen et al., 2023). Others questioned the value of the process altogether, with one participant asking: "*People may be able to find things easier, but is it really going to change mindsets and how we do business?*" (VanGronigen et al., 2023) (Table 3).

A lack of strong collaboration also emerged in the form of **Weak Partnerships** (Farmer et al., 2018; Selloni and Corubolo, 2017; VanGronigen et al., 2023). In several cases, insufficient buy-in, misaligned priorities, or lack of trust reduced collective commitment to DT processes (Farmer et al., 2018; Selloni and Corubolo,

2017; VanGronigen et al., 2023). As Farmer et al. (2018) observed, "*there was insufficient buy-in from other partners*", and "*partnerships with stakeholders were insufficiently developed to ease the path to uptake of new practice*" (Farmer et al., 2018). Weak or fragmented networks also contributed to limited support, with challenges "*related to the absence or scarcity of connections and relationships*" (Selloni and Corubolo, 2017). In more hierarchical contexts, traditional change processes tended to marginalize broader participation: "*the traditional change paradigm tends to exclude non-administrators from leading change efforts*" (VanGronigen et al., 2023) (Table 3).

- *Structural and Institutional Barriers*

Challenges also arose from **Insufficient Institutional Embedding** of DT initiatives (Farmer et al., 2018; Felder et al., 2023; Mortensen et al., 2024; Eines and Vatne, 2018; Komatsu et al., 2021; Victorino et al., 2022). In some cases, innovations remained marginal to established structures and routines, limiting their impact and long-term sustainability. Farmer et al. (2018) noted that "*the innovation was insufficiently embedded within the existing health regime*" (Farmer et al., 2018), while Felder et al. (2023) described how traditional reporting mechanisms conflicted with network-building efforts at the municipal level (Felder et al., 2023). Organizational learning often struggled to take root without internal champions or local ownership: "*embedding requires local support and often also an influential champion within the organization*" (Mortensen et al., 2024). In some cases, managers "*were unable to adopt or maintain the design thinking approach during the test period*" (Eines and Vatne, 2018) (Table 3).

Tensions also emerged when initiatives were visually or conceptually distinct from existing structures. Komatsu et al. (2021) reported that although the lab promoted innovation, it "*was made distinct from the rest of the organization in its visual identity and brand*", which ultimately "*challenged the legitimacy of Inland*" and "*was perceived as not conforming to the values and norms of the organization*" (Komatsu et al., 2021). The temporary nature of some initiatives further undermined institutionalization: "*the lab has yet to gain a permanent status and is once again on a two-year contract*" (Komatsu et al., 2021). Broader contextual uncertainty also played a role as a barrier for DT implementation in organization change management. As Victorino et al. (2022) noted, "*predicting the future nature of teaching/learning and student research and support is a complex challenge*", especially when "*the useful programmatic life of a building is often much shorter than its physical life*" (Victorino et al., 2022) (Table 3).

Further resistance came from **Organizational Pressures and Misaligned Expectations (**Teo et al., 2023; Felder et al., 2023; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018; Komatsu et al., 2021; VanGronigen et al., 2023; Dosi et al., 2023). In some cases, teams were pressured to deliver quick solutions rather than engage in deeper, participatory processes. "*Organizational or external pressures may compel health system stewards to adopt ill-conceived but popular quick fixes*" (Teo et al., 2023). Time constraints often prevented exploration or ownership of identified problems: "*normally and under pressure of time, we don't really take our ideas further"* (Felder et al., 2023). Participants also struggled to align institutional expectations with the iterative nature of the process: "*observed some challenges… mostly in the disconnect between the expectations of creating organizational change and the enabling conditions of the design action*" (Komatsu et al., 2021). In some cases, solutions were designed only to avoid anticipated resistance: "*Problem (6) was explicitly required… just to avoid organizational resistance*" (Dosi et al., 2023) (Table 3).

Moreover, **Rigid Hierarchical Structures** were a frequently limiting factor (Culver et al., 2022; Felder et al., 2023; VanGronigen et al., 2023). Rule-bound bureaucracies constrained the flexibility required by DT, particularly in public institutions and higher education: "*Professional bureaucracies have hierarchical structures with formalized rules and policies"* that require designers *"to navigate, collaborate, and negotiate with various stakeholders*" (Culver et al., 2022). This environment also constrained iteration: "*the bureaucratic environment similarly constrains designers' ability to engage in multiple iterations*" (Culver et al., 2022). Some teams struggled against institutional inertia: "*it's just how we do things*" (Felder et al., 2023), or continued using long-established processes with minimal reflection: "*we have all these structures in place that we just keep them going*" (VanGronigen et al., 2023) (Table 3).

