
**Transforming Construction with Off-site Methods and Technologies - TCOT 2026
Conference**

August 18-20, 2026, Newcastle upon Tyne, UK

**TRANSITIONING TO OFFSITE CONSTRUCTION: CAPABILITY-RESILIENCE-
ALIGNMENT OR ABJECT FAILURE?**

Ezcan, V^{1,*}, Goulding, J.S², and Huovinen, P³

¹ School of Engineering and Built Environment, Liverpool John Moores University, UK

² Unisearch Ltd, Glasgow, UK

³ Business Management PJH, Kauniainen, Finland

* v.ezcan@ljmu.ac.uk

Abstract: Architecture, Engineering, and Construction (AEC) is increasingly turning to offsite construction (OSC) as a strategic response to address performance and productivity challenges. This has (in the main) been very successful, especially where transition and migration plans have been established beforehand. However, more recently, there have been a number of high-profile business failures [ergo new entrants to OSC] which has raised significant concerns on the ‘true level of understanding and awareness’ of OSC – especially on “demands and needs”. This is seen as a major challenge and a critical gap in organisational resilience. In order to start to address this, this paper highlights the need to secure a much deeper and richer understanding of OSC transitional arrangements – particularly those which support resilience capabilities. Organisational resilience is proffered as a dynamic, multi-layered construct of Business Systems, where capability-based constructs directly/indirectly affect operationalisation. In this respect, studies have shown that organisational awareness (especially across stratified management levels) can often have an impact on transitional arrangements to such sectors as OSC.

In order to understand these issues and impact on AEC organisations, this research followed an interpretivist approach using multiple case study actors. Three case study organisations (with international experience in OSC) were selected from Türkiye. From these organisations, 24 semi-structured interviews were conducted across three different management levels (to assess differences in thinking). Qualitative insights from these interviews were examined using the Relative Existence Index (REI) and the Relative Perception Gap Index (RPGI). This approach enabled cross-level examination across these three companies and respective organisational layers.

Findings revealed uneven perceptions across these companies, and through organisational management strata. This reinforced the notion of ‘misalignment’; which inter alia, acted as a conditioning constraint and barrier, thereby limiting capability mobilisation and subsequent transformation. These findings align to traits evidenced in Dynamic Capabilities (DC) theory. Thus, in order to move this challenge forward, this paper presents a multi-layered conceptual framework for discussion. This conceptualises resilience operationalisation as a six-layered solution, highlighting cross-level alignment as a critical element which can influence successful organisational transformation.

Keywords: Offsite Construction, Organisational Resilience, Resilience Capabilities, Dynamic Capabilities, Transition Strategies, Business Transformation

1 INTRODUCTION

AEC has been continually challenged to improve its performance and productivity – especially over the last 50 years. Many reports and directives have been published worldwide, covering recurrent themes and issues. Whilst acknowledgement of these challenges in this paper is not meant to be ‘exhaustive’ by any means, the following narrative provides a few exemplars for context. For example, in the UK context, these issues covered inefficiency, resistance to change, lack of innovation, fragmentation, and poor quality (Farmer 2016; Nadim and Goulding 201; Parliament, 2018). Improvement measures included a wide range of solutions from skills provision, improved collaboration, communication and measures to improve productivity (Banwell, 1964; Latham, 1994; Fairclough, 2002; Farmer, 2016; HM Treasury, 2021). Some solutions to address these challenges advocated the need to adopt OSC, especially given its ability to ‘industrialise’ processes through advanced manufacturing techniques (Pan et al, 2005; Khotaja et al., 2025). Whilst this adoption addressed some of the ‘traditional’ construction challenges, for example, environmental sustainability, carbon and waste management (Nahmens and Ikuma, 2012), through to process optimisation, quality, and performance (Goulding and Rahimian, 2019; Wang et al., 2020); however, many challenges still remain. It seems that organisations that have entered the OSC sector have failed to fully understand the complexities of OSC - ergo, the systems, structures and procedures that need to be in place for this ‘new way’ of working and thinking to operate and thrive. Simply put, AEC organisations seem to have engaged with OSC without sufficient understanding of all interplay structures. This has evoked a degree of cynicism and raised broader questions about ‘organisational readiness’; and perhaps more importantly, the type, level and structure of resilience capabilities required to manage and sustain such transition to OSC. These issues are now being discussed in extant literature (Rabeneck, 2021; Stehn et al., 2021; Green, 2022).

Organisational resilience is broadly accepted as being an organisation’s ability to withstand external pressures, resist or survive unexpected and volatile conditions, and “bounce back” from disruptive events (Sheffi and Rice Jr, 2005; Wildavsky, 1988). Moreover, organisational resilience is increasingly being seen as a capability and process-based construct, which has recently started to be interpreted through the lens of dynamic capabilities, especially being transformative and forward-looking (Hernes et al., 2025; Lengnick-Hall et al., 2011). Despite this increased recognition, there is limited clarity on how resilience capabilities are operationalised in practice, particularly in complex project -based environments such as OSC (Aghimien et al., 2023; Adam and Lindahl 2017). Given these complexities, this paper examines the type, nature, structure and operationalisation of OSC resilience capabilities on AEC organisations. Emphasis is placed on how capabilities are perceived across different organisational levels in order to highlight divergence in perceptions and potential implications for operationalisation.

