

AGILE–LEAN HYBRIDISATION IN CONSTRUCTION

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ABSTRACT

Persistent fragmentation and slow feedback at the design and construction phases undermine planning reliability and increase waste. While Lean Construction and Agile Ways of Working are often seen as complementary, empirical evidence explaining how Agile is hybridised in practice and how such hybrids reinforce Lean outcomes remains limited. This paper reports findings from a Straussian Grounded Theory study of 22 professionals across the Australian Architecture, Engineering, and Construction (AEC) sector. The authors identified five clusters of hybrid practices enacted across design and construction: short-cycle planning and coordination, visual management, iterative design with early validation, rapid issue escalation, and hybrid Agile–Lean teaming. The findings demonstrated how these practices contribute to Lean outcomes, including waste reduction, improved flow, planning reliability, and continuous improvement. Building on these findings, the authors propose an Agile–Lean Hybridisation Model that explains when and why particular practice patterns are effective across project phases and governance contexts, positioning Agile learning cycles at points of high uncertainty and low irreversibility while Lean practices maintain stable flow and reliable commitments. This study contributes a practice-level theory of hybridisation and a contextual selection framework for designing phase-appropriate Agile–Lean hybrids in construction.

KEYWORDS

Lean construction, agile, flow, waste reduction, planning reliability.

INTRODUCTION

Fragmentation and slow feedback at the design and construction phases remain leading causes of rework, late changes, and unreliable planning in construction projects (Riazi et al., 2020). Across delivery models and project scales, teams struggle to maintain flow amid shifting information, interdependencies, and phase-based handoffs, particularly during design development and early construction coordination. These conditions frequently result in the accumulation of unresolved decisions, late design clarifications, and reactive problem-solving that propagate variability downstream and erode planning reliability (Marsh, 2024; Nega et al., 2024; Shehab et al., 2023).

In response, Agile Ways of Working, which emphasises short iteration cycles, frequent feedback, cross-functional collaboration, and lightweight visual controls, are increasingly trialled within construction environments (Moreno et al., 2024). However, the sector's physical

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irreversibility, safety-critical sequencing, and contractual governance structures limit the feasibility of “pure” Agile adoption (Elseknidy et al., 2024). Construction projects must comply with regulatory requirements, formal approval gates, and legally binding commitments that constrain continuous reprioritisation and unfettered iteration. Consequently, teams selectively adapt and embed Agile routines within existing Lean and project management frameworks, giving rise to hybrid forms of practice (Yang & Wang, 2025).

This hybridisation reflects a situated response to the dual imperatives of stability and adaptability. Lean Construction emphasises reliable commitments, flow efficiency, and waste reduction, while Agile foregrounds rapid learning and responsiveness under uncertainty (Poudel et al., 2020). In design and early construction phases, where information is most fluid and coordination demands are highest (Correa, 2020), teams increasingly blend these logics to manage variability without undermining governance and safety.

Despite growing practitioner interest, empirical research explaining how Agile–Lean hybrids are enacted in practice and how they contribute to Lean-relevant outcomes remains limited (Power et al., 2024). Much of the existing literature reports isolated case studies or prescriptive frameworks, offering limited theoretical explanation of the mechanisms through which hybrid practices stabilise flow and reduce waste in construction (Vilca & León, 2024).

This paper addresses this gap by reporting empirical evidence of practice-level hybridisation and its Lean impacts across design and construction. Specifically, the study aims to: (1) identify the hybrid Agile–Lean practices used by project teams, (2) demonstrate the Lean-relevant outcomes these practices enable, and (3) develop an Agile–Lean Hybridisation Model that explains when and why particular practice patterns are effective in different project contexts. The contribution is a contextual, practice-based theory that supports more informed selection and design of Agile–Lean hybrids in construction.

LITERATURE REVIEW

The construction industry continues to face persistent coordination and flow-related challenges, including fragmentation, late issue detection, design–construction misalignment, and significant rework (Love et al., 2023; Riazi et al., 2020). These inefficiencies are widely attributed to sequential workflows, siloed organisational structures, and adversarial contracting arrangements that inhibit early integration and collaborative problem-solving (Bresnen et al., 2025; Mesa et al., 2025). Lean Construction emerged as a response to these structural challenges, extending principles from the Toyota Production System to project-based production systems (Agrawal et al., 2024). Central concepts include the reduction of variability and waste, the stabilisation of flow, reliable commitment-making, and continuous improvement through learning cycles (Shehab et al., 2023). Tools such as the Last Planner System (LPS) operationalise these principles by emphasising collaborative planning, constraint removal, and measurement of plan reliability (Chiu & Cousins, 2020).

