

RESEARCH ARTICLE

A critical review of status quo and future directions of owner dynamic capabilities: Dimensions and key factors

Zidan Tian¹ , Ting Wang² and Qinghua He¹

¹School of Economics and Management, Research Institute of Complex Engineer & Management, Tongji University, Shanghai, China and ²College of Urban Construction and Safety Engineering, Shanghai Institute of Technology, Shanghai, China

Corresponding author: Ting Wang; Email: pauline_wt@163.com

(Received 17 November 2022; revised 28 July 2023; accepted 11 September 2023)

Abstract

Existing studies agree that owner dynamic capabilities are crucial in dynamic environments. Based on a systematic literature review of 44 research with CiteSpace and the content analysis method, this study aims to elucidate the dimensions and key factors of owner dynamic capabilities. Owner dynamic capabilities are studied in the context of a construction project due to their resource-constrained, goal-urgent, and uncertainty characteristics. Cognition capabilities, resilient change management capabilities, integrated organization capabilities, and strategic innovation capabilities are identified as the dimensions. Critical factors have also been analyzed at different levels. This study proposes a discriminatory framework of owner dynamic capabilities that combined organizational ambidexterity and resilience. Moreover, this study contributes to the clarification of the concept of owner dynamic capabilities and the enrichment of their knowledge hierarchy. Practitioners can track the main contradictions that owners are currently facing against the actual situation and seek strategies.

Keywords: owner dynamic capabilities; dimensions; critical factors; construction projects; organizational ambidexterity

Introduction

In recent years, dynamic capability theory has been recognized as a highly promising theoretical framework in the study of firm competitive advantage and project management (Arndt, 2019; Teece, 2012). Dynamic capabilities originate from the resource-based view, and they are closely linked to the external environment and embedded within the organization (Helfat & Martin, 2015). Eisenhardt and Martin (2000) viewed dynamic capabilities as a higher-order capability that focuses on improving organizational processes and routines rather than being directly related to performance. In this lens, the owner dynamic capabilities within the project scope are gradually converging. Cha, Newman, and Winch (2015) defined owner dynamic capabilities as those required by a project owner to originate, execute, and wind down an investment project.

The novel discussion of owner dynamic capabilities is introduced by the unique role of the owner and project uncertainty (Stordy, Zerjav, & Kanjanabootra, 2021; Winch & Cha, 2020). The owner, whether public or private, is the procurer and the actor that drives project initiation, renovation, and governance (Eriksson & Laan, 2007). Owners have the overall responsibility and authority to cope with the shocks and pressures of dynamic environments (Adam & Lindahl, 2017). Owners should play a key role in shaping the project process and the final product (Lindblad & Gustavsson, 2021), and their active role in promoting innovation and resilience is particularly prominent (Havenvid, Hulthén, Linné, & Sundquist, 2016). Dynamic capability theory emphasizes the

importance of developing ‘higher-order’ capabilities that enable organizations to respond quickly to opportunities and challenges (Teece, 2007). The challenge is particularly daunting for project owners who govern temporary organizations. Owners must exercise dynamic capabilities to reconfigure resource allocation, improve organizational routines, and train organizational resilience in an environment of coupled uncertainty and complexity (Eisenhardt & Martin, 2000; Khan, Farooq, & Rasheed, 2019; Prange, Bruyaka, & Marmenout, 2018). Scholars have combined resilience-based perspectives and dynamic capabilities to answer the endogenous question of how owners respond to uncertainty (Yang & Smyrnios, 2018). Davies and Brady (2016) proposed that owners can respond flexibly to varying degrees of uncertainty by developing dynamic capabilities and identified the process by which owners develop, collate, and mobilize dynamic capabilities to increase organizational resilience. Winch and Leiringer (2016) focused their study on infrastructure development and defined the owner project capability as the dynamic capability required by owner organizations to acquire infrastructure assets. They categorized owner dynamic capabilities from a process perspective as strategy capabilities, commercial capabilities, and governance capabilities. Therefore, Gulino, Sergeeva, and Winch (2020) extended the owner dynamic capability framework to the project life cycle based on case studies. Previous studies have concentrated on owner dynamic capabilities to explain improvement strategies for temporary organizational resilience and deal with uncertainty effectively; however, universal answers are still lacking (Gann, Davies, & Dodgson, 2017; Leiringer & Zhang, 2021). Most of these studies use regional cases to find empirical evidence for their arguments (Cha, Newman, & Winch, 2015; Gulino, Sergeeva, & Winch, 2020; Maytorena-Sanchez & Winch, 2022). The objects and focus of the studies vary widely, and the theories developed are scattered and unsystematic (Stordy, Zerjav, & Kanjanabootra, 2021; Winch & Cha, 2020).

This study provides a review of existing research involving owner dynamic capabilities and identifies and conceptualizes a framework of dimensions and key factors to address the aforementioned gap. This study selects the literature in the field of construction projects as a data source. The resource-constrained, multi-stage, and target-immediate context of construction projects leads to the considerable influence of owners, making the owner dynamic capabilities more challenging in some construction projects than others (Manley, 2006). Particularly, three significant objectives are stipulated: (1) to identify the dimensions of owner dynamic capabilities in construction projects, (2) to summarize and analyze the influencing factors of owner dynamic capabilities in construction projects, (3) to develop a discriminatory framework of owner dynamic capabilities in construction projects and further propose research trends in a broad context. Through the identification and analysis of dimensions and influencing factors, this study can present a systematic explanation of owner dynamic capabilities in construction projects and enhance the capability framework for owner organization and organizational resilience research. In addition, this study provides a valuable reference for comprehending the research statutes of owner dynamic capabilities. Moreover, the study can guide owners to track the major problems and seek strategies for improving owner dynamic capabilities.

The following section will provide a brief overview of the theoretical perspective of owner dynamic capability research. In the next section, the methodology used in the study is presented, followed by an analysis and discussion based on the dimensions, influencing factors of owner dynamic capability. Finally, the conclusions, limitations, and future research directions are provided.

Theoretical background

Dynamic capabilities and project owner research

Capability is distinguished from competency and leadership, which are concepts of skills and knowledge accumulated by individuals (Le Deist & Winterton, 2005; Sankaran, 2018). Teece, Pisano, and Shuen (1997) defined dynamic capability as the ability to integrate, build, and reconfigure the firm’s internal and external technologies and resources to adapt to the changing external environment. Eisenhardt and Martin (2000) argued that dynamic capabilities focused on improving organizational processes and strategic routines. Numerous studies have begun to discuss the challenges and

management issues that organizations encounter with uncertainty and ambiguity from a dynamic capability perspective. Melkonian and Picq (2011) proposed to approach the building processes of capabilities as a dynamic and multilevel course to strengthen project-based organizations in inconsistency, chaos, struggle for resources, and lack of coordination. Lobo and Whyte (2017) argued that aligning and reconciling capabilities is critical for organizations to deal with conditions of rapid technological change and high interdependence across heterogeneous organizations. The theoretical foundations of dynamic capabilities are also the main theoretical basis of this study, which guide the identification and analysis of the literature in this study. The theoretical foundations are the resource-based view, evolutionary economics theory, and knowledge-based view (Barney, 1991; Grant & Baden-Fuller, 2004; Leiringer & Zhang, 2021). Therefore, several scholars have explored the micro-foundations, factors, and application contexts of dynamic capabilities, combining dynamic capability theory with additional contemporary contexts to study numerous black box issues in project and organization management (Baía & Ferreira, 2019; Cristofaro & Lovallo, 2022; Jiao, Jifeng, & Ying, 2021).

Some studies use the key role of the project owner as an entry point to discuss the dynamic capabilities of owners (Winch & Leiringer, 2016; Zwikael, Meredith, & Smyrk, 2019). In construction projects, the owner is an organizational entity that raises project funds, defines specific objectives for project assets, manages the temporary project organization that delivers the assets, establishes business relationships with suppliers and contractors, and then realizes the benefits of the project through operations (Maytorena-Sanchez & Winch, 2022). Zwikael, Meredith, and Smyrk (2019) argued that the owner is responsible for project delivery and benefits realization in unstable and dynamic environments. The attributes and qualities of the owner as a resource integrator and primary decision-maker are crucial to improving the resilience of the entire temporary organization (Pavez, Gómez, Laulié, & González, 2021; Winch & Cha, 2020). Particularly, owners have the typical characteristics of organizational ambidexterity, which means that an organization achieves consistency and adaptability simultaneously (Gibson & Birkinshaw, 2004). The participation of owner in both exploitation (conformity-oriented) and exploration (adaptability-oriented) is conducive to the balance between stability and change (Adam, Lindahl, & Leiringer, 2020; O'Reilly & Tushman, 2008). Extending this line of thinking, several studies have closely aligned owners with dynamic capability theory (Gann, Davies, & Dodgson, 2017; Winch & Leiringer, 2016). In complex and changing missions, owners must exercise organizational ambidexterity and develop multidimensional dynamic capabilities to improve organizational resilience.

Owner dynamic capabilities: A theoretical lens of temporary organizational resilience

From the capability perspective, organizational resilience is interpreted as the ability to anticipate, recover, and adapt to systemic change under a variety of conditions (Yang, Wang, Zhu, & Müller, 2022). Owner dynamic capabilities are defined as the dynamic capabilities required by owners to initiate adaptively, execute, and close investment projects and realize project benefits in uncertainty (Davies & Brady, 2016; Winch & Leiringer, 2016). Owner dynamic capabilities can enhance the collective construct of temporary organizations and increase resource availability and recovery efficiency, thus significantly improving organizational resilience (Stordy, Zerjav, & Kanjanabootra, 2021). Therefore, owner dynamic capabilities can be used as a theoretical lens of temporary organizational resilience, further explaining how resilience can be regarded as the ability to anticipate adversity, absorb stress, and overcome crises (Rodríguez-Sánchez, Guinot, Chiva, & López-Cabrales, 2021; Wang, Geng, Dang, & Zhang, 2022).