2 LITERATURE REVIEW

2.1 Organisational Resilience as a Capability-Based Construct

Resilience concepts originate back to ecology and systems theory (Holling 1973), where this was used to describe the capacity of ecological systems to absorb disturbances while maintaining their normal functions. This concept subsequently diffused in organisational behaviour (Staw et al. 1981) as well as safety and disaster management domains, where it was defined as “the capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back” (Wildavsky, 1988).

From an organisational perspective, earlier studies identified resilience as the capacity to absorb the impact of disruptions and restore prior operations (Sheffi and Rice Jr 2005; Home III and Orr 1997). However, more recently, this perspective has evolved beyond this “bounce back” view towards a forward-looking and transformative capability, through which organisations leverage disruption for renewal and strategic repositioning (van Baardwijk and Reinmoeller 2005; Zhou et al., 2023). This development further reflected the distinction between resilience capacity – the latent stock of cognitive, behavioural and relational sources, and resilience capability -reflecting the ability to mobilise those sources under disruption (Lengnick-Hall et al., 2011). Resilience is therefore increasingly being viewed as moving away from being static, to one which embraces fluidity associated with processual understanding - operationalised through stages of anticipation, coping and adaptation (Duchek 2020), and spanning proactive preparation,

coordinated response, and post event learning (Hernes et al., 2025; Su and Junge, 2023). Resilience has also been recognised for its meta-capability, comprising cognitive, behavioural, structural and relational dimensions (Kantur and İşeri-Say 2012; Limnios et al., 2014; Burnard and Bhamra 2011).

In summary, despite, these developments, limited understanding is known on precisely how these capabilities are operationalised - particularly in complex, project-based contexts (such as AEC). These limitations highlight the need for a specific theoretical lens capable of explaining how organisations purposefully build, integrate, and reconfigure resilience-enabling capabilities over time.

2.2 Dynamic Capabilities and Resilience

Dynamic capabilities can be defined as an organisations' ability to integrate, build, and reconfigure internal and external competence within changing environments (Teece et al., 1997; Teece, 2007); thereby, providing a foundational lens for understanding organisational adaptation and transformation, as well as response to uncertainty. Teece (2007) organised these capabilities under three main clusters, namely sensing, seizing and transforming, which can be recognised as high-order or meta capabilities. However, it is important to note at this juncture, that dynamic capabilities tend to operate as higher-order routines that modify and reconfigure operational capabilities rather than substituting them (Zollo and Winter, 2002). In this context, organisational resilience can be interpreted as a specific form of dynamic capability, reflecting an organisation's ability to sense disruptions, respond effectively to these, and adapt through subsequent reconfiguration (Lengnick-Hall et al., 2011; Duchek, 2020). That being said, while dynamic capabilities provides some of the explanatory logic for understanding resilience as an adaptive and reconfigurable process; however, translating this into coherent organisational structures and practices still remains a key challenge.

2.3 The operationalisation gap in resilience research

Organisational resilience is increasingly being promoted as a capability-based construct. A critical challenge emanating from this is how the latent resilience capacity of an organisation can be translated into operationalised capabilities through mechanisms of activation and coordination (Ortiz-de-Mandojana and Bansal, 2016; Burnard and Bhamra, 2011). In this respect, existing approaches to operationalising resilience have been somewhat fragmented, and indeed (arguably), not sufficiently integrated across different organisational structures, levels and strategies. While structural approaches such as business continuity and disaster recovery models (Sahebjamnia et al., 2015) provide some functional guidance, they do not clarify how resilience capabilities are coordinated and sustained across different organisational levels. Literature identifies several enabling mechanisms, including strategic human resources management (Lengnick-Hall et al., 2011; Zhou et al., 2023) contingency planning (Gracey, 2020), digital capabilities, and decentralised structures (Vogus and Sutcliffe, 2007). However, from an operational perspective, discourse has not really highlighted or explained how these mechanisms are activated and integrated into coherent organisational capabilities – ergo, how latent capacity is translated into operationalised capabilities.

From an operationalisation perspective, tensions often arise between efficiency-oriented and adaptive capacity approaches (Ortiz-de-Mandojana and Bansal, 2016; Schoemaker et al., 2018). For instance, mechanistic and highly formalised structures can in some instances inhibit sensing and seizing capabilities, and more fundamentally, hinder an organisation's ability to absorb shocks. Consequently, routines and practices that aim to enhance efficiency, can become 'core rigid' (Leonard-Barton 1992), which in turn reinforces threat or rigidity dynamics, including organisational anthropomorphism associated with organisational individual/group forces (Staw et al., 1981). On this theme, a further challenge lies in how adaptive behaviours are translated from individuals to those at an organisational level (collective inheritance). Where, individual level efforts do not automatically scale into collective routines (or thinking) within the organisation (Salvato and Vassolo, 2018). Thus, focusing solely on structural dynamics, organisations risk creating core rigidities, which in turn, makes them tend to neglect the importance of interpersonal links – ergo, the "engine of emergence", where resilience is seen as a multi-level phenomenon shaped by cross level interactions (Hillmann and Guenther, 2021; You 2023).

In summary, capability operationalisation is predominantly shaped by organisational structures and governance; where dynamic capabilities are embedded into organisational processes and managerial decision making (Teece et al., 1997). Therefore, following this premise, it is important to manage structural configurations including the distribution of decision-making authority, as this both controls and augments how capabilities are deployed across an organisation. In this context, it is increasingly important to note that project-based environments should be able to proactively reconfigure their resources to successfully adapt to dynamic business change (Choi et al., 2018), particularly the main components that influence this change.