Despite its demonstrated benefits in stabilising production and improving reliability, Lean implementation in design and early construction phases operates in contexts characterised by high uncertainty, evolving requirements, and dense interdependencies (Sun et al., 2025). In these conditions, additional mechanisms that accelerate feedback, enhance transparency, and support rapid learning can further strengthen Lean’s capacity to maintain flow and reliable commitments (Pérez et al., 2024; Shim et al., 2024). Empirical studies indicate that when short learning cycles and cross-disciplinary visibility are embedded alongside Lean planning systems, projects are better able to surface design misalignments, decision dependencies, and coordination risks earlier, thereby reinforcing waste reduction and planning reliability across the design and construction phases (Power et al., 2024).

Agile methods, originating in software development, were designed to address similar conditions of uncertainty, interdependency, and evolving requirements through short iteration

cycles, frequent stakeholder feedback, cross-functional teams, and visual management of work (Dong et al., 2024). The conceptual alignment between Lean and Agile has been widely noted. Both emphasise early stakeholder engagement, reduction of batch sizes, transparency of work, and continuous improvement. Notably, elements of Agile practice are already embedded within Lean Construction tools such as LPS, including daily huddles, weekly planning cycles, and team-based commitment-making (Moreno et al., 2024; Yang & Wang, 2025). This overlap suggests a natural basis for integration rather than competition between the two philosophies.

In construction, early applications of Agile have focused on design management, BIM-enabled coordination, short-cycle decision-making, and iterative digital reviews (Moreno et al., 2024; Shim et al., 2024). These practices support Lean objectives by reducing information waste, improving flow across interfaces, and accelerating learning cycles (Power et al., 2024).

Despite its considerable strengths, Lean Construction exhibits persistent limitations in early design coordination, where uncertainty, incomplete information, and volatile decision environments dominate (Correa, 2020). Lean planning systems such as the Last Planner System are designed to stabilise workflow and minimise variability in production, and therefore rely on relatively stable information inputs (Power et al., 2024). These conditions do not characterise early design, where unresolved assumptions, late information, and fragmented coordination often result in interface clashes and rework. Agile learning cycles address this informational variability through iterative planning, rapid feedback, and cross-disciplinary visibility, enabling earlier assumption testing and reducing late-stage changes (Yang & Wang, 2025). Contrary to concerns that hybridisation adds complexity, hybrid Lean-Agile approaches function as mechanisms for managing inherent project complexity by surfacing interdependencies earlier, compressing decision cycles, and replacing reactive corrections with proactive adjustment (Power et al., 2024; Yang & Wang, 2025).

Besides that, the emerging literature increasingly refers to this phenomenon as hybridisation, whereby Agile routines are selectively embedded within Lean and project management frameworks to create situated, phase-appropriate ways of working (Ozorhon et al., 2022). While case-based evidence demonstrates promising outcomes, the literature lacks theory explaining how hybrid practices are selected, how they operate in different project contexts, and what mechanisms connect them to Lean outcomes such as waste reduction, flow stabilisation, and planning reliability.

These gaps affirm the need for a context-appropriate hybrid approach. The empirical findings presented here demonstrate how project teams naturally blend Agile and Lean practices to address these challenges and how such hybrids consistently reinforce Lean outcomes building toward a practice-level explanatory model of when and why particular hybrid forms are effective across varying project conditions. This study responds to these gaps by developing a practice-level, empirically grounded theory of Lean-oriented hybridisation across design and construction phases.

METHODOLOGY

This research adopts an interpretivist epistemological stance and employs Straussian Grounded Theory to examine how Agile–Lean hybrid practices are enacted and with what consequences in construction project contexts. Grounded Theory is suited to studying under-theorised processual phenomena through inductive analysis, systematic coding, and constant comparison (Groen et al., 2017).

Data were collected through 22 semi-structured interviews with professionals across the Australian AEC sector, as tabulated below. Participants included design managers, project managers, construction planners, digital engineering leads, and organisational leaders involved in projects ranging from public infrastructure to commercial and institutional developments.

The sample was selected to capture variation across roles, organisational positions, and project phases, enabling examination of hybrid practices across the design and construction phases.