Some barriers can be ascribed to **Risk Aversion Embedded in Organizational Culture (**Culver et al., 2022; Mortensen et al., 2024; Picanço and dos Santos, 2022; VanGronigen et al., 2023; Victorino et al., 2022). Many organizations resisted experimentation and iterative prototyping (Culver et al., 2022; Mortensen et al., 2024; Picanço and dos Santos, 2022; VanGronigen et al., 2023; Victorino et al., 2022). Culver et al. (2022) reported that "*the prototyping mindset was difficult to maintain…teams built multiple prototypes simultaneously and also developed a problem-and-solution story*" (Culver et al., 2022). Mortensen et al. (2024) similarly found weak support for "experimentation" and "aspirational thinking," reflecting a culture that constrained creativity (Mortensen et al., 2024). Change resistance was often attributed to leadership attitudes: "*when we ask why not, the answer was that top management has difficulty accepting changes*" (Picanço and dos Santos, 2022). In education, conformity norms further limited innovation: "*educators, as a whole, are rule followers*" and traditional standards shaped participants' work (VanGronigen et al., 2023). Even when ideas were generated, applying them remained challenging: "*we also acknowledge a challenge in persuading higher education institutions to implement the outcomes*" (Victorino et al., 2022) (Table 3).

Other barriers relate to **Scope of Practice Limitations** (Farmer et al., 2018; Salmi and Mattelmäki, 2021; Selloni and Corubolo, 2017). These reflect legal, professional, or organizational restrictions on who could carry out certain tasks within DT initiatives (Farmer et al., 2018; Salmi and Mattelmäki, 2021; Selloni and Corubolo, 2017). For example, Farmer et al. (2018) described that "*discussion around scope of practice and burdens of additional work affected who was 'allowed' to undertake oral health screening in the communities*" (Farmer et al., 2018). Challenges also arose in defining roles and responsibilities within project teams. As Salmi and Mattelmäki (2021) noted, "*the challenge was that we started to define an internal customer, who were the employees, and then the management who was our client*" (Salmi and Mattelmäki, 2021). Economic and legislative feasibility further restricted experimentation: "*feasibility, associated with economical and legislative obstacles*" and "*mainly from legislative obstacles emerging when experimenting new collaborative service models*" (Selloni and Corubolo, 2017) (Table 3).

Finally, **Unclear Decision-Making Authority** was another frequently barrier (Farmer et al., 2018; Eines and Vatne, 2018; Komatsu et al., 2021; Picanço and dos Santos, 2022). Ambiguity about who held approval power or strategic oversight created delays and confusion (Farmer et al., 2018; Eines and Vatne, 2018; Komatsu et al., 2021; Picanço and dos Santos, 2022). In one case, "*an initial challenge was discovering who should 'approve' this innovation,*" involving various stakeholders such as school coordinators, directors of oral health, and principals (Farmer et al., 2018). Eines and Vatne (2018) noted concerns over the absence of a project manager and inconsistent management across departments (Eines and Vatne, 2018). Komatsu et al. (2021) observed that the lab's cross-cutting nature "*led to many 'supervisors'*" and fragmented innovation efforts lacking strategic convergence (Komatsu et al., 2021). Lack of transparency also hindered processes, as seen in "*the monitor's selection process*" (Picanço and dos Santos, 2022) (Table 3).

- *Individual-Level Resistance*

A key barrier was **Personal Barriers** rooted in individual resistance to change (Carella et al., 2024; Selloni and Corubolo, 2017; Dosi et al.,

2023; Zuber and Moody, 2018). Employee attitudes, fears, and ingrained routines often hindered DT adoption (Carella et al., 2024; Selloni and Corubolo, 2017; Dosi et al., 2023; Zuber and Moody, 2018). As noted by Carella et al. (2024), "*employees are a significant barrier to the adoption of Design Thinking*", particularly when they are reluctant to leave their comfort zones or engage with unfamiliar methods (Carella et al., 2024) Curiosity and openness were deemed essential: "*stimulate people to get out of their comfort zone*" (Carella et al., 2024). Generational dynamics also mattered, with older employees seen as less adaptive: the need to "*create the right mix between generations of employees*" was stressed to "*stimulate older people*" (Carella et al., 2024) (Table 3).