2.4 Resilience challenges in construction and offsite transition

Given the recurrent challenges evidenced in AEC, the call to mitigate some of these through such initiatives like OSC has been partially successful. However, transitioning arrangements created several problems, and in some cases have led to companies rolling back operation, and in some cases this has led to bankruptcy and business failure. Whilst the principal causes of these failures can be typified as company and/or context-dependent, it is safe to say that conditions of uncertainty, structural complexity, and lack of awareness could have played a part. Unlike manufacturing, construction organisations tend to function in a project-based production environment, characterised by temporary project structures and high levels of delivery variability (Adam and Lindahl, 2017; Dubois and Gadde, 2002). This makes resilience a continuous organisational requirement rather than a response to discrete disruptions (Choi et al., 2018). Part of resilience planning is the need for capability management and development across all levels of the business (Adam and Lindahl, 2017).

When organisations decide to adopt OSC, the shift from traditional construction “thinking” to an offsite construction approach, often represents a fundamental challenge – transitioning from a “loosely coupled” project logic to a highly integrated, and manufacturing-based production setting. This new level of thinking and working requires radical approaches, some of which will be unfamiliar, for example: logistics, production methodologies, integration, reconfiguration capabilities etc (Aghimien et al., 2023; Wijayarathne et al., 2024). These challenges can be accentuated by systemic ‘loosely coupled construction systems’, which often limit coordination and resource mobilisation, including the transfer of project-based knowledge across organisational levels (Dubois and Gadde, 2002; Eriksson, 2014). Other impact areas include: structural and cultural barriers, siloed practices, bureaucratic processes, and immature digitalisation capabilities (Wilden et al., 2013; Aghimien et al., 2023).

Given the above challenges and migration issues, the concept of ‘resilience’ and its impact on businesses can be considered “work in progress”. The process of transitioning to OSC should not be seen solely as a function of ‘capability availability’, rather a highly complex system enabled by organisational mechanisms and shaped by how capabilities are understood, coordinated and implemented across organisational levels.

3 METHODOLOGY

The approach taken to unpick the above challenges required grass root introspection in order to understand how resilience capabilities were perceived and operationalised within AEC organisations transitioning from traditional methods to OSC. It was therefore necessary to explore how resilience was perceived, interpreted and operationalised in practice. Given this need, an Interpretivist approach was adopted to capture respondents’ views and experiences, following a case study approach (Yin, 1984). From a case study sampling perspective, three broadly similar AEC companies were chosen from Türkiye as the primary case study organisations. Each of these companies had international experience in OSC. This sampling approach created an opportunity for literal replication in order to strengthen analytical generalisation, as well as securing enhanced in-depth understanding of the socio-technical constructs underpinning organisational thinking and decision making.

In total, 24 actors were selected from each of these three organisations. To secure a balanced, nuanced and ‘representative view’, interviews were conducted across three different management levels: First-Line Management (FLM), Middle Management (MM) and Top Management (TM). This enabled the examination of how resilience capabilities were perceived, understood and operationalised across each of the

organisational layers, including cross-layer perception divergence. Eight semi-structured interviews were conducted from each organisation, making 24 interviews in total (Table 1).

Table 1: Respondents' experience by management level

Management Level	Experience (Years)					TOTAL NR*
	0 - 5	6 - 10	11 - 15	16 - 20	21 -	
Top Management (TM) <i>(Board of Directors, Chief Executive Officer, General Manager, Managing Director, President, etc.)</i>	-	-	-	1	5	6
Middle Management (MM) <i>(Department Heads, Branch Managers, Junior Executives, etc.)</i>	-	-	4	2	3	9
First Line Management (FLM) <i>(Engineers, Architects, Surveyors, Technicians working under the middle management)</i>	4	5	-	-	-	9
TOTAL	4	5	4	3	9	24

*NR = Number of respondents

Each interview was recorded and transcribed. This allowed quantitative data to be collected to support richer qualitative insight. Qualitative data was analysed through content analysis, while quantitative responses were processed using Relative Existence Index (REI) (Ezcan and Goulding, 2024). The REI values were then used as basis for developing a new concept, known as the Relative Perception Gap Index (RPGI). The RPGI represents the range or variation between the highest and lowest REI values assigned to each capability across each of the three management levels (FLM, MM and TM). In this context, a higher RPGI value indicates a greater divergence in perception across organisational levels, where a lower value indicates a lower divergence, or alignment. In this study, the RPGI approach was used as an 'indicative measure' to support further interpretation of cross-level divergence and alignment (rather than a formal statistical metric). The findings from the combined quantitative and qualitative insights helped inform, shape and develop the conceptual framework (Figure 1).

4 FINDINGS AND DISCUSSION

This research builds on previous empirical results (Ezcan and Goulding, 2024), where the identification of resilience capabilities and the calculation of the REI values were described. These findings acted as a nexus for this work, moves beyond capability identification and ranking, to one which examines how these capabilities were perceived across each of the three organisational levels - highlighting this as a 'conditioning layer' for the operationalisation of resilience capabilities.

RPGI values were used as an indicative measure of cross-level divergence, categorised into: High, Moderate, or Low levels of divergence. This enables a comparative view of how consistently each capability was understood across strategic (TM), tactical (MM), and operational levels (FLM) (Table 2).

