Civil Engineering

Capacity building strategies for implementing last planner system in the Sri Lankan construction industry

http://dx.doi.org/10.1590/0370-44672025790071

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Abstract

The Last Planner System (LPS) is a collaborative production planning and control approach in lean construction that improves workflow reliability by converting work into reliable commitments and systematically learning from plan failures. Despite its demonstrated benefits internationally, LPS adoption in Sri Lanka remains limited and often partial, largely due to insufficient organizational and industry-level capacities. This study identifies the capacity requirements for full LPS implementation in the Sri Lankan construction industry and proposes practical capacity-building strategies to address them. Nine expert interviews were conducted using qualitative design and analyzed using qualitative content analysis in NVivo. Nineteen capacity requirements were identified across LPS planning horizons. They were classified as internal (e.g., lean/LPS knowledge, structured training, leadership and change management, communication practices and media, top-management support, and adequate human/technical resources) and external (e.g., client approval processes, external stakeholder support, industrial training capability, lean information infrastructure, and supportive legal and regulatory frameworks). Twenty-five strategies were developed to strengthen these capacities, emphasizing phase-based LPS training and coaching, leadership development, collaborative contract and procurement arrangements, and institutional support mechanisms (e.g., CPD programs and lean information portals). The resulting strategic framework provides an actionable roadmap for contractors, clients, and regulators to enable sustainable LPS deployment in Sri Lanka.

Keywords: capacity building; lean construction; Last Planner System; Sri Lanka; Strategies.

1. Introduction

Construction projects frequently suffer from low planning reliability, fragmented decision making, and reactive control, which contribute to productivity losses, program overruns, cost escalation, and rework (Demircioglu & Can, 2025). These challenges are particularly pronounced in developing-country contexts where the industry operates under volatile market conditions, resource constraints, and institutional uncertainty (Malla, 2024). Recent evidence from Sri Lanka highlights persistent sector-wide disruptions, such as payment delays, material cost fluctuations, labor shortages, and political interference, all of which intensify the need for more reliable planning and production control at the project level (Pathirana *et.al*., 2026).

Lean construction offers a production-oriented perspective for managing variability and improving flow. Within lean construction, the Last Planner System (LPS) is a structured method for collaboratively planning and controlling production, linking long-term milestones to phase planning (pull planning), lookahead planning (constraint removal), weekly work planning (commitment planning), and learning through measures such as Percent Plan Complete (Fernández *et al*., 2025; Hamerski *et al*., 2024; Maponga *et al*., 2026). Recent reviews confirm that LPS has been implemented and studied across multiple regions and project types, and that it remains a central mechanism for improving planning reliability and coordination (Agrawal *et al*., 2024; Lagos *et al*., 2026).

In the Sri Lankan context, previous studies report barriers to LPS adoption, including conventional planning and execution procedures, limited coordination among project parties, contractual structures that discourage collaboration, and inadequate organizational capabilities to sustain all LPS phases (Madushanka T. & Ranadewa K., 2022). While these studies recognize barriers, there is limited empirical research that translates them into a coherent set of capacity requirements and actionable capacity-building strategies tailored to Sri Lanka.

Accordingly, the aim of this study is to identify the capacity requirements and propose capacity-building strategies for the full implementation of LPS within the Sri Lankan construction industry. The study focuses on large-scale projects delivered by established contracting organizations (where planning complexity and multi-stakeholder coordination are most evident), while recognizing that smaller projects and SMEs may face different constraints.

The research objectives are to: (1) synthesize, from literature, the capacities that enable LPS implementation; (2) explore, through expert interviews, the context-specific internal and external capacities required in Sri Lanka; (3) identify capacity-building strategies to develop these capacities; and (4) integrate the results into a strategic framework that can guide implementation initiatives.

1.1 Literature review

This section introduces the last planner system (LPS) and reviews the capacities and capacity-building strategies reported in literature, with attention to the Sri Lankan construction context.
Overview of the last planner system (LPS)

LPS was developed to improve the reliability of project production by shifting planning from optimistic forecasting to reliable commitments. It emphasizes the role of the 'last planners' (those closest to the job, such as foremen or discipline leads) in making and negotiating commitments that can be executed (Appireddy & George, 2025). A typical LPS implementation links multiple planning horizons: (i) master scheduling to set milestones; (ii) phase planning (pull planning) to design handoffs and sequencing; (iii) lookahead planning to identify and remove constraints; (iv) weekly work planning to generate executable commitments; and (v) learning and continuous improvement based on performance feedback, such as Percent Plan Complete (Lagos *et al*., 2026).