Skill gaps further reinforced resistance, with barriers "*related to the lack of competences, skills, attitude and knowledge*", while others linked resistance to fear of disruption to personal routines (Selloni and Corubolo, 2017). For instance, Dosi et al. (2023) similarly noted reluctance to alter routines that might disrupt family lives (Dosi et al., 2023). Emotional discomfort and fear of judgment compounded this, as one participant admitted: "*I worry so much that (my team) will hate my ideas… most of the time I just stay quiet*" (Zuber and Moody, 2018) (Table 3).

Fig. 3 provides a visual summary of the thematic structure of barriers identified in the review.

4.6. How enablers and barriers shape DT implementation in organizations (RQ3)

Across the included studies, enablers and barriers interacted to shape different trajectories of DT implementation. When factors such as *Knowledge Dissemination and Cultural Fit, Organizational Culture and Team Dynamics, Stakeholder Engagement and Trust, Support and Resources, Training and Capacity Building, Individual-Level Enablers,* and *DT Process Enablers* were present, DT initiatives tended to continue beyond initial projects, be reused in subsequent activities, and progressively integrate into local practices (Farmer et al., 2018; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021; Picanço and dos Santos, 2022; Victorino et al., 2022).

Conversely, when barriers such as *Operational and Resource Constrains, Stakeholder-Related Barriers, Stakeholder and Institutional Barriers,* and *Individual-Level Resistance* predominated, DT initiatives often remained confined to specific teams, pilot projects, or short-term interventions, with limited consolidation over time (Carella et al., 2024; Farmer et al., 2018; Teo et al., 2023; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018; Selloni and Corubolo, 2017; VanGronigen et al., 2023; Dosi et al., 2023; Zuber and Moody, 2018). Under these conditions, aspects captured by *Operational and Resource Constraints* and *Stakeholder and Institutional Barriers*—including lack of time and funding, dependency on external expertise, and absence of clear organizational anchoring—were frequently cited as key obstacles to the continuation and broader diffusion of DT practices (Carella et al., 2024; Farmer et al., 2018; Selloni and Corubolo, 2017; Dosi et al., 2023; Zuber and Moody, 2018).

Several studies also indicated that factors such as *Leveraging External Partnerships*, *Support and Resources*, *DT Process Enablers*, and *Training and Capacity Building* could act either as enablers or constraints, depending on their interaction with internal capacity, governance structures, and leadership support (Farmer et al., 2018; Felder et al., 2023; Salmi and Mattelmäki, 2021; Komatsu et al., 2021; Picanço and dos Santos, 2022; Herranz et al., 2024). For example, these factors supported wider dissemination when combined with strong organizational culture and internal champions, but limited expansion when associated with resource constraints and institutional barriers (Farmer et al., 2018; Felder et al., 2023; Salmi and Mattelmäki, 2021; Komatsu et al., 2021; Picanço and dos Santos, 2022; Herranz et al., 2024).

5. Discussion

This review synthesized empirical and conceptual evidence on the enablers and barriers shaping Design Thinking (DT) implementation across diverse organizational contexts. While DT is increasingly applied to innovation, participatory problem-solving, and user-centered redesign (Salmi and Mattelmäki, 2021; Komatsu et al., 2021), its successful integration remains highly dependent on cultural, structural, and relational dynamics (Mortensen et al., 2024; Komatsu et al., 2021). Rather than following a uniform trajectory, DT emerges as a context-sensitive