From Table 2, findings indicate that resilience capabilities were not uniformly perceived across all three organisations. In this respect, capabilities such as Connectivity Awareness and Responsive Decision – Making, demonstrated low divergence, which reflected a shared understanding and stronger cross-level coherence; however, capabilities such as Monitoring and Reporting, Assessment of Recovery Needs, and Reorganisation show higher divergence, indicated misalignment between these layers. Similarly, capabilities such as Risk Analysis, and Knowledge Management highlighted moderate divergence, suggesting partial alignment relating to how they were interpreted and applied across each level. Collectively, these divergences indicate that misalignments between organisational layers can in turn place

constraints and limitations on organisations vis-à-vis their resilience capability, coordination, adaptation and response approaches.

Table 2: Cross-level divergence in resilience capability perceptions

Capability	TM	MM	FLM	RPGI	Divergence
	REI	REI	REI	(Gap)	
[MR] Monitoring and Reporting	0.883	0.756	0.789	0.127	High
[CA] Connectivity Awareness	0.783	0.733	0.733	0.050	Alignment
[RA] Risk Analysis	0.817	0.744	0.711	0.106	Moderate
[SV] Strategic Vision	0.867	0.800	0.833	0.067	Low
[KM] Knowledge and Information Management	0.800	0.700	0.767	0.100	Moderate
[DM] Responsive Decision Making	0.717	0.711	0.667	0.050	Alignment
[AN] Assessment of Recovery Needs	0.800	0.811	0.667	0.144	High
[RP] Recovery Plan Development	0.800	0.744	0.733	0.067	Low
[RO] Reorganisation	0.733	0.700	0.600	0.133	High

Key: TM-Top Management, MM-Middle Management, FLM-First Line Management; REI-Relative Existence Index; RPGI: Relative Perception Gap Index.

From Table 2, it can also be seen that while RPGI captured the maximum divergence between management levels, it did not fully reflect the pattern of agreement or disagreement across all groups. This could be seen as a limitation. However, such patterns often require nuanced interpretation in order to unpick any embedded dynamics (and thinking) between each of the different management levels in relation to specific capabilities. Given this, on reflection, it can be reported here that the analysis did not extend into detailed analysis of the underlying dynamics that created these divergences; instead, these findings can be used to demonstrate the existence of stratified perspectives. Moreover, to integrate these insights with the interview-based findings to help inform a more ‘considered’ solution to help organisations operationalise their OSC resilience transitional arrangements.

4.1 Conceptual Framework Premise and Proposition

Given the need to present organisations with a formal (practical) mechanism for operationalising their OSC resilience transitional arrangements, it was important to reflect back on the importance of dynamic capability theory and the capability-based views of organisational resilience (Teece, 2007; Ducheck, 2020). In doing so, it was observed that organisational resilience was not seen as a simple set of capabilities, but rather, a multi-layered construct that both enabled and developed capability. This can be explained as an emergent interaction between latent capabilities – manifested through mechanisms through which they are activated; and perhaps more importantly, where these are aligned to organisational conditions (and culture) which shape operationalisation and impact through different layers.

This layered approach is presented as an “OSC Resilience Operationalisation Framework” (Figure 2). This multi-level operationalisation framework consists of six interconnected layers, each of which captures a distinct dimension of how ‘resilience’ can be developed, activated and implemented within organisational settings, particularly those wishing to transition from traditional construction approaches to those which implement or engage OSC. This framework is proffered as a ‘proof of concept’. This was conceptually developed, empirically informed, and aligned to actors’ feedback. It focuses specifically on the role of the multi-level conditioning layer and divergence parameters. In this respect, no attempt has been made to test and validate this framework at this stage, although this will follow protocols for: internal and external validity, reliability, homogeneity and consistency.