Because LPS is a socio-technical system, its effectiveness depends not only on tools (e.g., meeting routines, visual boards, software) but also on behaviors and organizational conditions, such as collaboration, leadership support, transparency, and disciplined learning. Consequently, many studies emphasize that implementation success requires deliberate capability and capacity development at both organizational and industry levels (Agrawal *et al*., 2024).

1.2 Capacity requirement to enable LPS

Capacities refer to the human and technological resources, managerial skills, and interrelated networks required to achieve predefined objectives (Dayal *et al*., 2025). In LPS implementation, capacities span technical knowledge of LPS practices, collaborative behaviors, leadership and change management, as well as enabling project and institutional conditions.

Table 1 summarizes a focused literature synthesis on capacities that enable successful LPS implementation. In addition to core capabilities such as training, leadership, collaboration, and adequate resourcing, recent work continues to highlight the importance of institutional support mechanisms and disciplined learning routines that sustain LPS practices beyond pilot stages (Dayal *et al*., 2025). Capacity building to enable LPS in the Sri Lankan construction industry.

Capacity building is a cyclical process that develops individual, organizational, and institutional strengths to achieve improved performance over time (Merino, 2012). In Sri Lanka, longstanding studies identify structural challenges, including limited government support, gaps in workforce skills, and variable adoption of technology and management practices (Madushanka T. & Ranadewa K., 2022). More recent evidence suggests that these pressures remain relevant and are compounded by sector disruptions (e.g., labor shortages, payment delays, and regulatory uncertainty), reinforcing the need for robust planning and control capabilities at the project level (Pathirana *et al*., 2026).

From an LPS perspective, capacity building must address both behavioral and structural conditions. Behavioral capacities include commitment management, collaborative decision making, and disciplined learning from plan failures. Structural capacities include training provision, time allocation for planning routines, and contractual and organizational arrangements that support transparency and collaboration (Ballard & Howell, 2010; Daniel *et al*., 2017).

Technology and information management can further enable LPS. While traditional implementations rely heavily on visual management and meeting routines, recent research demonstrates growing interest in digital support for constraint management, knowledge reuse, and dynamic replanning across LPS stages (Agrawal *et al*., 2024). For Sri Lanka, this implies that capability

development should include not only basic planning tools but also the competencies required to integrate digital planning and information platforms with LPS routines.

In summary, literature indicates that enabling LPS requires internal capacities within organizations (people, leadership, processes, and resources) and external capacities shaped by clients, regulators, and professional institutions. The empirical component of this study therefore investigates which capacities and strategies are most critical for the Sri Lankan construction industry and how they can be operationalized.

Table 1 - Capacities to be developed to enable LPS (Literature Synthesis).

	Capacities to be required	References																
		2000-2005					2005-2020											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Internal	Training and Induction Process		✔		✔	✔			✔	✔							✔	✔
	Organization's inertia and resistance to change		✔	✔		✔		✔	✔						✔	✔		
	Human Capital and Resistance to Adopting New Systems.				✔		✔						✔	✔		✔	✔	✔
	Proper quality assignments/ Human capital, skill, and experience.				✔		✔						✔	✔		✔	✔	✔
	Leadership and management skills of professionals.		✔				✔		✔									✔
	Commitment to using LPS & attitude towards the system	✔							✔						✔			✔
	Team chemistry and collaboration						✔		✔					✔				
	Internal Stakeholder Support	✔								✔								
	Suitable contractual structure	✔								✔								
	Field management										✔				✔			✔
	Resource additions, staff, meetings, participation, and time		✔								✔							
	Full implementation of LPS on time																	✔
	Physical integration						✔											
External	External stakeholder support	✔								✔								
	Formation of regulations	✔								✔								

1-Garza *et al.* (2000), 2-Alarcon *et al.* (2002), 3- Fiallo *et al.* (2002), 4- Kim *et al.* (2005), 5- Koskenvesa *et al.* (2005), 6- Arbulu *et al.* (2006), 7- Ansell *et al.* (2007), 8- Ballard *et al.* (2007), 9- Jang *et al.*, (2007a), 10- Jang *et al.* (2007b), 11- Kemmer *et al.* (2007), 12- Kim *et al.*(2007), 13- Sterzi *et al.* (2007), 14- Alsehaimi *et al.* (2009), 15- Hamzeh (2009), 16- Jara *et al.* (2009), 17- Schöttle *et al.* (2019)

2. Research methodology

A qualitative research design was adopted to capture expert insights on the capacities and strategies required for LPS implementation in Sri Lanka.