Compared to dynamic managerial capabilities, owner dynamic capabilities must mobilize a broader range of interorganizational resources to address the challenges of coupling uncertainty and complexity (Helfat & Martin, 2015; Winch & Cha, 2020). Specifically, owner dynamic capabilities must ensure the prompt recovery, adaptation, and smooth delivery of the project when faced with unexpected crises and stress (Grabher, 2002). Xia and Chan (2010) identified six key competencies

of design-build owners, which mainly include scope management, contract management, and stakeholder collaboration. Winch and Leiringer (2016) and Gulino, Sergeeva, and Winch (2020) deconstructed the owner dynamic capabilities as strategic capabilities, commercial capabilities, governance capabilities, and transformational capabilities from a process theory perspective. Lindblad and Gustavsson (2021) illustrated the important role of the absorptive capability of owners in driving industry change and innovation. Maytorena-Sanchez and Winch (2022) described owner dynamic capabilities as articulating the voice of the customer and operations, demonstrating a value-driven mindset, creating and managing complex systems, and recruiting, building, and retaining talent. Furthermore, as the initiator of the project, the owner pursues growth rather than a competitive advantage (Winch & Leiringer, 2016). Owner dynamic capabilities should improve temporary organizational resilience and focus on the efficient transformation of resources and the benefits of project implementation (Cha, Newman, & Winch, 2015; Winch & Leiringer, 2016). Although previous studies have shown a strong interest in owner dynamic capabilities, the identification of dimensions is complex, and the deep issues behind these dimensions are simplistic. Owner dynamic capabilities are loosely identified, and relevant articles are typically based on regional data or cases, with minimal knowledge accumulation and generalization between studies (Leiringer & Zhang, 2021).

Research methods

The authors conducted a systematic literature review of owner dynamic capabilities in construction projects, which was divided into two phases, as shown in Figure 1. The authors retrieved and screened the literature related to owner dynamic capabilities of construction projects as the database for the literature analysis. The bibliometric analysis and deductive content analysis were developed to identify the dimensions and key factors of owner dynamic capabilities. The two phases are detailed next.

Data collection

The literature related to owner dynamic capabilities in construction projects was explored in two authoritative databases, namely Scopus and Web of Science, to collect data scientifically and efficiently. The two databases cover a wider journal range and are readily updated not only with printed literature but also with early versions before print publication (Falagas, Pitsouni, Malietzis, & Pappas, 2008). Based on the definition of the owner dynamic capabilities in the previous section and the study scope of construction projects, the search rules employed in the title/abstract/keyword field of the selected database were as follows: ((TS = (owner* OR client*)) AND (TS = (dynamic AND (capabilit* OR competenc* OR abilit* OR capacit*))) AND (TS = (construction* OR 'infrastructure*' OR 'civil engineering project*'))). This study used the term 'owner' to denote its large business responsibility, but the term 'client' often refers to the same role that focuses on the contractual relationship (Cha, Newman, & Winch, 2015). Therefore, both keywords were considered in the search rules. The selection of synonyms in the keywords referred to the relevant literature, such as Oppong, Chan, and Dansoh (2017) and Xia, Chen, Xie, and Liu (2018). The dynamic capability theory formally appeared in authoritative journals in 1997 and gradually permeated the project management field (Teece, Pisano, & Shuen, 1997). Therefore, potentially relevant articles were searched in the specified databases with a time frame of January 1997 to May 2022. Only peer-reviewed articles were considered for the current study. At this stage, 185 articles were retrieved from the Scopus database and 368 articles from the Web of Science database. A total of 123 duplicates were then removed from the two databases. The authors performed two rounds of article filtering by reading the abstracts and content. In the first round of filtering, 213 articles whose abstracts did not mention concepts related to the owner dynamic capabilities were excluded. In the second round of filtering, articles that satisfied at least one of the following criteria were retained: (1) described adaptive activities or capabilities that should be available to the owner under dynamic environments and (2) discussed the factors relevant to these activities or capabilities. The two authors independently evaluated the eligibility of the articles

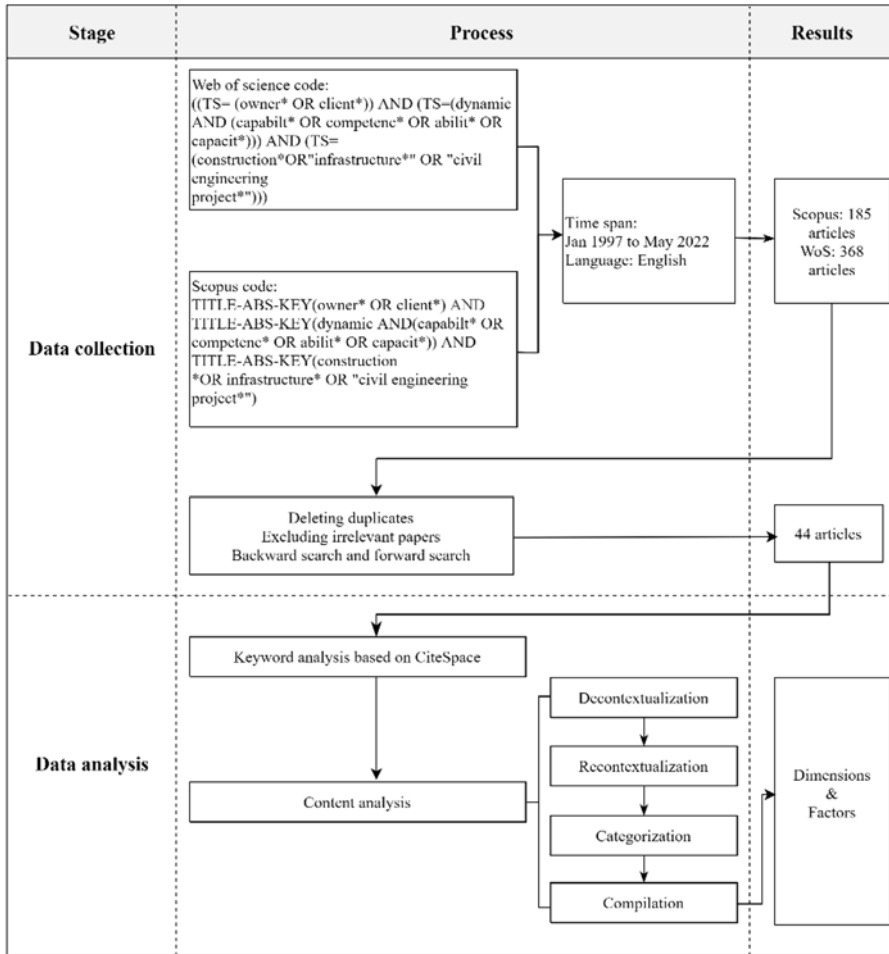


Figure 1. An overview of the literature search and review process.

to ensure the accuracy of filtering and conducted discussion until a consensus was reached. A total of 42 articles were retained after filtering. Moreover, backward and forward searches were conducted in accordance with the remaining articles (Webster & Watson, 2002). Finally, 44 articles were selected as the target literature for this study.

Data analysis

Following the data collection of relevant articles, the 44 articles were then imported into CiteSpace for bibliometric analysis, which can provide a holistic view of research trends and hotspots. CiteSpace analyzes key data of literature through network modeling and systematically presents the knowledge landscape of specific knowledge areas, offering significant advantages in dissecting research frontiers and visualizing data (Chen, 2014). Among them, keyword co-occurrence analysis aims to evaluate the high-frequency keywords in the literature database, which can often find the research hotspots in this field (Chen, 2014). Keyword emergence analysis focuses on analyzing the Citation Bursts that have been widely cited in a short period, which can imply the current research status and hotspots (Kleinberg, 2003).

The content analysis was conducted to explore the theoretical research process of owner dynamic capabilities and then identify and analyze the dimensions and key factors. Content analysis is not

Table 1. Codebook for content analysis

Code	Explanation of code
Article title	Title of the article
Authors	Author list of the article
Year	Year of publication
Journal	Journal in which the article published
Dimensions	Dimensions of owner dynamic capabilities
Key factors	Key factors of owner dynamic capabilities

Table 2. Example of the content analysis process

Decontextualization	Recontextualization	Categorization	Compilation
D6 Owners lack a holistic understanding of project risks	R6 holistic understanding of project risk	C1 Comprehensive and systematic visions of the whole project	Cognition capabilities
...	...		
D59 The most important actions to promote sustainable building are the development of the awareness of clients about the benefits of sustainable building	R59 Restructuring of the organization's internal management system	C2 Anticipating difficulties while perceiving potential opportunities	
D105 Understanding operational difficulties by the owner engineer, thereby taking appropriate decisions	R105 Understanding operational difficulties		
...	...		
D172 Client had a precise understanding of the opportunities of D&B project before it was submitted to the contractor	R172 A precise understanding of the opportunities	C3 Understanding their own and stakeholders' demands	
D58 Clients' capabilities to manage their requirements. The client was capable of comparing the proposed concept with his requirement baseline and identifying flaws in the design	R58 Managing the owner's own requirements		
...	...		
D99 Clear and effective project communication to all stakeholders involved, primarily to users, helps to understand the demands of all stakeholders and to establish a user-driven mindset	R99 Understanding the demands of all stakeholders	C4 Conveying the project vision and unifying the advanced values continuously	
D27 The owner had advanced environmental and legal awareness and adopted a combination of legal, engineering, and management measures ... thus successfully achieving the dual objectives of building the HZMB project and protecting the Chinese White Dolphins	R27 Advanced environmental and legal awareness		
...	...		
D52 Clients should also be ready to impart project vision consistently throughout the construction duration to foster a sense of 'affinity' among the stakeholders' competence in technical and managerial skills	R52 Imparting project vision consistently		

conducted linearly; thus, it is less standardized and formulaic compared with quantitative analysis (Polit & Beck, 2004). A qualitative and inductive content analysis was used in this study due to insufficient prior knowledge of owner dynamic capabilities and fragmented current understanding (Winch & Leiringer, 2016). Qualitative content analysis is based on valid inferences and interpretations that gradually condense the raw data into categories or themes (Zhang & Wildemuth, 2016). The authors used inductive reasoning to derive themes and categories from the data through careful examination and constant comparison. Content analysis methods operationally follow specific analysis and data conceptualization steps (Bengtsson, 2016). This study follows four main stages outlined by Bengtsson (2016): the decontextualization of the analysis unit, the recontextualization, the categorization, and the compilation.