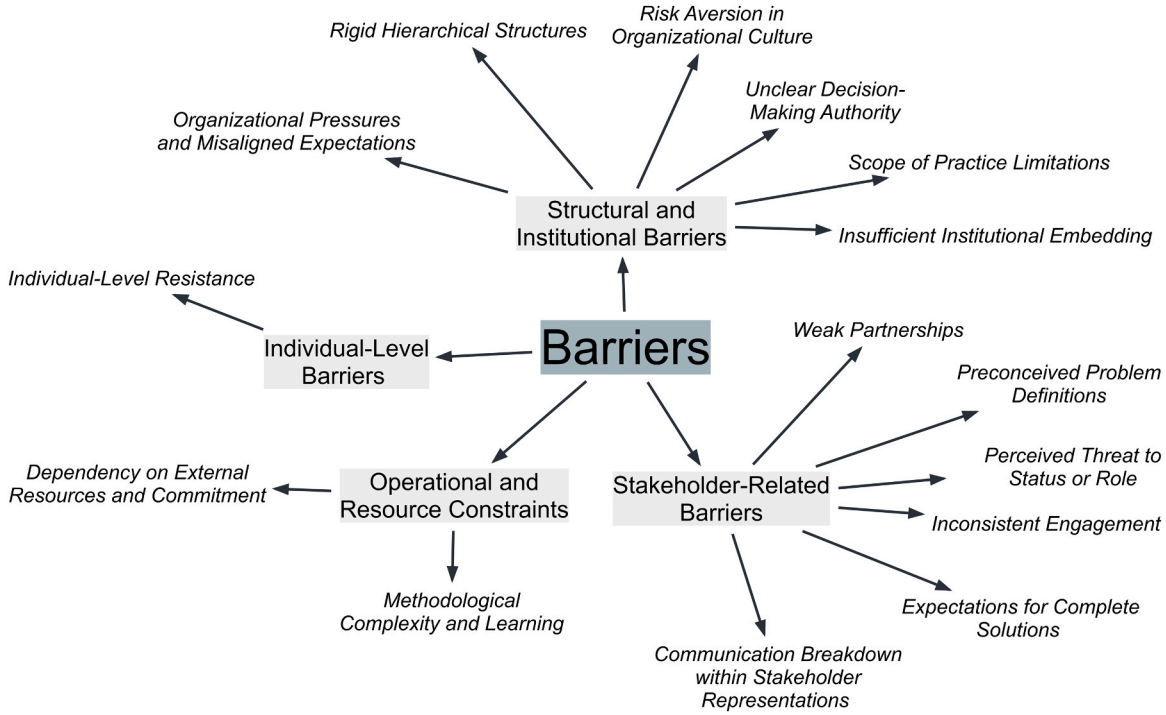

Fig. 3. Thematic structure of barriers for DT implementation.

practice, whose success depends on organizational readiness, stakeholder alignment, and adaptive leadership (Carella et al., 2024; Teo et al., 2023; Zuber and Moody, 2018). This context-sensitive nature of DT implementation has been consistently highlighted in prior research, which shows that organizations struggle not with understanding DT as a concept, but with translating it into everyday practices within existing structures and cultures (Carlgren et al., 2016b, 2016c).

Therefore, a key insight is the importance of knowledge dissemination and cultural fit (Farmer et al., 2018; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Eines and Vatne, 2018; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021; Picanço and dos Santos, 2022). DT gained legitimacy when seen as compatible with existing norms and routines (Farmer et al., 2018; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021). In fields like health, education, and public administration, where iterative reasoning and adaptive decision-making are embedded, DT was accepted as a natural extension rather than a disruption (Farmer et al., 2018; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018; Koppel and Sullivan, 2022; Nielsen et al., 2018; Komatsu et al., 2021). de Moraes Silva et al. (2023) note that innovation frameworks are more easily internalized when aligned with local traditions (de Moraes Silva et al., 2023), while Riding & Sadler-Smith (1997) highlight the role of "cognitive fit" between design methods and organizational learning (Riding & Sadler-Smith, 1997). Thus, DT's success seems to depend not only on methodological value but on its alignment with organizational values, practices, and cognitive styles (Elsbach and Stigliani, 2018b; Magistretti et al., 2022b).

Knowledge sharing and diffusion through informal and peer-based learning were central to DT adoption. Communities of practice, ambassadors, and participatory workshops facilitated both tool diffusion and collective identity-building (Farmer et al., 2018; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Koppel and Sullivan, 2022; Komatsu et al., 2021; Picanço and dos Santos, 2022). Nisioti et al. (2022) note that innovation learning is most effective when social and dialogical rather than prescriptive (Nisioti et al., 2022). Similarly, George et al. (2022) show how internal champions and distributed leadership sustain design cultures in transforming organizations (George et al., 2022). These findings also resonate with the open innovation literature, which emphasizes knowledge flows and social learning as drivers of innovation diffusion (Bogers et al., 2018).