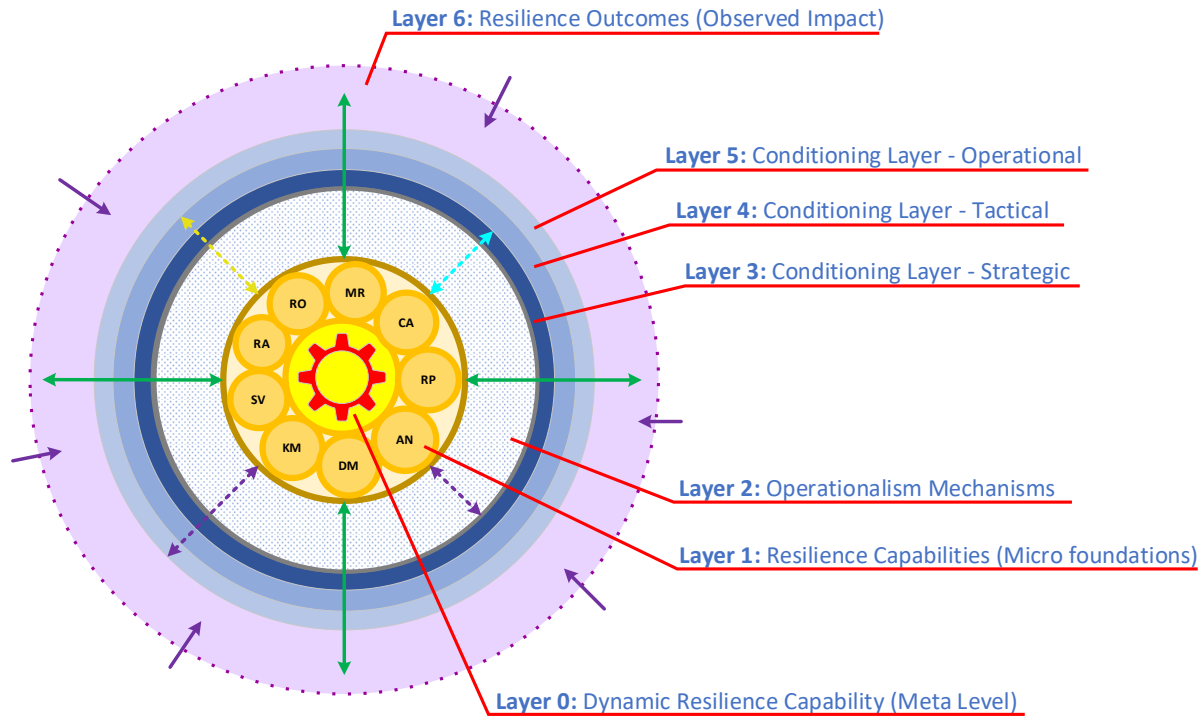


Figure 1: OSC Resilience Operationalisation Framework

From Figure 1, the inner central core of the framework is identified as **Layer 0**, representing the **dynamic resilience capability**. This is seen as a higher-order integrative capability which enables organisations to sense, align and reconfigure resilience related resources in response to changes in the internal and external environment (Teece et al., 1997; Ducheck, 2020). As such, it acts as the foundation layer of the framework, providing the start point for resilience capability into the following layer (Layer 1).

Layer 1 is comprised of nine **resilience capabilities**, all of which are needed for OSC transition. These represent the organisational capabilities needed to support an organisation's ability to sense, respond, adapt and learn. These capabilities encompass, cognitive, behavioural and relational dimensions; and collectively, form organisational resilience within the context of OSC transition (Lengnick-Hall et al., 2011). Please note, these are considered as latent organisational potential at the beginning, as they need to be codified before activation and mobilisation.

Layer 2 represents the capability **operationalisation mechanisms**. These capture the processes through which latent capabilities are activated and mobilised into operational practices (Burnard and Bhamra, 2011; Powley, 2009). These mechanisms include decision-making structures, information flows, coordination routines, and feedback loops that structure how organisations respond to change. Layer 2 therefore, plays a critical mediating role between capabilities and observed outcomes. This is the layer where the latent capability potential is converted into coordinated organisational actions implemented in practice. In this context, failures in organisational resilience are rarely caused by the absence of capabilities alone; rather, they arise from the lack of ability to establish and sustain the necessary organisational mechanisms that effectively operationalise these capabilities (Vogus and Sutcliffe, 2007).

Operationalisation of the resilience capabilities is further shaped by multi-level conditioning layers (Layers 3 to 5), which include strategic, tactical, and operational dimensions. These layers represent the organisational contexts within which decisions are formed, structured and executed (Gracey, 2020; Hernes et al., 2025).

The conditioning layer - strategic (Layer 3) engages the role of top management to provide, shape structure strategic direction. This includes governance structures, resource allocation, and all logical arrangements and constraints that define organisational vision and concomitant priorities.

The conditioning layer - tactical (Layer 4) captures the role of middle management in translating the strategic intent into operational plans, coordination routines and resource configurations across all business functions.

The conditioning layer - operational (Layer 5) represents day-to-day execution, frontline decision making, and immediate responses to emerging challenges.

The resilience outcomes layer (Layer 6) represents the observed impact of combined layers. This layer can be seen as a context-dependent observational lens rather than a direct outcome of internal capabilities (Burnard and Bhamra, 2011). The dotted boundary of this layer reflects the organisation's permeability to external forces (*cf.* Open Systems). Where, interaction between internal organisational dynamics and external environment conditions tend to shape outcomes (You, 2023). Dotted lines that do not extend to Layer 6 represent capabilities that fail to pass through the conditioning layers, which *inter alia* can therefore not be operationalised due to this misalignment.

In summary, collectively, these six layers can be considered distinct but highly interdependent. They form the *modus operandi* of an integrated system that conditions how capabilities are created and operationalised. Empirical findings of this research have shaped the operationalisation of this framework. However, it is important to note that diverse perceptions across these layers (or indeed misalignment) can often limit or weaken the operationalisation of resilience. This was recognised in similar studies (Salvato and Vassolo, 2018). Overall, this framework highlights the importance of how (and under what conditions) resilience capabilities can be operationalised. It also showcases conditions and pitfalls of not envisioning the 'bigger picture' prior to actioning transitional plans.

4.2 How this framework works in practice (*modus operandi* and operationalisation of resilience capabilities)

The starting point for applying this framework in a business environment commences with a complete and thorough examination of all business activities. The first stage therefore is to gather all operationalisation activities which support or feed into the formation of resilience capabilities. This information is used to assess several aspects, including: organisational maturity, market risk exposure, resource allocation, compliance, environmental disturbance, recovery mechanisms etc. This may also include an examination of external forces (e.g. market volatility, regulatory changes, or supply chain uncertainties) and internal disruptions (e.g. restructuring and change plans, change, culture re-setting mechanisms etc) – all of which could directly/indirectly influence business performance and continuity. Once this information has been gathered, this information is fed into the dynamic resilience capability (Layer 0), to start the process of examination. The results from Layer 0 inform the alignment and deployment of relevant organisational resilience capabilities within Layer 1.