The three authors agreed on a coding framework based on the purpose of the study, as shown in Table 1. In the decontextualization stage, the authors read the text repeatedly and understood the data as a whole before scientifically and informedly breaking it down into small meaning units. The authors identified and coded the meaning units that describe the dimensions and influencing factors separately. In the recontextualization stage, the authors checked whether the coded meaning units covered all aspects relevant to the purpose of the study. The meaning units were reread along with the original data, and their meanings were appropriately simplified to ensure that the original data were adequately analyzed and captured (Bengtsson, 2016). Additional irrelevant data were eliminated. In the categorization stage, themes and categories were identified from the coded meaning units, which are the essence of the raw data and must be supported by the literature or theoretical basis (Dey, 2003). In the compilation phase, the author developed an analysis and report to further manifest the identified themes and categories and narrate and summarize them using the visible and obvious (Berg, Lune, & Lune, 2012). The raw data were analyzed and coded by two authors separately to reduce inherent subjectivity and potential discrepancies and to ensure the credibility and reliability of the study. Differences in judgments were compared, and opinions were discussed until a consensus was reached. Table 2 shows the decontextualization, recontextualization, categorization, and compilation of some of the data for the cognition capabilities dimension, illustrating the exact process of content analysis.

Analysis

Bibliometric analysis of literature keywords

The author runs CiteSpace 6.1.R6 to obtain the keyword co-occurrence map and keyword emergence of the target literature from 1997 to 2022 to improve the validity of the results. As shown in Figure 2, the top five keywords of centrality are 'project management', 'construction industry', 'dynamic capability', 'critical success factor', and 'performance', which are consistent with the subject of the literature retrieved in this study. More importantly, keywords such as 'decision-making', 'organizational capability', 'project capability', and 'systems integration' also occur with high centrality. This occurrence indicates the enthusiasm and attention of scholars in the research of these concepts and also confirms the significance of owner dynamic capabilities in construction project research from another perspective. Citation Bursts were identified by examining the temporal distribution of keywords and detecting emergent words with high-frequency change and fast growth rate to further dissect research trends. As shown in Figure 3, 'critical success factors' and 'construction industry' began to emerge in 2004 and 2006, respectively, and they are the two keywords that emerged early as traditional research fields. In addition, 'dynamic capability' and 'client' have been a concern for scholars since 2017. Among them, the emergent strength of 'dynamic capability' reaches 1.31, which indicates that this field has received extensive attention and has become a popular topic. Overall, the bibliometric analysis intuitively validates the emphasis and extensive focus of the 44 pieces of literature on owner dynamic capabilities. Co-occurring keywords and Citation Bursts provide multiple theoretical lenses for the content analysis of the literature, which served as the rationale and basis for the qualitative analysis.



Figure 2. Keyword co-occurrence map of owner dynamic capability research in construction projects.

Keywords	Year	Strength	Begin	End	2001 - 2022
critical success factor	2004	0.69	2004	2006	[Timeline bar with red burst from 2004 to 2006]
construction industry	2004	1.24	2006	2013	[Timeline bar with red burst from 2006 to 2013]
green building	2007	1.09	2007	2011	[Timeline bar with red burst from 2007 to 2011]
factor analysis	2011	0.84	2011	2015	[Timeline bar with red burst from 2011 to 2015]
construction project	2011	0.74	2011	2013	[Timeline bar with red burst from 2011 to 2013]
innovation	2006	0.65	2013	2016	[Timeline bar with red burst from 2013 to 2016]
systems integration	2016	1.57	2016	2018	[Timeline bar with red burst from 2016 to 2018]
model	2006	0.73	2016	2017	[Timeline bar with red burst from 2016 to 2017]
contractor	2017	1.02	2017	2019	[Timeline bar with red burst from 2017 to 2019]
public sector	2006	0.83	2017	2019	[Timeline bar with red burst from 2017 to 2019]
construction planning	2017	0.81	2017	2020	[Timeline bar with red burst from 2017 to 2020]
dynamic capability	2012	1.31	2017	2019	[Timeline bar with red burst from 2017 to 2019]
client	2007	0.46	2017	2019	[Timeline bar with red burst from 2017 to 2019]
narrative	2018	1.19	2018	2019	[Timeline bar with red burst from 2018 to 2019]
collaboration	2019	1	2019	2020	[Timeline bar with red burst from 2019 to 2020]
overrun	2020	1.01	2020	2022	[Timeline bar with red burst from 2020 to 2022]

Figure 3. A summary list of references with strongest Citation Bursts.

Dimensions of owner dynamic capabilities

After a holistic approach, four dimensions of owner dynamic capabilities are identified through content analysis, as shown in Table 3 and Figure 4.

Table 3. Findings from studies on the dimensions of owner dynamic capabilities

Dimensions	Indicators	References
Cognition capabilities	Comprehensive and systematic visions of the whole project	Adam and Lindahl (2017); Zerjav et al. (2018)
	Conveying the project vision and unifying the advanced values continuously	Winch and Cha (2020); Mulholland et al. (2020); Maytorena-Sanchez and Winch (2022)
	Anticipating difficulties while perceiving potential opportunities	Yong and Mustafa (2013); Adam and Lindahl (2017); Adner and Helfat (2003); Laamanen and Wallin (2009)
	Understanding their own and stakeholders' demands	Forgues, Koskela, and Lejeune (2007); Maytorena-Sanchez and Winch (2022)
Resilient change management capabilities	Adaptive adjustment of expectations in equivocality environment	Yong and Mustafa (2013); Sinesilassie et al. (2019)
	Continuous involvement to enable timely decision-making	Iyer and Jha (2006)
	Responding to local conditions in cross-regional context	Bonham (2013)
	Leading, driving, and encouraging change	Bonham (2013); Lindblad and Gustavsson (2021); Gulino, Sergeeva, and Winch (2020); Ludvig, Stenberg, and Gluch (2013)
	Financial stability and assessing the economic feasibility	Garvin and Cheah (2004)
Integrated organization capabilities	Establishing and maintaining an open and collaborative environment	Bonham (2013); Adam and Lindahl (2017)
	Maintaining trust and rapport between participant	Gulino, Sergeeva, and Winch, (2020); Yong and Mustafa (2013)
	Maintaining alliance mindset for risk allocation and responsibility delegation	Anand, Oriani, and Vassolo (2010); Hu, Chan, and Le (2015); Wen, Qiang and An (2017)
	Extensive communication skills and comprehensive communication platform	Ludvig, Stenberg, and Gluch (2013)
	Maintaining close communication and feedback with all stakeholders	Levander et al. (2011)
Strategic innovation capabilities	Adequate and professional knowledge and skills	Davies et al. (2014); Dodgson et al. (2015)
	Improving continually and transferring knowledge continuously	Yong and Mustafa (2013)
	Obtaining and orchestrating scarce and valuable resources	Wang, Tang, and Li (2013)
	Investing in and contributing to research projects and talent development	Maytorena-Sanchez and Winch (2022)

Cognition capabilities

As a project investor and purchaser of project delivery services, the owner typically plays a fundamental role in the success of the project (Hui, Davis-Blake, & Broschak, 2008). Simultaneously, the owner is also a role model in the project and should coordinate the strategic management of the project organization from the perspective of values establishment and maintenance (Lindblad & Gustavsson, 2021). Walsh (1995) believed that management cognition capability is the belief and psychological basis for decision-making, which includes perception, attention, and logical reasoning

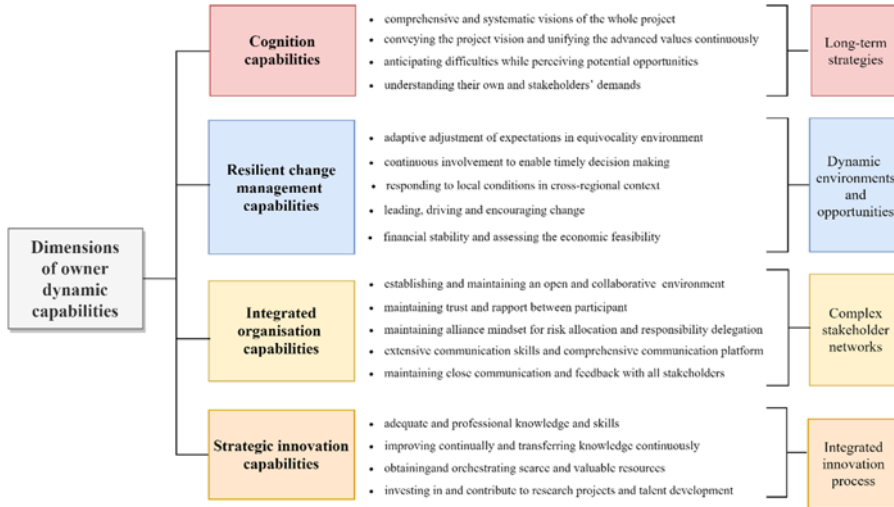


Figure 4. Dimensions of owner dynamic capabilities.

capability (Helfat & Peteraf, 2005). The cognitive foundation includes awareness of historical experience, anticipation and certainty of future events, and a clear understanding of stakeholder demands (Adner & Helfat, 2003). Therefore, as the project decision-maker, the owner should have outstanding cognition capabilities. The owner should have a comprehensive and systematic vision of the project objectives (Adam & Lindahl, 2017) and a clear understanding of the scope and nature of the work (Zerjav, Edkins, & Davies, 2018). The temporary organization requires multiple coordinated and coherent members, and achieving this group effect requires not only constraints under a rigid institution but also self-discipline under unified values (Mulholland, Chan, Canning, & Ejohwomu, 2020). Therefore, the owners should consider the mission and project vision of each organization from a holistic perspective (Winch & Cha, 2020), while focusing on the realization of business value and social responsibility (Maytorena-Sanchez & Winch, 2022). The project vision should be continuously conveyed to the stakeholders, and owners should continuously export and consolidate the right values of the participants and promote their affinity with the temporary organization (Yong & Mustafa, 2013). In addition, logical and deductive problem-solving thinking is essential for understanding and anticipating difficulties in the project process while perceiving potential opportunities in the project environment (Adam & Lindahl, 2017; Adner & Helfat, 2003), for example, having holistic cognition of project risks and considering the benefits of innovative and sustainable building. Managerial attention and foresight can affect the diversity of resource allocation, which in turn changes the adaptation of the project to the external environment (Laamanen & Wallin, 2009). Moreover, owners should have a clear understanding of their own needs (Forgues, Koskela, & Lejeune, 2007) and anticipate and precisely understand the needs of end users (Maytorena-Sanchez & Winch, 2022). Particularly for owners, differences in cognition capability can lead to different strategic and consequential decisions (Adner & Helfat, 2003).