External partnerships also enabled DT adoption. Collaborations with universities, labs, and consultants added legitimacy, expertise, and resources (Farmer et al., 2018; Felder et al., 2023; Salmi and Mattelmäki, 2021). Academic involvement through co-design or student placements provided knowledge and credibility (Komatsu et al., 2021), while some partnerships introduced gamified tools to support engagement (Carella et al., 2024; Picanço and dos Santos, 2022). However, their sustainability depended on internal capacities (Komatsu et al., 2021; Victorino et al., 2022). Starostka et al. (2022) show that while external actors can catalyze design adoption, sustainable impact depends on an organization's ability to internalize and institutionalize DT practices (Jarrett et al., 2022). Similarly, Jarrett et al. (2022) illustrate how, without structural integration, DT efforts risk remaining isolated or short-lived (Starostka et al., 2022). This dynamic parallels ecosystem collaboration mechanisms in open innovation, where external actors provide complementary resources while long-term sustainability depends on internal absorption and institutionalization (Huizingh, 2011).

In terms of process, core DT practices such as prototyping, user research, and iterative feedback helped teams engage with complexity, surface tacit knowledge, and adapt solutions to real-world conditions (Mortensen et al., 2024; VanGronigen et al., 2023; Victorino et al., 2022). Together, they supported hands-on learning and grounded innovation, ensuring that DT solutions responded directly to real-world needs (Magistretti et al., 2022a; Felder et al., 2023; Nielsen et al., 2018). More than technical steps, these practices fostered shifts toward reflection, experimentation and empathy (Mortensen et al., 2024; Zuber and Moody, 2018). This shift aligns with recent research illustrating that DT's transformative potential is only realized when teams are given space to learn through iteration and failure (Heldal, 2023; Schiuma et al., 2024). Successful implementation also depended on leadership as transformative competencies such as facilitation, pragmatic catalyst behaviors, and values driven communication were critical for embedding these practices into organizational routines and sustaining change (Schiuma et al., 2024).

One notable point concerns the distinction between stakeholders and individuals, which are not always conceptually or functionally equivalent in design driven processes (Katz et al., 1973). While stakeholders were defined by their formal institutional roles and representational mandates (Katz et al., 1973), individuals were recognized as actors with unique emotional, motivational and relational dispositions (Eines and Vatne, 2018; Nielsen et al., 2018; Zuber and Moody, 2018). This distinction has important implications for participation and engagement. Organizational change efforts often fail when they treat stakeholder participation as structurally sufficient, without attending to the affective, cognitive, and identity-based experiences of individuals (Komatsu et al., 2021; Picanço and dos Santos, 2022). Several studies reported tensions between official representatives who did not actively consult their constituencies and informal participants who engaged deeply due to personal alignment with DT values (Salmi and Mattelmäki, 2021; Selloni and Corubolo, 2017; VanGronigen et al., 2023). Acknowledging this divergence adds analytical clarity to the field and suggests that participation should be framed both as a structural requirement and a relational and emotional process (Schachameier et al., 2025; Khan et al., 2016).

At the individual level, motivation, perceived relevance and psychological safety are central to engagement in DT and organizational change. In reviewed studies, participants who felt intellectually stimulated, socially connected or aligned with a meaningful purpose were more likely to embrace DT initiatives (Nielsen et al., 2018; Komatsu et al., 2021; Zuber and Moody, 2018). These findings echo recent analysis who argues that innovative cultures require emotional commitment as much as technical competence (Albrecht et al., 2023). Inclusive environments that encouraged open dialogue, and dismantled hierarchical dynamics were seen as critical to sustaining motivation and trust among participants (Felder et al., 2023; Mortensen et al., 2024).

In this regard, some studies emphasized the importance of responsible facilitation that actively shape conditions enabling participants to challenge assumptions and take creative risks. Rather than relying on abstract ideals, these practices were deliberately embedded in the relationships and group dynamics (Felder et al., 2023; Salmi and Mattelmäki, 2021; Zuber and Moody, 2018).

Conversely, barriers such as fear of judgment, uncertainty, or perceived threats to professional identity, are also perceived obstacles noted by other researchers (Küçükatalay et al., 2023; Ackerhans et al., 2024). In some cases, participants feared being perceived as "troublemakers" or incompetent, especially in settings with rigid organizational norms (Salmi and Mattelmäki, 2021; Zuber and Moody, 2018). These barriers resonate with prior work showing that DT often fails when cognitive routines, mental models, and professional identities interfere with exploratory and abductive reasoning, requiring deliberate countermeasures to overcome such cognitive traps (Butler and Roberto, 2018). These dynamics were intensified in contexts like higher education, where risk aversion prevails (Victorino et al., 2022). For example, Culver et al. (2022) observed that maintaining a prototyping mindset was difficult due to this risk aversion, leading teams to build multiple prototypes simultaneously and rely on narrative justification behavior reflecting not only fear of failure but also deeper cultural constraints (Culver et al., 2022; Felder et al., 2023; VanGronigen et al., 2023; Khan et al., 2016; Drejeris and Drejeriene, 2022). Importantly, other authors suggest that such struggles and tensions may also function as learning triggers, indicating that barriers are not merely obstacles but part of the developmental trajectory of DT journeys when appropriately supported

(Coco et al., 2020).