Table 1: Summary of participant profiles

Participant	Role & Experience	Agile Exposure
PM01	Principal consultant, 25+ years in strategic program leadership	Thought leadership, PM bodies
PM02	Systems engineer & agile coach	Digital tools, agile delivery
PM03	Consultant, 20+ years, multi-disciplinary	Agile certified
PM04	Senior leader, 35+ years	Governance, risk, reviews
PM05	Capital delivery expert, 18+ years	PMP, lifecycle delivery
PM06	ICT & business leader, 35+ years	SAFe, agile transition
PM07	Global delivery transformation lead	Design thinking, agile
PM08	Project manager & civil engineer	Hybrid, agile methods
PM09	Architect & product leader	3D, digital platforms
PM10	Senior advisor, 10+ years	Agile, AI, analytics
PM11	Executive, 20+ years	BIM, GIS, agile
PM12	Portfolio & PMO leader	Agile governance
PM13	Senior PM, 20+ years	Agile-inspired planning
PM14	Design manager, 15+ years	Adaptive design
PM15	Site engineer, 8 years	Informal iteration
PM16	Contracts administrator, 10 years	Contract–agile tension
PM17	State project director	Transparency methods
PM18	Structural engineer, 12 years	Lean, hybrid
PM19	BIM specialist	Iterative modelling
PM20	Superintendent	Agile exposure
PM21	Interior architect, 18 years	Agile exploration
PM22	Construction manager	Agile trials

Interviews focused on participants' experiences of planning, coordination, decision-making, and improvement practices in design and construction, with particular attention to adaptations of Agile and Lean routines. Interviews were audio-recorded and transcribed verbatim. Supplementary data included field notes and a reflexive research journal to support memoing and analytical sensitivity.

The analysis followed the Straussian coding sequence of open, axial, and selective coding. During open coding, transcripts were examined line-by-line to identify practices, actions, and outcomes related to planning, coordination, and learning. Axial coding focused on identifying relationships between categories, linking practice adaptations to their observed consequences. Selective coding integrated these into a coherent explanatory framework (Hoda, 2021).

Constant comparison was employed throughout, both within and across interviews, to refine categories and ensure theoretical saturation. Analytical memos documented emerging patterns, hypotheses, and boundary conditions. The purpose of this paper is to report the resulting clusters of hybrid practices, their outcomes, and the Hybridisation Model that explains their operation.

To illustrate how coding decisions were made and how interview data were translated into the five clusters presented later in the Findings, Table 2 shows an excerpt from the coding process. Quotations are anonymised using participant identifiers (e.g., PM07).

Table 2: Example of coding progression from quotations to clusters

Interview Quote	Open Code	Axial Category	Final Cluster
“We started doing daily huddles just to keep everyone aligned. It helped surface issues quickly before they became bigger.” (PM08)	Daily huddles; surfacing issues early; alignment	Short-term coordination routines that reduce delays	Short-Cycle Planning & Coordination
“Putting everything on a board meant no one could hide the bottlenecks. You could see exactly where decisions were stuck.” (PM14)	Visualising work; exposing bottlenecks; transparency	Visual controls improving cross-discipline coordination	Visual Management of Work & Information
“We would sketch options in the model and test them with the builders in the same session. It saved us from revisiting decisions months later.” (PM19)	Rapid option testing; early validation; BIM-enabled iteration	Early detection of design–construction misalignments	Iterative Design with Early Validation
“We didn’t wait for weekly meetings anymore. If something was stuck, we escalated it straight away to whoever had the authority.” (PM17)	Immediate escalation; shortening decision cycles	Removing decision-making delays	Rapid Issue Escalation & Decision Cycles
“The retrospectives helped us understand where our handoff rules were breaking down. Everyone felt safer raising what wasn’t working.” (PM11)	Reflection rituals; improving handoffs; psychological safety	Shared ownership of improvements	Hybrid Agile–Lean Teaming

This excerpt demonstrates how practice-level behaviours identified in raw data were progressively aggregated into five recurrent clusters. The goal of this research was to develop an empirically grounded explanation of how Agile–Lean hybrid practices operate across the design and construction phases and why they reinforce Lean outcomes.

FINDINGS

ADDRESSING AIM 1: IDENTIFYING HYBRID PRACTICES

The five recurrent clusters of hybrid practices reported in this section were derived inductively through Straussian Grounded Theory analysis. Rather than being pre-determined by existing

literature, they emerged through systematic open and axial coding of 22 interview transcripts. Literature was introduced exclusively at the selective coding stage, fulfilling its role in Straussian methodology as a comparative and refinement tool, not a generative one.