Resilient change management capabilities

Construction projects encounter diverse and unexpected challenges at different stages of the life cycle (Aaltonen & Kujala, 2010), which are related to the change management of the owner due to the varying levels of involvement of project participants and the dynamic nature of the external environment (Winch & Leiringer, 2016). The dynamic capability theory emphasizes the need to explore, create, or adjust operational routines in uncertain and dynamic environments (Gulino, Sergeeva, & Winch, 2020). Khan, Farooq, and Rasheed (2019) identified organizational

resilience as a dynamic capability that contains serious organizational routines including resilience sensing, resilience seizing, and resilience reconfiguration to deal with threats and opportunities from the external environment. The organizational resilience of the owner is crucial to coping with challenges in uncertain contexts (Hetemi, Gemünden, & Meré, 2020; Levander, Engström, Sardén, & Stehn, 2011), such as unknown technologies, ambiguous stakeholder needs, and dynamic operating environments (Davies, Dodgson, & Gann, 2016). The owner can structure and maintain resilient change management capabilities to face uncertain environmental anomalies and scan potential opportunities from changing market and technological conditions (Khan, Farooq, & Rasheed, 2019; Schilke, Hu, & Helfat, 2018).

Being proactive is an important characteristic of project owners that shapes resilient change management capability, which is necessary for effective owner-participant interaction and is required for trust-based project governance (Hetemi, Gemünden, & Meré, 2020). Resilient change management capabilities involve adaptive adjustment of expectations in an unexpected and equivocal environment (Yong & Mustafa, 2013), proactive monitoring and feedback on projects (Sinesilassie, Tripathi, Tabish, & Jha, 2019), continuous involvement in projects to enable timely decision-making (Iyer & Jha, 2006), and responding to local conditions in cross-regional projects (Bonham, 2013). Meanwhile, the owner should act as a key agent in keeping resilience to lead, drive, and encourage change in dynamic environments (Bonham, 2013; Lindblad & Gustavsson, 2021). In dynamic environments where organizations may need to perform extensive reorganization (Adam & Lindahl, 2017), the organizational resilience of owners is critical to recovery in the face of project adversity (Häkkinen & Belloni, 2011). For example, in long-term projects with multiple parties involved, Ludvig, Stenberg, and Gluch (2013) considered changing organizational structures as an important resilience capability of owners that can 'shake organizational boundaries' and provide an enabling environment for achieving long-term dynamic goals (Gulino, Sergeeva, & Winch, 2020). As the basis for change management, owners should maintain financial stability and assess economic feasibility (Garvin & Cheah, 2004).

Integrated organization capabilities

An integrated organization is a collaborative and integrated approach to solving complex and uncertain challenges by the key participants (Che Ibrahim, Costello, & Wilkinson, 2015). This approach can be viewed as a team of multiple entities, including the owner, consultant, designer, and contractor (Che Ibrahim, Costello, & Wilkinson, 2013). The owner has an important role in the integrated organization as a proactive organizer and coordinator. The owner should be clear that alliance building is necessary and that all participants should be involved early in the project process (Häkkinen & Belloni, 2011). The owner should actively interact effectively with the project participants during the project process to improve the level of network collaboration (Hetemi, Gemünden, & Meré, 2020). They should be able to solve the problems of insufficient motivation and weak trust among members due to the temporary nature of the integrated organization and the uncertainty level of the participants' knowledge (Liu, Yu, Sun, & Yan, 2021). In a temporary organization with members from different professions, the project owner, especially the government owner, should break away from the traditional role of setting and adopting rules and explore new patterns of communication to connect all members involved (Bonham, 2013). The owner should promote rich and efficient communication to improve organizational resilience (Levander et al., 2011).

The integrated organization capabilities include establishing and maintaining an open and collaborative organizational environment (Bonham, 2013), creating and managing alliances to achieve technology catch-up and capability enhancement (Anand, Oriani, & Vassolo, 2010). Owners should change the traditional siloed work culture to an open and inclusive one (Gulino, Sergeeva, & Winch, 2020), be clear about what should be done and by whom (Levander et al., 2011), and facilitate collaboration among all members (Adam & Lindahl, 2017). Owners should maintain organizational trust through ongoing relationship management strategies (Yong & Mustafa, 2013), maintain rapport, and

focus on interorganizational team building and project incentives (Hu, Chan, & Le, 2015). In addition, owners should have the ability to integrate and manage interorganizational relationships with an alliance mindset for risk allocation and responsibility delegation (Wen, Qiang, & An, 2017). Oriented toward building rapport, owners should have extensive communication skills and a comprehensive communication platform, such as formal and informal communications in parallel, thereby establishing a network communication platform and adapting communication style and approach to the situation (Ludvig, Stenberg, & Gluch, 2013). Moreover, owners should maintain close communication and feedback with consultants and experts in different fields (Levander et al., 2011), creating a respectful and non-judgmental environment where project teams trust each other and communicate openly (Gulino, Sergeeva, & Winch, 2020).

Strategic innovation capabilities

Strategic innovation capabilities can help owners address challenges and establish formal innovation processes. The development of an innovation strategy facilitates the planning, coordination, and orchestration of the innovation resources and capabilities of project participants and research institutions considering project community goals (Davies, MacAulay, DeBarro, & Thurston, 2014; Dodgson, Gann, MacAulay, & Davies, 2015). According to the knowledge-based view, both explicit knowledge and tacit knowledge are essential for owners to organize innovative activities. Such knowledge is a prerequisite for effective owner leadership, risk sharing, and relationship governance in the innovation process (Sergeeva, 2020). In addition, owners must continuously improve based on the accumulation of rich experience and focus on the transfer of experience, new management methods, and concepts between organizations (Yong & Mustafa, 2013). Resource reserves and allocations are necessary for the development of strategic innovation capabilities. The uniqueness and complexity of innovation activities often require owners to obtain scarce and valuable resources (Wang, Tang, & Li, 2013) and to match 'bespoke' resource orchestrations to meet innovation needs (Gibb & Isack, 2001).

As shown in Figure 4, the owner dynamic capabilities are divided into four dimensions for multi-faceted project characteristics and contexts. Cognitive capabilities focus on long-term strategies that relate to investment selection and project mission definition (Winch & Leiringer, 2016). Resilient change management capabilities primarily help address dynamic environments and opportunities, such as coping with uncertainty and ambiguity in the financial environment and policy contexts (Gulino, Sergeeva, & Winch, 2020), and scanning competitive opportunities from market-related resources (Danneels, 2016). Integrated organization capabilities are aimed at addressing potential problems of complex stakeholder networks. The heterogeneous and interactive nature of stakeholders determines the central role of owners in stakeholder networks (Adam & Lindahl, 2017). Owner-led alliances and effective communication are key to resolving stakeholder conflicts and increasing the flow of resources, information, and knowledge between organizations (Levander et al., 2011). Strategic innovation capabilities focus on the integrated innovation process, such as knowledge transfer, and strategic resource orchestration (Vu, Cu, Min, & Wang, 2017; Yong & Mustafa, 2013).

Key factors of owner dynamic capabilities

This study identified descriptions of key factors from 15 literature sources and conducted content analysis through a process of decontextualization, recontextualization, categorization, and compilation. Based on classic literature, the factors influencing dynamic capabilities were discussed at the environmental, organizational, and individual levels (e.g. Fainshmidt, Wenger, Pezeshkan, & Mallon, 2019; Jiao, Jifeng, & Ying, 2021; Schilke, Hu, & Helfat, 2018). Ultimately, the key factors of owner dynamic capabilities were classified and compiled into three categories, namely project-level, organizational-level, and individual-level factors. Table 4 shows the key factors of owner dynamic capabilities identified through content analysis. The impact of key factors on owner dynamic capabilities is visualized based on the analysis below, as shown in Figure 5.