Leadership and strategic alignment are equally crucial in shaping DT implementation in organizations. DT initiatives that received visible support from senior leadership, including protected time for experimentation, integration with planning cycles, and alignment with institutional strategy, were more likely to generate lasting effects (Carella et al., 2024; Teo et al., 2023; Zuber and Moody, 2018). These findings align with prior work identifying leadership commitment, organizational readiness, and sustained capability building as critical success factors for DT implementation, particularly beyond pilot initiatives (De Paula et al., 2019). Conversely, when leadership was passive or overly outcome driven, DT efforts remained fragmented or short-lived (Felder et al., 2023; Salmi and Mattelmäki, 2021; Eines and Vatne, 2018). These observations also are consistent with other findings, which demonstrate that enabling leadership in innovation processes must balance strategic direction with cultural facilitation (Zhao et al., 2022; Mogaji and Dimingu, 2024).

Creating inclusive and psychologically safe environments also emerged as essential in this context. DT flourished when participants felt safe to challenge assumptions, share ideas without fear of judgment, and collaborate openly (Felder et al., 2023; Salmi and Mattelmäki, 2021; Mortensen et al., 2024; Komatsu et al., 2021; Zuber and Moody, 2018) Such environments facilitated by dedicated spaces, reflective practices, and supportive interpersonal dynamics were seen as vital for sustaining creativity and experimentation (Felder et al., 2023; Mortensen et al., 2024). Recent qualitative research validates this association. For instance, Moffett et al. (2024) found that psychological safety in virtual DT education enabled greater openness, collaboration, and tolerance for uncertainty (Moffett et al., 2024). Further, Wang et al. (2018) demonstrate that psychological safety plays a mediating role between humble leadership and follower creativity, highlighting the importance of leadership behaviors that foster open communication and knowledge sharing (Wang et al., 2018).

Institutional embedding was a key enabler of DT in organizational change. When integrated into performance frameworks, communication, and decision-making, DT became part of the organizational fabric rather than an add-on (Carella et al., 2024; Komatsu et al., 2021; Herranz et al., 2024). Furthermore, practical support actions, such as dedicated resources, tailored training, and visible recognition of innovation efforts, were identified as crucial to move beyond symbolic adoption and ensure real, sustainable impact (Carella et al., 2024; Teo et al., 2023; Zuber and Moody, 2018). Bellini et al. (2012) stress that institutionalization requires not only tools but also management models and knowledge flows aligned with culture, ensuring DT is embedded rather than peripheral (Bellini et al., 2012). In contrast, subtle and persistent forms of resistance to DT implementation for organizational change remained. Such resistance was often embedded in routine practices, bureaucratic expectations, and institutional inertia (Felder et al., 2023; Komatsu et al., 2021). Skepticism toward iterative processes, discomfort with ambiguity, and a preference for immediate results are common challenges (Culver et al., 2022; Mortensen et al., 2024). In contexts where control, predictability, and efficiency were prioritized, DT's experimental ethos often clashed with organizational norms, resulting in passive or active resistance (VanGronigen et al., 2023; Zuber and Moody, 2018). Similar tensions have been observed in open innovation literature, where integration into organizational routines and governance structures is critical for sustaining outcomes (Chesbrough and Bogers, 2014). These findings show that cultural alignment and psychological safety must be paired with efforts to shift entrenched mindsets and behaviors (Hubbart, 2024; Bagrationi and Thurner, 2023).

Governance challenges further constrained implementation. Unclear decision-making authority, particularly in cross-sectoral or interdepartmental settings, created confusion, diluted accountability, and stalled progress (Farmer et al., 2018; Eines and Vatne, 2018; Komatsu et al., 2021; Picanço and dos Santos, 2022). Effective governance for DT requires structural alignment, role clarity, and adaptive leadership that avoids reverting to rigid hierarchies (Howlett, 2014; Magistretti et al., 2023; Reitzig, 2022).