Layer 1 is then used to examine the nine micro-foundations (resilience capabilities), which support the organisation's OSC transition. Once populated, these capabilities are seen as latent organisational potential, which will be mobilised into action through the organisational mechanisms of Layer 2. The mobilisation process structures the activated latent capability potential into practical outcomes for delivery. At this point, alignment and configuration is deemed critical for enabling successful transition, as Layer 2 represents the stage where resilience capabilities shift from 'potential' to 'realised' organisational implementation. The next stage involves the actualisation process of the framework through the multi-level conditioning layers (Layers 3-5). These layers augment and influence how these capabilities are prioritised, interpreted and implemented across organisational levels. These layers collectively define the organisational context through strategic, tactical and operational perspectives. Care must be taken to ensure full alignment. Interaction and alignment of Layers 3-5 create the resilience outcomes of the organisation (Layer 6). These outcomes reflect the company's "realised state", ergo, its ability to anticipate, respond to, and recover from disruptions. As discussed earlier (section 4.1) these outcomes are shaped through the interaction between internal processes and external environmental conditions. These findings

are then analysed from an impact perspective – to see if things have gone to plan or indeed failed to make an impact. In this respect, the framework presented here only really comes into its own after repeated use. This repetition aims to develop organisational maturity through iteration, using continuous feedback loops to inform subsequent cycles of sensing learning and adaptation. Feedback loops enable organisations to refine their capabilities and adjust organisational processes to maximise resilience and organisational capability.

5 CONCLUSION

This research originated from the need to understand how AEC organisations wishing to enter OSC actually understood the transition process in its entirety. This required an examination of thinking and behaviour. Focus was placed on resilience capabilities, and in particular, how these capabilities were aligned to business imperatives and assessed afterwards. Whilst this was considered a complex issue to unpick, this research engaged three case study organisations, using 24 respondents spanning three managerial levels (FLM, MM and TM). Findings from this research helped develop a multi-layered conceptual framework. This was grounded in dynamic capabilities theory, with particular emphasis on the role of multi-level conditioning and alignment.

Findings from this work highlighted the importance and need for resilience planning. In this respect, one aspect deemed critical for success was that of alignment, as the degree (and approach) to alignment was seen as a fundamental prerequisite. In this respect, any misalignment acted as a constraint, which consequently impeded the mobilisation of resilience capabilities. This in turn hindered organisational transformation; which inter alia, suggests that organisational resilience in OSC transition is not solely a function of capability availability per se, but more a complex, multi-layered process dependent on cross-level alignment. This work represents an initial step towards addressing the resilience operationalisation gap in OSC literature. However, from a replicability perspective, care must be taken to observe that these findings are context bound. Moreover, that testing and validation is still needed. This is likely to deploy stress testing in order to evaluate findings across different contexts, scales and levels of OSC maturity.

6 REFERENCES

- Adam, Abderisak, and Göran Lindahl. 2017. "Applying the Dynamic Capabilities Framework in the Case of a Large Public Construction Client." *Construction management and Economics* 35 (7):420–31. <https://doi.org/10.1080/01446193.2017.1309441>
- Aghimien, Douglas, Clinton Aigbavboa, and Kefilwe Matabane. 2023. "Dynamic Capabilities for Construction Organizations in the Fourth Industrial Revolution Era." *International Journal of Construction Management* 23 (5):855–64. <https://doi.org/10.1080/15623599.2021.1940745>
- Banwell, H, 1964. Report of the Committee on the Placing and Management of Contracts for Building and Civil Engineering Works, HMSO, UK
- Burnard, Kevin, and Ran Bhamra. 2011. "Organisational Resilience: Development of a Conceptual Framework for Organisational Responses." *International Journal of Production Research* 49 (18):5581–99. <https://doi.org/10.1080/00207543.2011.563827>
- Choi, Seokjin, Insu Cho, Seung Heon Han, Young Hoon Kwak, and Ying-Yi Chih. 2018. "Dynamic Capabilities of Project-Based Organization in Global Operations." *Journal of Management in Engineering* 34 (5):04018027. <https://ascelibrary.org/doi/10.1061/%28ASCE%29ME.1943-5479.0000621>
- Dubois, Anna, and Lars-Erik Gadde. 2002. "The Construction Industry as a Loosely Coupled System: Implications for Productivity and Innovation." *Construction Management & Economics* 20 (7):621–31. <https://doi.org/10.1080/01446190210163543>
- Duchek, Stephanie. 2020. "Organizational Resilience: A Capability-Based Conceptualization." *Business Research* 13 (1):215–46. <https://doi.org/10.1007/s40685-019-0085-7>
- Eriksson, Taina. 2014. "Processes, Antecedents and Outcomes of Dynamic Capabilities." *Scandinavian journal of management* 30 (1):65–82. <https://doi.org/10.1016/j.scaman.2013.05.001>