Table 4. Findings from studies on the key factors of owner dynamic capabilities

Category	Key factors	References
Project-level factors	External environment	Adam, Lindahl, and Leiringer (2020); Gibb and Isack (2001); Xia and Chan (2010); Zerjav, Edkins, and Davies (2018)
	Institutional logic	Bonham (2013); Gulino, Sergeeva, and Winch (2020); Häkkinen and Belloni (2011); Qiang et al. (2015); Simkoko (1992)
Organizational-level factors	Organizational structure	Ghannoum et al. (2019); Lindblad and Gustavsson (2021); Too (2012)
	Organizational culture	Ghannoum et al. (2019); Zerjav, Edkins, and Davies (2018)
Individual-level factors	Managerial cognition	Dakhil et al. (2019); Forgues, Koskela, and Lejeune (2007); Molenaar et al. (2000)
	Employee creativity	Ghannoum et al. (2019)

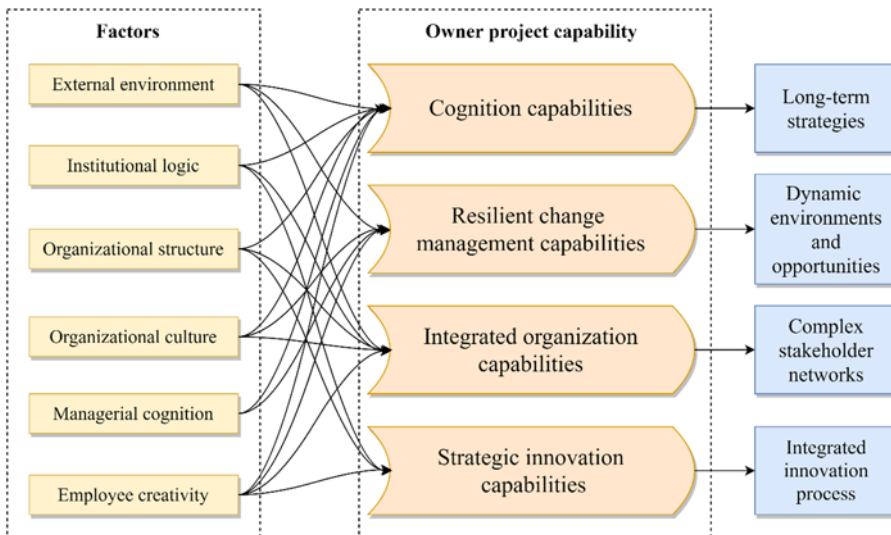


Figure 5. Key factors of owner dynamic capabilities.

Project-level factors

The dynamic level of the project’s external environments (e.g., changes in investment demand, market competition, and the workforce) puts the owner under tremendous pressure, with varying degrees of knock-on effects on each owner dynamic capability (Adam, Lindahl, & Leiringer, 2020). When the external environment is highly dynamic, the facilitating effect on resilient change management capabilities is strong. Simultaneously, this condition will gradually introduce new operation capabilities (Zerjav, Edkins, & Davies, 2018). However, in the short term, rapid changes in the market and competitive environment can weaken the cognition capability of the owner and integrated organization capabilities. Overall, a volatile external environment can facilitate the development of owner dynamic capabilities (Adam, Lindahl, & Leiringer, 2020). In addition, the external market environment, including industry technology innovation, the level of economic development, and competitive changes in the industry, are key influencing factors in the development of the owner dynamic capabilities (Xia & Chan, 2010). Changes in the characteristics of the market environment cause turbulence in the owner’s business area, and the owner must improve dynamic capabilities to enhance competitiveness and develop new markets (Gibb & Isack, 2001). Owners need to improve their perception

of opportunities and reallocate resources to cope with the capability gap, which will lead to the improvement and innovation of other owner dynamic capabilities.

Institutional logic refers to the rules, policies, social culture, and belief systems that play a leading role in the behavior of subjects in the organizational field (Friedland, 2014). The institutional context sets the stage for innovation and professional role development for owners, and the institutional logic may directly affect the mission and organizational systems of the owner (Bonham, 2013). On the one hand, mature institutional logic can shape owner dynamic capabilities. Through the constraints of formal institutions such as laws and regulations, as well as the incentives of informal institutions such as social norms and local culture, owners have a highly comprehensive understanding of project success and value, and their sense of responsibility and mission is also high (Gulino, Sergeeva, & Winch, 2020). On the other hand, the complexity of institutional logic affects the accumulation and development of owner dynamic capabilities (Lindblad & Gustavsson, 2021). In the absence of market pull, promotion and institutional incentives by government authorities play an important role in building owner dynamic capabilities (Häkkinen & Belloni, 2011). Simultaneously, the local institutional logic and participation level have a significant influence on the development of owner dynamic capabilities (Gadisa & Zhou, 2020). The low adaptability of the owner in the relatively unfamiliar local field and the tightening of relevant policies and regulations may lead to the degradation of its integrated organization capabilities and even strategic innovation capabilities.

Organizational-level factors

Organizational structure is a critical factor. Within the organization, strong links between different areas of expertise are an important basis for maintaining organizational ambidexterity, and exploitation and exploration based on a sound organizational structure can contribute to the owner dynamic capabilities (Adam, Lindahl, & Leiringer, 2020). Conversely, for example, interorganizational segmentation is a structural barrier to the development of cognition capabilities of owners (Lindblad & Gustavsson, 2021). Among multiple participants, the organizational structure affects the owner's perception of value. The types of values among the participants, the power owned and utilized by the owner, and the distribution of responsibilities in the organization directly affect the cognition capabilities of owners (Ghannoum, Antar, Daoud, & Hamzeh, 2019). Social integration mechanisms are the basis for building systematic interorganizational structures and developing and exercising integrated organization capabilities. The lack of social integration mechanisms is an enormous obstacle for owners to absorb external knowledge (Lindblad & Gustavsson, 2021). Similarly, owner dynamic capabilities are influenced by the reduced integration between technology and personnel due to poor organizational structure (Too, 2012).

Organizational culture provides flexibility drivers for organizations, and owners with cultural strengths can accumulate good dynamic capabilities over time. For example, Zerjav, Edkins, and Davies (2018) indicated that the long-standing goal of reducing uncertainty in the organizational culture helps in the reconfiguration of owner dynamic capabilities in the transition phase. In some cases, a poor culture of entrenched collectivist thinking, resistance to change, and excessive focus on short-term goals within the organization is a significant impediment to the development of the owner's resilient change management capabilities, integrated organization capabilities, and cognition capabilities (Ghannoum et al., 2019).

Individual-level factors

Managers of owner units exercise control over the resources of their departments and make key decisions, and differences in the perceptions of individual managers will lead to different strategic decisions and outcomes (Helfat & Peteraf, 2015). Differences in managers' perceptions of the project and the owner's role exist affecting the construction of the owner dynamic capabilities, and the attention and foresight of managers influence the diversity of resource allocations, which in turn

continuously adjust the owner dynamic capabilities (Forgues, Koskela, & Lejeune, 2007; Too, 2012). In addition, managerial experience at the individual-level affects knowledge-based human, social, and organizational capital at the organizational level. For example, the managerial experience can contribute to team cohesion through experience sharing, to interpersonal interaction, and thus to the cognition capabilities of owners (Lindblad & Gustavsson, 2021). Cognitive inertia is a psychological characteristic developed by managers after a long period of directed thinking, which manifests itself as reliance on subjective assumptions and assertions (Kozhevnikov, 2007). Cognitive inertia can lead managers to ignore changes in the external environment, which in turn reduces the cognition capabilities of owners and resilient change management capabilities, and inhibits the owner dynamic capabilities from contributing to project success (Forgues, Koskela, & Lejeune, 2007). Continued cognitive inertia generates organizational rigidity in core capabilities, stagnating or even degrading the overall owner dynamic capability development (Heffernan, 2003).

Employee creativity is a personal attribute characteristic at the individual level, and the impact of sustainability and solidity of the personal attribute characteristic on dynamic capabilities is outstanding (Teece, 2012). Change within the organization of an owner is experiential, and much of the dynamism comes from employee creativity (Ghannoum et al., 2019). Encouraging employee empowerment and motivating employees to feel, think, and act creatively in performing tasks will provide improvements in the owner's overall way of operating and enhance the adaptability of the owner dynamic capabilities (Ghannoum et al., 2019; Salvato & Vassolo, 2018).

Discussion

Discrimination of multidimensional owner dynamic capabilities

In the dynamic external environment and complex institutional logic, owner dynamic capabilities are an important element in achieving the balance between stability and change, thus improving organizational resilience (Davies & Brady, 2016). Specifically, projects comprise predictable, standardized practices, as well as innovative but uncertain processes that are applied for the first time (Zerjav, Edkins, & Davies, 2018). Some examples show that project participants are cautious when introducing innovative activities; thus, owners must have the capability to combine simple routine procedure with organizational resilience improvement (Davies et al., 2014). At the organizational level, owners must maintain good organizational structure and culture to develop owner dynamic capabilities, which contribute to seeking a balance between exploitation and exploration (Gulino, Sergeeva, & Winch, 2020). Based on the above discussion, the owner dynamic capabilities identified in this study can be discriminated considering project and organizational levels, as shown in Figure 6. Cognition capabilities are the ability to reduce uncertainty and standardize routines and decisions based on available resources, information, and knowledge, thereby maintaining project activities within cognitive limits (Durán & Aguado, 2022). In an uncertain environment, owners exercise resilient change management capabilities to build and maintain a range of organizational routines to lead, drive, and encourage change and identify challenges and opportunities from changing market and technological conditions (Khan, Farooq, & Rasheed, 2019). Integrated organization and strategic innovation capabilities play a considerable role in the orientation of the promotion of innovative activities. Of these, integrated organization capabilities are highly oriented toward exploitation, integrating and orchestrating the resources available in the participating organizations to increase the certainty and efficiency of innovative activities. By contrast, strategic innovation capabilities focus on exploration and development, actively addressing challenges and developing formal innovation processes to support the successful delivery of projects (Davies et al., 2014; Dodgson et al., 2015). In addition, the dotted lines in Figure 6 indicate that the various dimensions of owner dynamic capabilities do not simply correspond to related activities but that multiple capabilities work in tandem. The discrimination can explain the balancing effect of the owner dynamic capabilities on efficiency and resilience from a multidimensional perspective. Thus, this finding further confirms the view of owner dynamic

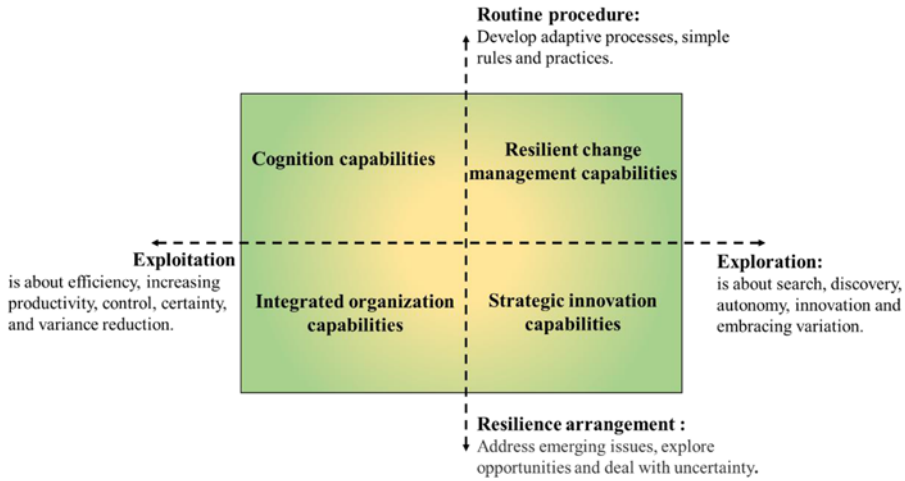


Figure 6. Discrimination of owner dynamic capabilities.

capabilities as a theoretical lens of organizational resilience and lends additional clarity to the concept of owner dynamic capabilities.