Finally, stakeholder engagement and trust-building also proved decisive. DT initiatives were more successful when design teams were involved from the outset, allowing for deeper problem framing, stakeholder ownership, and reduced information silos (Carella et al., 2024; Komatsu et al., 2021). Superficial engagement or unaddressed status concerns led to resistance and disengagement (Culver et al., 2022; Zuber and Moody, 2018), highlighting the need for transparency, trust, and attention to power dynamics (Teo et al., 2023). Similarly, other studies have shown that integrating stakeholders into decision-making processes leads to better outcomes and fosters more informed, responsible, and sustainable choices across diverse policies and organizational contexts (Yusif and Hafeez-Baig, 2024; Perrone et al., 2023).

Taken together, these findings confirm that DT is not just a toolkit but a relational and institutional practice whose success depends on alignment across individual, organizational, and systemic levels. This interpretation is consistent with broader conceptual syntheses that frame DT as a practice-based and sensemaking-oriented approach, whose outcomes depend on situated enactment rather than standardized application (Micheli et al., 2019; Rylander Eklund et al., 2022). Its transformative potential lies in fostering inclusive, reflective, and adaptive processes that mobilize distributed knowledge, challenge existing paradigms, and support sustained innovation. Across these levels, enablers and barriers jointly shape DT implementation in organizations.

This review situates DT within the broader paradigm of open innovation, where knowledge flows, collaboration, and cultural factors shape transformation. Case studies show how initiatives leverage distributed knowledge to accelerate change (Elsbach and Stigliani, 2018b; Zhao et al., 2022). Meta-analyses confirm that inbound and outbound flows enhance performance, moderated by absorptive capacity and learning culture (Nguyen et al., 2025; Zhang et al., 2024). Openness drives agility and new revenue streams (Bogers et al., 2018), while bounded rationality explains iterative, collaborative approaches under uncertainty (Yun et al., 2022). Cultural and organizational factors remain critical: hierarchical norms constrain openness, whereas adhocracy fosters co-creation (Parveen et al., 2023; Yun et al., 2020). Costs and complexity demand robust governance and resource alignment (Dabić et al., 2023; Quesado and Silva, 2021). Collectively, these insights reinforce the potential of DT, as an open innovation-oriented approach, to foster systemic change within organizations and align with the results of our analysis.

Building on this positioning of DT within open innovation and as a mechanism for systemic change, it is important to note that previous reviews on DT have primarily focused on its application in education, team dynamics, or product development, offering conceptual insights but providing limited empirical synthesis on organizational change (Schlott, 2024; Daymond and Knight, 2023b). Johansson-Sköldberg et al. (2013) provide historical and theoretical perspectives but overlook implementation barriers (Johansson-Sköldberg et al., 2013). Recent review evidence further reinforces this positioning. For instance, Mayer and Schwemmle (2025) highlight the fragmented and context-dependent nature of DT outcomes and emphasize the need for integrative frameworks capable of synthesizing enablers and barriers across organizational settings (Mayer and Schwemmle, 2025 Mar 1).

Accordingly, this review consolidates empirical evidence on DT as a change-enabling practice, filling a gap in the literature by mapping the conditions for adoption and sustainability. Grey literature sources, including practitioner toolkits and playbooks (e.g., Design for Change; Design Thinking Meets Change Management by Lena Ross), emphasize practical strategies for embedding DT in change management but lack methodological rigor (Design Thinking, 2025; A Toolkit, 2025). While some enablers may function as barriers when absent, the literature does not consistently conceptualize them as direct counterparts. Empirical

studies vary in analytical emphasis, with some focusing on enabling conditions and others on resistance dynamics. Consequently, this review reflects the structure of the available evidence rather than imposing symmetrical categories.

Together, these observations reinforce the need for evidence-based frameworks that bridge practice and scholarship, ensuring DT's integration into organizational change is both theoretically grounded and empirically validated.

5.1. Strengths and limitations

This review has limitations. Included studies varied in scope, methodology, and setting, reflecting the multidimensional nature of DT but also creating variability in reporting and synthesis. The focus on qualitative and exploratory studies provided contextual depth but increased susceptibility to interpretation bias. To mitigate this, systematic coding with predefined categories was applied, and three reviewers independently conducted screening, extraction, and thematic synthesis, with quality assessed using the MMAT.

The review followed PRISMA guidelines with a structured protocol and comprehensive searches across three databases. Although not preregistered, procedures were transparently documented. Only peer-reviewed and indexed studies published between 2014 and 2024 were included, ensuring the recency and relevance of the evidence. While the final corpus comprised 19 studies, this number is consistent with the emerging and applied nature of the field, and sufficient to generate a robust thematic synthesis.