-
- Ezcan, Volkan, and Jack Goulding. 2024. "Building Offsite Resilience Using Capability-Driven Stage Gates," paper presented at Transforming Construction with Off-site Methods and Technologies, 20–22 August 2024. <https://doi.org/10.57922/93ngs896>
- Fairclough, J. 2002. Rethinking Construction Innovation and Research: A Review of Government R&D Policies and Practices, Department of Trade and Industry, Available from <https://webarchive.nationalarchives.gov.uk/ukgwa/20121205231108/http://www.bis.gov.uk/files/file14364.pdf> [Accessed 10/04/26]
- Farmer, M. 2016. The Farmer Review of the UK Construction Labour Model: Modernise or Die. Construction Leadership Council. <https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2016/10/Farmer-Review.pdf> [Accessed 10/04/26]
- Goulding, J.S., and Rahimian, F.P., (Eds.), 2019. *Offsite Production and Manufacturing for Innovative Construction: People, Process and Technology*, Routledge, London, UK, ISBN: 978-1-138-55068-1 <https://doi.org/10.1201/9781315147321>
- Gracey, Aaron. 2020. "Building an Organisational Resilience Maturity Framework." *Journal of Business Continuity & Emergency Planning* 13 (4):313–27. <https://doi.org/10.69554/BBJG1421>
- Green, S.D., 2022. Modern methods of construction: reflections on the current research agenda, *Buildings and Cities*, 2 (1), 653–662. <https://doi.org/10.5334/bc.265>
- Hernes, Tor, Blagoy Blagoev, Sven Kunisch, and Majken Schultz. 2025. "From Bouncing Back to Bouncing Forward: A Temporal Trajectory Model of Organizational Resilience." *Academy of Management Review* 50 (1):72–92. <https://doi.org/10.5465/amr.2022.0406>
- Hillmann, Julia, and Edeltraud Guenther. 2021. "Organizational Resilience: A Valuable Construct for Management Research?" *International journal of management reviews* 23 (1):7–44. <https://doi.org/10.1111/ijmr.12239> Digital Object Identifier (DOI)
- HM Treasury 2021. Build Back Better: our plan for growth, Crown Copyright 2021, ISBN 978-1-5286-2415-2, CCS0221029762 03/21, Available from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/969275/PfG_Final_print_Plan_for_Growth_Print.pdf [Accessed 25/03/24].
- Holling, C. S. 1973. "Resilience and Stability of Ecological Systems." *Annual Review of Ecology and Systematics* 4:1–23. <http://www.jstor.org/stable/2096802>
- Home III, John F, and John E Orr. 1997. "Assessing Behaviors That Create Resilient Organizations." *Employment relations today* 24 (4):29–39. <https://doi.org/https://doi.org/10.1002/ert.3910240405>
- Kantur, Deniz, and Arzu İşeri-Say. 2012. "Organizational Resilience: A Conceptual Integrative Framework." *Journal of management & organization* 18 (6):762–73. <https://doi.org/10.5172/jmo.2012.2155>
- Khoteja, Rejsha, Rashmi Khatri, Nicole Odo, Alexandra Thompson, Amirhossein Mehdipoor, Brandon Searle, and Jeff H. Rankin. 2025. "Advancing Off-Site Construction: Assessing Organizational Maturity and Capabilities in the Canadian Construction Industry." *CIB Conferences* 1 (Article 162). <https://doi.org/10.7771/3067-4883.1915>
- Latham, M. 1994. Constructing the Team. Final Report of the Government/Industry Review of Procurement and Contractual Arrangements in the UK Construction Industry. HMSO, London, UK. <https://constructingexcellence.org.uk/wp-content/uploads/2014/10/Constructing-the-team-The-Latham-Report.pdf> [Accessed 25/03/24].
- Lengnick-Hall, Cynthia A, Tammy E Beck, and Mark L Lengnick-Hall. 2011. "Developing a Capacity for Organizational Resilience through Strategic Human Resource Management." *Human resource management review* 21 (3):243–55. <https://doi.org/10.1016/j.hrmr.2010.07.001>
- Leonard-Barton, Dorothy. 1992. "Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development." *Strategic management journal* 13 (S1):111–25. <https://doi.org/10.1002/smj.4250131009>
- Limnios, Elena Alexandra Mamouni, Tim Mazzarol, Anas Ghadouani, and Steven GM Schilizzi. 2014. "The Resilience Architecture Framework: Four Organizational Archetypes." *European Management Journal* 32 (1):104–16. <https://doi.org/10.1016/j.emj.2012.11.007>
- Nadim, Wafaa, and Jack S Goulding. 2011. "Offsite Production: A Model for Building down Barriers: A European Construction Industry Perspective." *Engineering, Construction and Architectural Management* 18 (1):82–101. <https://doi.org/10.1108/09699981111098702>
-