The data indicate that Agile is rarely adopted in its canonical form within construction projects. Instead, teams selectively translate Agile routines into construction-fit behaviours that align with formal governance, safety requirements, and contractual obligations, while reinforcing Lean objectives of flow and waste reduction. Five recurrent clusters were identified across the dataset.

The first cluster, short-cycle planning and coordination, involved teams introducing daily huddles and weekly or biweekly micro-planning windows, typically nested within formal master schedules. These short cycles created smaller, near-term commitments that complemented long-range planning and phase gates. By surfacing constraints early and breaking work into manageable increments, teams reduced the accumulation of unresolved issues and improved the reliability of handoffs between design and construction. Rather than displacing formal planning systems, short-cycle coordination operated as a stabilising layer that maintained flow within governance constraints. Participants described these routines as pulling decisions forward and creating a shared rhythm that aligned multiple disciplines around immediate priorities.

The second cluster, visual management of work and information, encompassed the widespread use of physical and digital Kanban boards, decision logs, and lightweight dashboards to make queues of design tasks, RFIs, approvals, and clashes visible across organisational boundaries. This transparency supported pull-based coordination by revealing bottlenecks and surfacing dependencies between disciplines. Participants reported reductions in information hunting, duplicated effort, and misaligned expectations, particularly in multidisciplinary design environments. Visual management tools functioned as shared boundary objects that enabled common understanding without recourse to extensive formal documentation.

The third cluster, iterative design with early validation, involved time-boxed design sprints that integrated client, constructor, and specialist input through BIM-enabled reviews and rapid option testing. These iterations surfaced constructability issues, regulatory concerns, and stakeholder misalignments earlier in the project lifecycle, shifting problem discovery upstream and reducing late-stage design changes and downstream rework. Participants emphasised that digital rehearsal through models and visual mock-ups enabled experimentation without the risks associated with physical irreversibility.

The fourth cluster, rapid issue escalation and decision cycles, featured simplified escalation pathways and cadence-based decision points that shortened turnaround times for clarifications and approvals. Participants reported reductions in decision latency from weeks or months to days or weeks across many design and coordination issues. These accelerated cycles reduced waiting waste and prevented the accumulation of unresolved dependencies that would otherwise disrupt downstream work, relying on pre-agreed decision forums and authority thresholds embedded within formal governance structures.

The fifth and final cluster, hybrid Agile–Lean teaming, saw cross-disciplinary micro-teams comprising designers, construction planners, and key subcontractors adopt facilitative leadership behaviours akin to Scrum Master roles. Regular retrospectives and psychological safety rituals supported continuous improvement and collective problem ownership. Lean commitment-based planning was reinforced through Agile-style reflection cycles, creating shared accountability for both plan reliability and learning. Participants highlighted improvements in trust, transparency, and willingness to raise problems early as distinguishing features of this cluster.

ADDRESSING AIM 2: LEAN-RELEVANT OUTCOMES OF HYBRID PRACTICES

The five practice clusters produced consistent outcomes aligned with core Lean principles. In terms of waste reduction, earlier clash detection, constructability input, and stakeholder validation collectively reduced design-related rework in later project phases. Shorter decision cycles and right-sized documentation further attenuated waiting and overprocessing, with participants reporting that many RFIs were prevented altogether through earlier integration and visual coordination.

Flow and coordination also improved markedly. Short planning cycles combined with visual management smoothed discipline handoffs and reduced batch sizes of unresolved issues, while near-term work became more stable — particularly at the end of the design phase, where interdependencies are most pronounced. This stability was reinforced by gains in planning reliability: smaller, time-boxed commitments improved planned completion rates, and Agile cadence-based reviews complemented Last Planner practices by creating regular forums for constraint surfacing and commitment renegotiation.

At the organisational level, the clusters supported both continuous improvement and people-centric outcomes. Regular retrospectives and digital rehearsal institutionalised learning, enabling teams to adapt meeting formats, role definitions, and handoff rules iteratively across cycles. Participants concurrently reported higher motivation, clearer ownership, and more transparent collaboration. Psychological safety rituals allowed problems to be surfaced earlier and resolved without attribution of blame — directly reinforcing Lean's foundational respect-for-people principle.