Constructing a dual micro-foundation of cognitive and non-cognitive for owner dynamic capabilities

The findings on the dimensions and factors of owner dynamic capabilities provide an opportunity to further discuss their internal mechanisms based on a theoretical perspective. While discussing the necessary dynamic capabilities that owners must possess, the foundations that generate and develop owner dynamic capabilities are also worth exploring. The micro-foundations of dynamic capabilities are gradually comprehensively explored. Unique skills, decisions, principles, and processes are usually embedded within the organization and are the micro-foundation of dynamic capabilities (Helfat & Peteraf, 2009). The capability hierarchy perspective treats capabilities related to resources, routines, and processes as zero-level capabilities (Schilke, Hu, & Helfat, 2018; Winter, 2003), while additional root-level foundation must be explored. For example, strategic planning (Araújo, Kato, & Del Corso, 2022), managerial cognition (Durán & Aguado, 2022), and information sources (Markovich, Raban & Efrat, 2022) are proposed and discussed from different perspectives. Based on the review of the relevant literature, existing cognitive and non-cognitive elements can be regarded as the micro-foundations of owner dynamic capabilities. Cognition capabilities are identified as important owner dynamic capabilities, and managerial cognition is an individual-level factor that influences owner dynamic capabilities (Durán & Aguado, 2022). At the micro-level, cognition is the ability of individuals to perform one or more mental activities that constitute stable thinking, such as paradoxical cognition, problem-solving logic, and reasoning thinking (Adner & Helfat, 2003). Cognitive micro-foundations have two processes, one is spontaneous processing and the other is rational construction (Jiao, Jifeng, & Ying, 2021). Specifically, owners maintain mechanisms and routines for identifying external opportunities and threats, and organizational experience and rationality can help interpret the information communicated by the external environment (Winch & Cha, 2020). Cognitive processes must take place frequently in the owner organization due to critical decisions. These processes are the primary prerequisite for owners to master new technologies, seize opportunities, redeploy resources, improve strategic agility, and achieve rapid innovation and responsiveness (Sirmon & Hitt, 2009). Therefore, cognitive micro-foundations are an important source of owner dynamic capabilities and are motivational drivers of capability creation and enhancement.

By contrast, non-cognitive is unconscious, unprocessed behavior without abstract analysis and processing. Non-cognitive micro-foundations are derived from the historical view of the organization and prior accumulated experience (Sirmon & Hitt, 2009). In owner organizations, the non-cognitive micro-foundation manifests itself in the organization's empirical sensitivity, decision propensity, and intra-organizational habits. It is a solid foundation for the requirement of cognition capabilities and resilient change management capabilities in a dynamic and complex environment. Overall, cognitive and non-cognitive micro-foundations provide owners with clarity on the importance of dynamic capabilities, while maintaining positive and sustainable development of their dynamic capabilities.

Conclusions and future research

This study explores the dimensions and key factors of owner dynamic capabilities through a systematic literature review of 44 journal articles. The bibliometric analysis of the 44 articles shows a broad research interest in the area of owner dynamic capabilities, but previous research was siloed and fragmented. A qualitative and inductive content analysis revealed that owner dynamic capabilities can be divided into the following four dimensions: cognition capabilities, resilient change management capabilities, integrated organization capabilities, and strategic innovation capabilities. These owner dynamic capabilities are critical to addressing project ontogenetic issues, complex stakeholder networks, dynamic environments and opportunities, and long-term strategies. In addition, the following three levels of key factors of owner dynamic capabilities are identified: the external environment and institutional logic, organization structure and culture, and managerial cognition and employee creativity. Moreover, this study discriminates between owner dynamic capabilities with organizational ambidexterity and resilience and identifies the cognitive and non-cognitive micro-foundations of owner dynamic capabilities.

Contributions and limitations

By taking the construction industry from a specific industry perspective, this study forms a systematic interpretation of owner dynamic capabilities, which augments the capability framework in owner organizations and resilience studies, providing a solid foundation for future studies. This study serves as a valuable reference for appreciating the research statutes of owner dynamic capabilities. Moreover, this current study can be used as the basis for empirical research in related fields and provides fertile ground for further exploring the internal mechanism and evaluation of owner dynamic capabilities. From a practical perspective, the results of this study have implications for owner organizations, government agencies, and construction companies. The importance of outstanding owners has been emphasized, and the authors have highlighted the need for the utilization and development of owner dynamic capabilities. Practitioners can track the main contradictions that owners are currently facing against the actual situation and seek some strategies for owners to improve their capabilities. Accordingly, owner organizations in other industries can obtain guidance from this study to assess and upgrade their owner dynamic capabilities.

Despite the numerous contributions of this study, a few limitations cannot be ignored. Only peer-reviewed English articles were considered in this study, and some of the valuable findings may have been overlooked. In addition, this study is based on scientific qualitative research methods and proven theories to ensure the accuracy and credibility of the results, but the subjectivity of the coding process is still unavoidable. Finally, the construction project was chosen as the subject, and the specific roles played by owners lead to the possibility that some of the conclusions may be specific to construction projects. Therefore, future research could extend the framework of this study to a broad range of areas.

Future research directions

Internal relationships between dimensions of owner dynamic capabilities

This study distinguished the factors of owner dynamic capabilities at the project, organizational, and individual levels. However, highly complex and internal relationships between owner dynamic capabilities are worthy of investigation. Owner dynamic capabilities have close links, and the dimensions are not unrelated and parallel but are explicitly or implicitly related. Researchers need to work toward exploring the relationship between the dimensions of capabilities to sort out the context and crack the black box for research in this field. For example, the cognition capabilities of owners affect the diversity of resource allocation, which, in turn, is continuously adjusted to one draft of resilient change management capabilities (Laamanen & Wallin, 2009). Owners absorb and learn from previous project activities, and improved knowledge and skills can contribute to strategic innovation capabilities (Winch & Leiringer, 2016). Moreover, owners with high cognition capabilities can change the way they acquire human capital by gathering experience and learning (Adner & Helfat, 2003). Highly internal relationships and even intermediary variables must be explored to establish a compact and systematic owner dynamic capabilities system.

Influence mechanism of owner dynamic capabilities on resilience

As the investor and operator, the owner has a key role in project performance, and it can also influence organizational resilience by aligning stakeholder behavior (Wang, Tang, & Li, 2013). One of the main objectives of owner dynamic capabilities is to promote temporary organizational resilience, help owners earn profits, and achieve short-term organizational adaptability. Outstanding owner dynamic capabilities can help to effectively optimize the allocation of project resources and improve the efficiency and resilience of the temporary organization (Louw, Steyn, Wium, & Gevers, 2022). In addition, through the behavioral interaction mechanism in the stakeholder network, owner dynamic capabilities influence the behavior of other participants, which in turn has a positive impact on the overall project resource allocation, decision transmission, and organizational resilience. Thus, if owner dynamic capability becomes an important research topic within the project management domain, then scholars must delve deep into its exact influence on organizational resilience. This influence mechanism involving the entire project life cycle and stakeholder network remains unexplored.

Dynamic evolution of owner dynamic capabilities

Most existing studies discuss the owner dynamic capabilities from a single static perspective, with literature analysis and case studies as the main types of research (Gulino, Sergeeva, & Winch, 2020; Winch & Cha, 2020). However, within the project domain, the interaction between the owner and other stakeholders and the project life cycle leads to the complexity and dynamic evolution of owner dynamic capabilities (Davies & Brady, 2016; Zerjav, Edkins, & Davies, 2018). In the face of changing context, strong owners can neither rely solely on existing capabilities to solve problems nor find alternatives through improvisation but rather establish mechanisms to adapt owner dynamic capabilities autonomously to respond to change (Cha, Newman, & Winch, 2015; Stordy, Zerjav, & Kanjanabootra, 2021). Thus, the owner dynamic capabilities may vary at different stages of the project life cycle (Zerjav, Edkins, & Davies, 2018). This dynamic evolutionary process is highlighted in the findings of this article, but an exhaustive analysis was not performed. Hence, simulation-based methods should be applied to crack the black box of the dynamic evolution of owner dynamic capabilities.

Data Availability Statement. Data generated or analyzed during the study are available from the corresponding author by request.

Acknowledgements. This work was supported by the National Natural Science Foundation of China (grant no. 72371189, 72301178, 71971161), Shanghai Sailing Program (no. 23YF1446400) and Shanghai Youth Soft Science Research Project (no. 23692117700).

Conflicts of Interest. There is no conflict.