As few studies explicitly framed their findings within open innovation, our discussion draws interpretive parallels rather than reporting direct evidence.

Overall, the review offers a structured and evidence-based contribution to understanding how DT is applied in organizational contexts. By mapping both facilitating factors and barriers, it provides valuable insights for scholars and practitioners seeking to advance innovation through design thinking-led approaches.

5.2. Practical implications and directions for future research

This review provides actionable guidance for leaders aiming to integrate DT into organizational change efforts. Beyond tools and techniques, successful implementation depends on fostering participation, psychological safety, and adaptive learning environments. Leaders are encouraged to prioritize internal capacity building, relational trust, and strategic alignment over rigid process adherence. These enablers are critical for sustaining DT beyond initial pilot phases and embedding it as an ongoing practice. For researchers, several opportunities emerge. First, there is a need to develop integrative frameworks that explain how contextual, organizational, and individual factors interact during DT implementation. Such models would support both theoretical advancement and cross-sector application. Second, there is a need to design and validate assessment tools or measurement scales that capture readiness for DT, quality of participation, or impact on responsible innovation capability. Future research could expand the evidence base through longitudinal or mixed-methods approaches, enabling better understanding of long-term effects. As primary studies rarely provided sufficient procedural detail or used consistent DT models and terminology, stage-specific analysis was not feasible. In addition, a dedicated review or empirical studies examining how enablers and barriers vary across the different stages of the DT process (from empathy and ideation to prototyping, testing, and implementation) would provide a more fine-grained understanding of DT implementation. Further exploration is also needed on the dynamics between formal stakeholder roles and individual motivations, particularly in complex or hierarchical environments. Finally, studies comparing DT implementation across cultural or institutional contexts would help refine the conditions under which DT can scale effectively.

6. Conclusions

This review examined how DT has been implemented across diverse organizational settings, identifying key conditions that enable or constrain its adoption. Eight main facilitating factors were found: Knowledge Dissemination and Cultural Fit, Leveraging External Partnerships, Design Thinking Process Enablers, Organizational and Team Dynamics, Organizational Support and Resources, Stakeholder Engagement and Trust, Training and Capacity Building, and Individual-level Enablers. These reflect both structural supports and cultural or relational dynamics that foster engagement and adaptability.

At the same time, four barrier categories, such as Operational and Resource Constraints, Methodological Complexity and Learning Curve, Stakeholder-Related Barriers, and Individual-Level Resistance, highlight persistent challenges related to limited resources, unclear roles, institutional inertia and personal reluctance to change.

Overall, DT emerges as both a toolkit and a relational practice, with success depending on context-sensitive, iterative alignment of strategy, culture, and people. Sustainable adoption requires attention not only to methods but also to the broader conditions shaping participation and learning. These insights advance innovation management by clarifying how DT can be more effectively embedded in organizational processes. By situating DT within both change management and open innovation, this review clarifies how creative, participatory approaches can be embedded more effectively and sustainably across organizational contexts.

CRediT authorship contribution statement

AS Cunha: Writing – review & editing, Writing – original draft, Visualization, Validation, Conceptualization. **JV Cordeiro:** Writing – review & editing, Writing – original draft, Validation. **G. Victorino:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology.

Ethical considerations

As this study involves secondary analysis of published literature and does not involve human subjects or animal studies, formal ethical approval was not required. Efforts to minimize bias included independent and blinded screening by multiple reviewers. All procedures followed established academic standards, and all data were extracted and reported with a strong commitment to transparency, accuracy, and integrity, ensuring faithful representation of the original sources.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used a Large Language Model (ChatGPT-4o) to assist with grammar and language editing of the manuscript. The tool was used under author supervision and did not contribute to the generation of content. The authors declare that the manuscript content is entirely original and take full responsibility for the integrity and accuracy of the final text.

Authorship contribution

ASC contributed to the study design, selection process, data extraction, conducting and verifying the thematic analysis, interpreting the results of the thematic analysis, and to drafting the article.

JVC contributed to the study design, selection process, quality assessment of the included studies, verification and validation of the results of the thematic analysis, interpretation of the thematic analysis, and to drafting the article.

GV contributed to the study design, selection process, quality assessment of the included studies, verification and validation of the

results of the thematic analysis, interpretation of the thematic analysis, and to drafting the article.

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Declaration of Competing Interest

The authors have no conflicts of interest to declare.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.joitmc.2026.100742.

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