ADDRESSING AIM 3: AGILE-LEAN HYBRIDISATION MODEL

Construction projects operate under conditions of physical irreversibility, regulatory oversight, and contractual governance that limit continuous reprioritisation and unfettered iteration. At the same time, design and early construction phases involve high uncertainty and intense coordination demands. Hybridisation emerges as a negotiated envelope within which teams retain Lean stability while injecting Agile learning loops where information is most fluid and the cost of change is lowest.

This Agile–Lean Hybridisation Model, developed inductively through the selective coding stage of the Grounded Theory analysis, illustrates a dynamic, iterative relationship between Guiding Principles, Selection Criteria, and Patterns. The Guiding Principles set the intent and boundaries for how agility and lean thinking should be applied, informing and shaping the Selection Criteria used to assess what practices are appropriate in each context. The Selection Criteria then guide the choice of Patterns i.e. concrete methods, techniques, or ways of working, which are tested and refined through practice. The outcomes of these patterns feedback to validate or refine both the criteria and the underlying principles, while the principles also constrain and clarify which patterns are suitable. A combination of the three elements forms a reinforcing system that continuously adapts and improves, thus ensuring hybrid ways of working remain intentional, context-appropriate, and aligned with organisational values.

Patterns

Five recurrent patterns were identified as a contextual selection lens. Each pattern blends Agile learning cycles with specific Lean production system concepts, including flow efficiency, pull, reliable commitments, and continuous improvement:

- **Iterative-Design Hybrid:** Agile sprints are embedded within design phases to support early problem framing, option exploration, and constructability validation, while construction remains plan-driven (Chai et al., 2022). Lean concepts of front-end loading and built-in quality are operationalised through early stakeholder integration and BIM-enabled checks that prevent defect generation rather than detecting it downstream (Koo

& O'Connor, 2022; Lappalainen et al., 2022). This pattern is most effective for early clash prevention, reduction of late design changes, and stabilisation of downstream flow.

- **Coordination-Focused Hybrid:** Daily huddles, Kanban boards, and short-cycle coordination are layered onto Last Planner-style planning systems (Ballard & Tommelein, 2021; Fuentes-del-Burgo et al., 2024). Visual work queues function as pull signals, enabling teams to manage work-in-progress and surface constraints before commitments are made. This pattern reinforces reliable promising, reduces variability at handoffs, and improves planning reliability and throughput.
- **Digital-Twin-Enabled Hybrid:** BIM and virtual environments are used for iterative testing, rehearsal, and multi-trade coordination (Johansson & Roupé, 2024). Digital models act as error-proofing mechanisms (poka-yoke) by enabling defect detection and constructability validation in a low-cost, low-risk virtual space (Ailem & Boton, 2026). This pattern supports continuous learning loops and is most effective for defect prevention and early system integration.
- **Contract-Enabled Hybrid:** Alliancing or IPD features enable cross-organisational teams to make real-time adaptations supported by shared commercial incentives (Garcés et al., 2025; Thaloor Ramesh & Nattanmai Swaminathan, 2024). Lean's system-level optimisation is prioritised over local efficiency, and respect-for-people principles are operationalised through transparent decision rights and collective problem ownership. This pattern is most effective where governance flexibility is required to sustain learning and flow across organisational boundaries.
- **System-Scaled Hybrid:** Team-of-teams structures and cascading stand-ups synchronise multiple workfronts and packages across a program or portfolio (Lehtovaara et al., 2022). Lean value-stream thinking is used to align activities across trades and phases (Naser et al., 2023), while Agile cadence establishes regular feedback points for continuous improvement. This pattern is most effective in multi-trade, multi-project environments requiring coherent flow across interconnected delivery systems.

Across patterns, Agile manages uncertainty through rapid learning cycles, while Lean preserves stable flow and reliable commitments.

Guiding Principles

The following principles summarise how hybrid practices are configured to deliver Lean outcomes:

- **Protect flow where irreversibility and safety are high:** In construction, physical irreversibility and safety-critical sequencing require stable production flow. Agile practices therefore avoid task-level iteration in execution and are instead applied to coordination, information flow, and decision-making, ensuring Lean stability is not disrupted (Ozorhon et al., 2022; Power et al., 2024).
- **Enable iteration where uncertainty and reversibility are high:** Agile learning loops create the most Lean value where work is informational and reversible, particularly during design and early coordination. Iterative design sprints and early validation reduce late changes and downstream rework, aligning with Lean's emphasis on building quality in.
- **Differentiate variability types:** Hybridisation is most effective when Agile reduces informational variability (uncertain requirements, incomplete knowledge), while Lean controls process variability (workflow instability, unreliable commitments). Confusing these roles risks either rigidity or instability.