References

- Aaltonen, K., & Kujala, J. (2010). A project lifecycle perspective on stakeholder influence strategies in global projects. *Scandinavian Journal of Management*, 26(4), 381–397.
- Adam, A., & Lindahl, G. (2017). Applying the dynamic capabilities framework in the case of a large public construction client. *Construction Management and Economics*, 35(7), 420–431.
- Adam, A., Lindahl, G., & Leiringer, R. (2020). The dynamic capabilities of public construction clients in the healthcare sector. *International Journal of Managing Projects in Business*, 13(1), 153–171.
- Adner, R., & Helfat, C. E. (2003). Corporate effects and dynamic managerial capabilities. *Strategic Management Journal*, 24(10), 1011–1025.
- Anand, J., Oriani, R., & Vassolo, R. S. (2010). Alliance activity as a dynamic capability in the face of a discontinuous technological change. *Organization Science*, 21(6), 1213–1232.
- Araújo, G. R., Kato, H. T., & Del Corso, J. M. (2022). Dynamic capabilities, strategic planning and performance: A virtuous and mutually reinforcing cycle. *Journal of Management & Organization*, 28(5), 1116–1132.
- Arndt, F. (2019). Dynamic capabilities: A retrospective, state-of-the-art, and future research agenda. *Journal of Management & Organization*, 1–4. doi:10.1017/jmo.2019.21
- Baía, E. P., & Ferreira, J. J. M. (2019). Dynamic capabilities and performance: How has the relationship been assessed? *Journal of Management & Organization*, 1–30. doi:10.1017/jmo.2019.88
- Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.
- Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis. *NursingPlus Open*, 2, 8–14.
- Berg, B., Lune, H., & Lune, H. (2012). *Qualitative research methods for the social sciences*. Harlow: Pearson Education.
- Bonham, M. B. (2013). Leading by example: New professionalism and the government client. *Building Research and Information*, 41(1), 77–94.
- Cha, J., Newman, M., & Winch, G. (2015). Owner dynamic capabilities and benefits management in public information systems projects: A qualitative content analysis. In *2015 International Conference on Information Systems: Exploring the Information Frontier, ICIS 2015*, 1–13.
- Che Ibrahim, C. K. I., Costello, S. B., & Wilkinson, S. (2013). Development of a conceptual team integration performance index for alliance projects. *Construction Management and Economics*, 31(11), 1128–1143.
- Che Ibrahim, C. K. I., Costello, S. B., & Wilkinson, S. (2015). A fuzzy approach to developing scales for performance levels of alliance team integration assessment. *Journal of Construction Engineering and Management*, 141(5), 04014094.
- Chen, C. (2014). *The CiteSpace manual*. Retrieved November 1, 2022, from <http://cluster.ischool.drexel.edu/~cchen/citespace/CiteSpaceManual>
- Cristofaro, M., & Lovallo, D. (2022). From framework to theory: An evolutionary view of dynamic capabilities and their microfoundations. *Journal of Management & Organization*, 28(3), 429–450.
- Dakhil, A., Underwood, J., & Al Shawi, M. (2019). Critical success competencies for the BIM implementation process: UK construction clients. *Journal of Information Technology in Construction*, 24, 80–94.
- Danneels, E. (2016). Survey measures of first- and second-order competences. *Strategic Management Journal*, 37(10), 2174–2188.
- Davies, A., & Brady, T. (2016). Explicating the dynamics of project capabilities. *International Journal of Project Management*, 34(2), 314–327.
- Davies, A., Dodgson, M., & Gann, D. (2016). Dynamic capabilities in complex projects: The case of London Heathrow Terminal 5. *Project Management Journal*, 47(2), 26–46.
- Davies, A., MacAulay, S., DeBarro, T., & Thurston, M. (2014). Making innovation happen in a megaproject: London's Crossrail suburban railway system. *Project Management Journal*, 45(6), 25–37.
- Dey, I. (2003). *Qualitative data analysis: A user-friendly guide for social scientists* (p. 1). London: Routledge.
- Dodgson, M., Gann, D., MacAulay, S., & Davies, A. (2015). Innovation strategy in new transportation systems: The case of Crossrail. *Transportation Research Part A: Policy and Practice*, 77, 261–275.
- Durán, W. F., & Aguado, D. (2022). CEOs' managerial cognition and dynamic capabilities: A meta-analytical study from the microfoundations approach. *Journal of Management & Organization*, 28(3), 451–479.
- Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, 21(10–11), 1105–1121.
- Eriksson, P. E., & Laan, A. (2007). Procurement effects on trust and control in client-contractor relationships. *Engineering, Construction and Architectural Management*, 14(4), 387–399.
- Fainshmidt, S., Wenger, L., Pezeshkan, A., & Mallon, M. R. (2019). When do dynamic capabilities lead to competitive advantage? The importance of strategic fit. *Journal of Management Studies*, 56(4), 758–787.
- Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: Strengths and weaknesses. *The FASEB Journal*, 22(2), 338–342.

- Forgues, D., Koskela, L., & Lejeune, A. (2007). Toward a client-driven requirement management framework for achieving best value for money. In W. Hughes (Ed.), *CME 2007 Conference – Construction Management and Economics: “Past, Present and Future”* (pp. 373–383). School of Construction Management and Engineering, University of Reading.
- Friedland, R. (2014). The institutional logics perspective: A new approach to culture, structure and process. *Leadership & Organization Development Journal*, 35(6), 584–584.
- Gadisa, B., & Zhou, H. (2020). Exploring influential factors leading to the poor performance of public construction project in Ethiopia using structural equation modelling. *Engineering, Construction and Architectural Management*, 28(6), 1683–1712.
- Gann, D. M., Davies, A., & Dodgson, M. (2017). Innovation and flexibility in megaprojects. In B. Flyvbjerg (Ed.), *The Oxford handbook of megaproject management* (vol 1, pp. 313–338). London: Oxford University Press.
- Garvin, M. J., & Cheah, C. Y. J. (2004). Valuation techniques for infrastructive investment decisions. *Construction Management and Economics*, 22(4), 373–383.
- Ghannoum, C., Antar, S., Daoud, Y., & Hamzeh, F. (2019). Are construction clients ready to lead the lean initiative? *Lean Construction Journal*, 2019, 105–120.
- Gibb, A. G. F., & Isack, F. (2001). Client drivers for construction projects: Implications for standardization. *Engineering, Construction and Architectural Management*, 8(1), 46–58.
- Gibson, C. B., & Birkinshaw, J. (2004). The antecedents, consequences, and mediating role of organizational ambidexterity. *Academy of Management Journal*, 47(2), 209–226.
- Grabher, G. (2002). The project ecology of advertising: tasks, talents and teams. *Regional Studies*, 36(3), 245–262.
- Grant, R. M., & Baden-Fuller, C. (2004). A knowledge accessing theory of strategic alliances. *Journal of Management Studies*, 41(1), 61–84.
- Gulino, M. L., Sergeeva, N., & Winch, G. (2020). Owner capabilities in social infrastructure projects: Towards an expansion of the dynamic capabilities’ framework. *International Journal of Managing Projects in Business*, 13(6), 1263–1282.
- Häkkinen, T., & Belloni, K. (2011). Barriers and drivers for sustainable building. *Building Research & Information*, 39(3), 239–255.
- Havenvid, M. I., Hulthén, K., Linné, Å., & Sundquist, V. (2016). Renewal in construction projects: Tracing effects of client requirements. *Construction Management and Economics*, 34(11), 790–807.
- Heffernan, G. M. (2003). Path dependence, behavioral rules, and the role of entrepreneurship in economic change: The case of the automobile industry. *The Review of Austrian Economics* 2003, 16(1), 45–62.
- Helfat, C. E., & Martin, J. A. (2015). Dynamic managerial capabilities: Review and assessment of managerial impact on strategic change. *Journal of Management*, 41(5), 1281–1312.
- Helfat, C. E., & Peteraf, M. A. (2005). The dynamic resource-based view: Capability lifecycles. *Strategic Management Journal*, 24(10), 997–1010.
- Helfat, C. E., & Peteraf, M. A. (2009). Understanding dynamic capabilities: Progress along a developmental path. *Strategic Organization*, 7(1), 91–102.
- Helfat, C. E., & Peteraf, M. A. (2015). Managerial cognitive capabilities and the microfoundations of dynamic capabilities. *Strategic Management Journal*, 36(6), 831–850.
- Hetemi, E., Gemünden, H. G., & Meré, J. O. (2020). Embeddedness and actors’ behaviors in large-scale project life cycle: Lessons learned from a high-speed rail project in Spain. *Journal of Management in Engineering*, 36(6), 05020014.
- Hu, Y., Chan, A. P. C., & Le, Y. (2015). Understanding the determinants of program organization for construction megaproject success: Case study of the Shanghai Expo construction. *Journal of Management in Engineering*, 31(5), 05014019.
- Hui, P. P., Davis-Blake, A., & Broschak, J. P. (2008). Managing interdependence: The effects of outsourcing structure on the performance of complex projects. *Decision Sciences*, 39(1), 5–31.
- Iyer, K. C., & Jha, K. N. (2006). Critical factors affecting schedule performance: Evidence from indian construction projects. *Journal of Construction Engineering and Management*, 132(8), 871–881.
- Jiao, H., Jifeng, Y., & Ying, Y. (2021). Dynamic capabilities: A systematic literature review and an Agenda for the Chinese Future Research. *Management World*, 37(5), 191-210+14+22-24.
- Khan, T. Z. A., Farooq, W., & Rasheed, H. (2019). Organizational resilience: A dynamic capability of complex systems. *Journal of Management and Research*, 6(1), 1–27.
- Kleinberg, J. (2003). Bursty and hierarchical structure in Streams. *Data Mining and Knowledge Discovery*, 7(4), 373–397.
- Kozhevnikov, M. (2007). Cognitive styles in the context of modern psychology: Toward an integrated framework of cognitive style. *Psychological Bulletin*, 133(3), 464–481.
- Laamanen, T., & Wallin, J. (2009). Cognitive dynamics of capability development paths. *Journal of Management Studies*, 46(6), 950–981.
- Le Deist, F. D., & Winterton, J. (2005). What is competence? *Human Resource Development International*, 8(1), 27–46.
- Leiringer, R., & Zhang, S. (2021). Organisational capabilities and project organising research. *International Journal of Project Management*, 39(5), 422–436.
- Levander, E., Engström, S., Sárdén, Y., & Stehn, L. (2011). Construction clients’ ability to manage uncertainty and equivocality. *Construction Management and Economics*, 29(7), 753–764.
- Lindblad, H., & Gustavsson, T. K. (2021). Public clients ability to drive industry change: The case of implementing BIM. *Construction Management and Economics*, 39(1), 21–35.