-
- Nahmens, I., and Ikuma, L. 2012. Effects of Lean Construction on Sustainability of Modular Homebuilding. *Journal of Architectural Engineering*, 18(2), 155-163.
[https://doi.org/10.1061/\(ASCE\)AE.1943-5568.0000054](https://doi.org/10.1061/(ASCE)AE.1943-5568.0000054)
- Ortiz-de-Mandojana, Natalia, and Pratima Bansal. 2016. "The Long-Term Benefits of Organizational Resilience through Sustainable Business Practices." *Strategic management journal* 37 (8):1615–31.
<https://doi.org/10.1002/smj.2410> Digital Object Identifier (DOI)
- Pan, W., Gibb, A. and Dainty, A. 2005. Offsite modern methods of construction in housebuilding: perspectives and practices of leading UK housebuilders. Loughborough: Buildoffsite, UK
https://www.buildoffsite.com/content/uploads/2015/04/Offsite_modern_methods_construction_housebuilding.pdf [Accessed 10/04/26]
- Parliament 2018. What are the barriers in the wider uptake of off-site manufacture? Lords Select Committee, <https://www.parliament.uk/globalassets/documents/lords-committees/science-technology/off-site-manufacture-for-construction/off-site-manufacture-construction-ev.pdf> [Accessed 10/04/26].
- Powley, Edward H. 2009. "Reclaiming Resilience and Safety: Resilience Activation in the Critical Period of Crisis." *Human relations* 62 (9):1289–326. <https://doi.org/10.1177/0018726709334881>
- Rabeneck, A., 2021. A history of failed dreams: Modern methods of construction and Kattera [Commentary], *Buildings & Cities*. Available from:
<https://www.buildingsandcities.org/insights/commentaries/mmc.html> [Accessed 10/04/26]
- Sahebjamnia, Navid, S Ali Torabi, and S Afshin Mansouri. 2015. "Integrated Business Continuity and Disaster Recovery Planning: Towards Organizational Resilience." *European journal of operational research* 242 (1):261–73. <https://doi.org/10.1016/j.ejor.2014.09.055>
- Salvato, Carlo, and Roberto Vassolo. 2018. "The Sources of Dynamism in Dynamic Capabilities." *Strategic management journal* 39 (6):1728–52. <https://doi.org/10.1002/smj.2703>
- Schoemaker, Paul JH, Sohvi Heaton, and David Teece. 2018. "Innovation, Dynamic Capabilities, and Leadership." *California management review* 61 (1):15–42. <https://doi.org/10.1177/0008125618790246>
- Sheffi, Yossi, and James B Rice Jr. 2005. "A Supply Chain View of the Resilient Enterprise." *MIT Sloan management review* (47):41–48. Available from: <https://sloanreview.mit.edu/article/a-supply-chain-view-of-the-resilient-enterprise/> [Accessed 10/04/26]
- Staw, Barry M, Lance E Sandelands, and Jane E Dutton. 1981. "Threat Rigidity Effects in Organizational Behavior: A Multilevel Analysis." *Administrative science quarterly*:501–24.
<https://doi.org/10.2307/2392337>
- Su, Wenjia, and Sebastian Junge. 2023. "Unlocking the Recipe for Organizational Resilience: A Review and Future Research Directions." *European Management Journal* 41 (6):1086–105.
<https://doi.org/10.1016/j.emj.2023.03.002>
- Teece, David J, Gary Pisano, and Amy Shuen. 1997. "Dynamic Capabilities and Strategic Management." *Strategic management journal* 18 (7):509–33. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z)
- Teece, David J. 2007. "Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance." *Strategic management journal* 28 (13):1319–50.
<https://www.jstor.org/stable/20141992>
- van Baardwijk, Nicole, and Patrick Reinmoeller. 2005. "The Link between Diversity and Resilience." *MIT Sloan management review* 46 (4):61–65. ISSN 1532-9194
- Vogus, Timothy J, and Kathleen M Sutcliffe. 2007. *Organizational Resilience: Towards a Theory and Research Agenda*. 2007 IEEE International Conference on Systems, Man and Cybernetics, Montreal, QC, Canada, 2007, pp. 3418-3422, doi: 10.1109/ICSMC.2007.4414160.
- Wang, M., Wang, C.C., Sepasgozar, S. and Zlatanova, S. 2020. A systematic review of digital technology adoption in off-site construction: Current status and future direction towards industry 4.0. *Buildings*, 10 (11), 204. <https://doi.org/10.3390/buildings10110204>
- Wijayarathne, Navodi, Indra Gunawan, and Frank Schultmann. 2024. "Dynamic Capabilities in Digital Transformation: A Systematic Review of Their Role in the Construction Industry." *Journal of Construction Engineering and Management* 150 (11):03124008.
<https://doi.org/10.1061/JCEMD4.COENG-15055>
- Wildavsky, A.B. 1988. *Searching for Safety*. 1st ed. ed. Routledge. ISBN 9780912051185
-

-
- Wilden, Ralf, Siegfried P Gudergan, Bo Bernhard Nielsen, and Ian Lings. 2013. "Dynamic Capabilities and Performance: Strategy, Structure and Environment." *Long range planning* 46 (1-2):72–96. <https://doi.org/10.1016/j.lrp.2012.12.001>
- Yin, R.K. 1984. *Case Study Research: Design and Methods*. SAGE Publications.
- You, Jacqueline. 2023. "An Overview of Organizational Resilience in Research and Strategy: Implications for the Future of Work." *Insights* 23 (3) <https://doi.org/https://doi.org/10.46697/001c.77387>
- Zhou, Qin, Tinkuma Ejovi Edafioghor, Chia-Huei Wu, and Bob Doherty. 2023. "Building Organisational Resilience Capability in Small and Medium-Sized Enterprises: The Role of High-Performance Work Systems." *Human Resource Management Journal* 33 (4):806–27. <https://doi.org/10.1111/1748-8583.12479>[Digital Object Identifier \(DOI\)](#)
- Zollo, Maurizio, and Sidney G Winter. 2002. "Deliberate Learning and the Evolution of Dynamic Capabilities." *Organization science* 13 (3):339–51. <https://doi.org/10.1287/orsc.13.3.339.2780>