- Virtualise learning before physical execution: Digital-Twin-Enabled hybrids extend Lean waste prevention by shifting experimentation into virtual domains, allowing rapid iteration without physical rework (Sepasgozar et al., 2020).
- Align governance with hybrid practices: Hybrid practices depend on governance arrangements that support collaboration, learning, and trust. Where contracts and leadership behaviours conflict with these conditions, Agile routines struggle to produce Lean benefits (Tetty et al., 2025).

Selection Criteria

The selection of hybridisation patterns is guided by several contextual criteria consistent with Lean production system design. Physical and safety constraints determine whether Agile practices can be applied directly to work packages or should instead be concentrated within coordination and planning routines. Project phase and work-package characteristics shape hybrid suitability: Iterative-Design and Digital-Twin-Enabled hybrids suit early phases, while Coordination-Focused hybrids align with construction execution.

Contractual and governance arrangements exert an equally important influence, with relational contracts enabling broader hybridisation and traditional procurement structures confining Agile to micro-routines operating beneath formal controls. Digital capability amplifies these possibilities by enabling earlier learning and waste prevention, particularly through virtual coordination and model-based validation. Finally, psychologically safe and collaborative cultures improve the sustainability and scalability of Agile–Lean practices.

These principles and selection criteria position hybrid Agile practices as a Lean system-design strategy. Lean stability and Agile adaptability allows projects to protect flow while introducing purposeful learning, improving waste reduction, planning reliability, and coordination under uncertainty. While the model draws conceptually on established Lean Construction principles and Agile learning loops, the structure and logic of the model synthesises disparate practice-level behaviours into a coherent, empirically grounded explanation of how hybridisation operates within real project environments. The model therefore positions hybridisation not as a prescriptive method, but as a selective strategy through which teams balance adaptability and stability across phases of uncertainty and irreversibility.

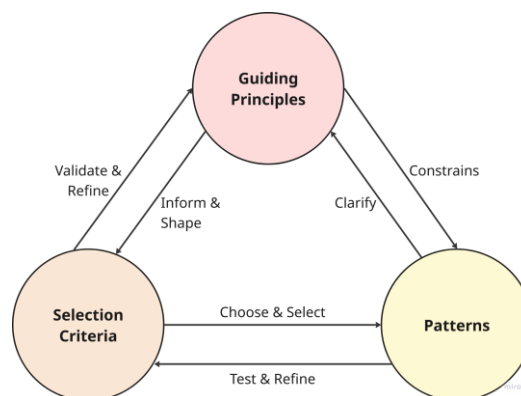


Figure 1: Agile-Lean hybridisation model

DISCUSSION

The findings demonstrate that Lean and Agile are not competing paradigms in construction but complementary logics that, when hybridised contextually, address different dimensions of project uncertainty and variability. Lean anchors planning reliability and flow, preventing coordination from devolving into reactive chaos. Agile reduces information latency and accelerates problem discovery where change is inevitable.

The design and construction phases emerge as a critical leverage point. Hybrid routines convert fragmented, milestone-driven communication into cadence-based collaboration, reducing waiting, rework, and handoff losses. The results suggest that hybridisation should be designed as a phase-appropriate configuration rather than a uniform methodology. Heavy iteration is most effective in design, while coordination-focused cadence and visual management are more appropriate in construction.

Contractual form, leadership behaviour, and digital capability condition the effectiveness of each pattern. Where governance structures support shared risk and rapid decision-making, more adaptive hybrids can be sustained. Where formality and regulatory oversight dominate, hybrid practices function best as stabilising overlays rather than transformative replacements.

CONCLUSION

This study identifies five clusters of Lean-reinforcing hybrid Agile practices and demonstrates their consistent contribution to waste reduction, improved flow, planning reliability, continuous improvement, and people-centric outcomes across design and construction phases. The proposed Lean-oriented Hybridisation Model provides a contextual selection framework that explains when and why particular practice patterns are effective.

The contribution is a practice-level theory of hybridisation grounded in empirical evidence from real project environments. Future research should quantitatively examine the effects of hybrid patterns on performance metrics such as Percent Plan Complete (PPC), RFI volume, and change order rates and levels of digital maturity. Further work is also needed to explore how procurement and governance regimes mediate the sustainability of Agile–Lean hybrids in public-sector construction.

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