- Liu, H., Yu, Y., Sun, Y., & Yan, X. (2021). A system dynamic approach for simulation of a knowledge transfer model of heterogeneous senders in mega project innovation. *Engineering, Construction and Architectural Management*, 28(3), 681–705.
- Lobo, S., & Whyte, J. (2017). Aligning and reconciling: Building project capabilities for digital delivery. *Research Policy*, 46(1), 93–107.
- Louw, W., Steyn, H., Wium, J., & Gevers, W. (2022). An investigation of sponsor attributes on six megaproject cases. *International Journal of Managing Projects in Business*, 15(1), 58–81.
- Ludvig, K., Stenberg, A. C., & Gluch, P. (2013). The value of communicative skills for developing an energy strategy. *Building Research and Information*, 41(6), 611–621.
- Manley, K. (2006). The innovation competence of repeat public sector clients in the Australian construction industry. *Construction Management and Economics*, 24(12), 1295–1304.
- Markovich, A., Raban, D. R., & Efrat, K. (2022). Tailoring competitive information sources to the sequence of dynamic capabilities. *Journal of Management & Organization*, 28(3), 480–501.
- Maytorena-Sanchez, E., & Winch, G. M. (2022). Engaged scholarship in project organizing research: The case of UK infrastructure. *Project Leadership and Society*, 3, 100049.
- Melkonian, T., & Picq, T. (2011). Building project capabilities in PBOs: Lessons from the French Special Forces. *International Journal of Project Management*, 29(4), 455–467.
- Molenaar, K., Washington, S., & Diekmann, J. (2000). Structural Equation Model of Construction Contract Dispute Potential. *Journal of Construction Engineering and Management*, 126(4), 268–277.
- Mulholland, C., Chan, P. W., Canning, K., & Ejohwomu, O. A. (2020). Social value for whom, by whom and when? Managing stakeholder dynamics in a UK megaproject. *Proceedings of Institution of Civil Engineers: Management, Procurement and Law*, 173(2), 75–86.
- Oppong, G. D., Chan, A. P. C., & Dansoh, A. (2017). A review of stakeholder management performance attributes in construction projects. *International Journal of Project Management*, 35(6), 1037–1051.
- O'Reilly, C. A., & Tushman, M. L. (2008). Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. *Research in Organizational Behavior*, 28, 185–206.
- Pavez, I., Gómez, H., Laulié, L., & González, V. A. (2021). Project team resilience: The effect of group potency and interpersonal trust. *International Journal of Project Management*, 39(6), 697–708.
- Polit, D., & Beck, C. (2004). *Nursing research: Principles and methods*. Retrieved May 13, 2023, from https://books.google.com/books?hl=zh-CN&lr=&id=5g6VtYWnjUC&oi=fnd&pg=PA3&dq=Nursing+Research.+Principles+and+Methods&ots=_0jNwGmiAA&sig=rtKappAdRTIzQTMwRX33bQlxCzk
- Prange, C., Bruyaka, O., & Marmenout, K. (2018). Investigating the transformation and transition processes between dynamic capabilities: Evidence from DHL. *Organization Studies*, 39(11), 1547–1573.
- Qiang, M., Wen, Q., Jiang, H., & Yuan, S. (2015). Factors governing construction project delivery selection: A content analysis. *International Journal of Project Management*, 33(8), 1780–1794.
- Rodríguez-Sánchez, A., Guinot, J., Chiva, R., & López-Cabrales, Á. (2021). How to emerge stronger: Antecedents and consequences of organizational resilience. *Journal of Management & Organization*, 27(3), 442–459.
- Salvato, C., & Vassolo, R. (2018). The sources of dynamism in dynamic capabilities. *Strategic Management Journal*, 39(6), 1728–1752.
- Sankaran, S. (2018). Megaproject management and leadership: A narrative analysis of life stories – Past and present. *International Journal of Managing Projects in Business*, 11(1), 53–79.
- Schilke, O., Hu, S., & Helfat, C. E. (2018). Quo vadis, dynamic capabilities? A content-analytic review of the current state of knowledge and recommendations for future research. *Academy of Management Annals*, 12(1), 390–439.
- Sergeeva, N. (2020). Towards more flexible approach to governance to allow innovation: The case of UK infrastructure. *International Journal of Managing Projects in Business*, 13(1), 1–19.
- Simkoko, E. (1992). Managing international construction projects for competence development within local firms. *International Journal of Project Management*, 10(1), 12–22.
- Sinesilassie, E. G., Tripathi, K. K., Tabish, S. Z. S., & Jha, K. N. (2019). Modeling success factors for public construction projects with the SEM approach: Engineer's perspective. *Engineering, Construction and Architectural Management*, 26(10), 2410–2431.
- Sirmon, D. G., & Hitt, M. A. (2009). Contingencies within dynamic managerial capabilities: Interdependent effects of resource investment and deployment on firm performance. *Strategic Management Journal*, 30(13), 1375–1394.
- Stordy, J., Zerjav, V., & Kanjanabootra, S. (2021). Owner capabilities in the project society: The setting of project-supported organisations. *Project Leadership and Society*, 2, 100024.
- Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28(13), 1319–1350.
- Teece, D. J. (2012). Dynamic capabilities: Routines versus entrepreneurial action. *Journal of Management Studies*, 49(8), 1395–1401.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533.

- Too, E. G. (2012). Capability model to improve infrastructure asset performance. *Journal of Construction Engineering and Management*, 138(7), 885–896.
- Vu, H. A., Cu, V. H., Min, L. X., & Wang, J. Q. (2017). Risk analysis of schedule delays in international highway projects in Vietnam using a structural equation model. *Engineering, Construction and Architectural Management*, 24(6), 1018–1039.
- Walsh, J. P. (1995). Managerial and organizational cognition: Notes from a trip down memory lane. *Organization Science*, 6(3), 280–321.
- Wang, B., Geng, L., Dang, P., & Zhang, L. (2022). Developing a framework for dynamic organizational resilience analysis in prefabricated construction projects: A project life cycle perspective. *Journal of Construction Engineering and Management*, 148(10), 1–14.
- Wang, S., Tang, W., & Li, Y. (2013). Relationship between owners' capabilities and project performance on development of hydropower projects in China. *Journal of Construction Engineering and Management*, 139(9), 1168–1178.
- Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. Reproduced with permission of the copyright owner. Further reproduction prohibited without permission. *MIS Quarterly*, 26(2), xiii–xxiii.
- Wen, Q., Qiang, M., & An, N. (2017). Collaborating with construction management consultants in project execution: Responsibility delegation and capability integration. *Journal of Construction Engineering and Management*, 143(7), 04017021.
- Winch, G., & Cha, J. (2020). Owner challenges on major projects: The case of UK government. *International Journal of Project Management*, 38(3), 177–187.
- Winch, G., & Leiringer, R. (2016). Owner project capabilities for infrastructure development: A review and development of the “strong owner” concept. *International Journal of Project Management*, 34(2), 271–281.
- Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic Management Journal*, 24(10 SPEC ISS), 991–995.
- Xia, B., & Chan, A. P. C. (2010). Key competences of design-build clients in China. *Journal of Facilities Management*, 8(2), 114–129.
- Xia, O., Chen, A., Xie, Q., & Liu, Y. (2018). Conceptualising the state of the art of corporate social responsibility (CSR) in the construction industry and its nexus to sustainable development. *Journal of Cleaner Production*, 195, 340–353.
- Yang, X., & Smyrniotis, K. X. (2018). Unravelling organizational resilience. *Academy of Management Proceedings*, 2018(1), 10979.
- Yang, X., Wang, L., Zhu, F., & Müller, R. (2022). Prior and governed stakeholder relationships: The key to resilience of inter-organizational projects. *International Journal of Project Management*, 40(1), 64–75.
- Yong, Y. C., & Mustafa, N. E. (2013). Critical success factors for Malaysian construction projects: An empirical assessment. *Construction Management and Economics*, 31(9), 959–978.
- Zerjav, V., Edkins, A., & Davies, A. (2018). Project capabilities for operational outcomes in inter-organisational settings: The case of London Heathrow Terminal 2. *International Journal of Project Management*, 36(3), 444–459.
- Zhang, Y., & Wildemuth, B. M. (2016). Qualitative analysis of content. In *Applications of social research methods to questions in information and library science* (p. 421). Santa Barbara: ABC-CLIO.
- Zwikael, O., Meredith, J. R., & Smyrk, J. (2019). The responsibilities of the project owner in benefits realization. *International Journal of Operations & Production Management*, 39(4), 503–524.

Zidan Tian is a Ph.D. student in the Department of Construction Management and Real Estate, School of Economics and Management, Tongji University, Shanghai, China. The author's research areas include Megaproject management and Owner project capability.

Ting Wang is a Lecturer in the College of Urban Construction and Safety Engineering, Shanghai Institute of Technology, Shanghai, China. The author's research areas include Megaproject management, Project success, Organizational behavior, and Urban sustainability.

Qinghua He is the Professor in the Department of Construction Management and Real Estate, School of Economics and Management, Tongji University, Shanghai, China. The author's research areas include Complex project management, Large-infrastructure life cycle management, and Lean project delivery.