2.1 Research design and phases

The study was organized into four phases to ensure traceability between the literature and empirical findings: Phase 1- literature review and initial capacity list development; Phase 2- development of the interview protocol and pilot refinement; Phase 3- expert interviews to identify and contextualize capacity requirements; and Phase 4- expert elicitation of capacity-building strategies and synthesis into the final strategic framework.

2.2 Participant selection and sampling

Judgmental (purposive) sampling was used to recruit participants who could provide informed perspectives on project planning and control, collaboration across project parties, and implementation challenges associated with introducing new management systems. Participants were selected to ensure direct involvement in project delivery roles linked to planning, control, and coordination (e.g., project management, planning, contracts/disputes, or monitoring functions), and exposure to practices related to lean construction and/or overseas project environments where collaborative planning approaches are more established. Respondents are anonymized as R1–R9.

The adequacy of nine interviews was evaluated against the study scope and the richness of the expert population. Empirical guidance indicates that many qualitative interview studies with relatively focused objectives and homogenous expert populations reach code-level saturation within approximately 9-17 interviews (Hennink & Kaiser, 2022).

2.3 Data collection

Semi-structured interviews were used to allow a consistent set of prompts while enabling participants to elaborate on context-specific barriers, capacities, and strategies. The interview guide covered: (i) the wider industrial problems that LPS could address; (ii) internal and external capacities required for implementing the LPS phases; and (iii) feasible strategies for building these capacities within Sri Lanka.

2.4 Data analysis

Interview data were analyzed using qualitative content analysis with an iterative coding process. An initial deductive coding structure was derived from the literature-based capacity list (Phase 1), and inductive codes were added when new concepts emerged from the interviews. Codes were then grouped into higher-level categories representing (a) capacity requirements and (b) capacity-building strategies. NVivo was used to support data management, coding, retrieval, and category refinement, but the analytical logic was based on the coding and categorization procedure rather than the software itself.

3. Research findings

This section reports the empirical findings derived from the semi-structured interviews and is presented in two stages aligned with the research phases described in the Methodology: Phase 3 (capacity identification) and Phase 4 (strategy elicitation). Findings are reported as (i) capacities required to implement LPS within the Sri Lankan construction industry and (ii) strategies proposed by experts to build those capacities. To reduce the risk of misinterpretation, each capacity and strategy is briefly explained after the corresponding table and selected verbatim interview excerpts are provided to illustrate how these issues manifest in practice.

3.1 Capacities to implement lps in the Sri Lankan construction industry

The literature review identified a set of internal and external capacities relevant to LPS implementation. In Phase 3 (capacity identification stage), interview respondents (R1-R9) were asked to identify and prioritize the most critical capacities separately under internal and external environments, required for the successful implementation of LPS in Sri Lanka. Responses were recorded and subsequently triangulated with the literature review. Table 2 summarizes the capacities identified by each respondent.

Table 2 - Capacities identified by respondents (internal and external).

	Capacities	R1	R2	R3	R4	R5	R6	R7	R8	R9
Internal	Professional development	☐	☐	☒	☒	☐	☒	☐	☒	☒
	Knowledge about lean	☒	☒	☐	☒	☒	☒	☒	☐	☒
	Top management support	☐	☒	☐	☐	☐	☒	☒	☐	☒
	Required human resources, such as planners	☐	☒	☐	☐	☐	☒	☒	☐	☒
	Individual commitment	☒	☐	☒	☒	☐	☒	☒	☐	☒
	Employee's resistance to change via top management influence	☐	☒	☒	☐	☒	☐	☐	☒	☐
	Organization's contractual structures	☐	☒	☐	☒	☐	☒	☒	☐	☐
	Communication skills	☐	☐	☒	☐	☒	☒	☐	☒	☐
	Communication medium	☐	☐	☒	☐	☒	☒	☐	☒	☐
	Training LPS	☒	☒	☐	☒	☒	☒	☐	☒	☐
	Develop attitudes	☒	☐	☒	☒	☐	☐	☐	☐	☐
External	Lean information portals	☐	☒	☐	☐	☒	☒	☐	☒	☐
	Research and Development	☐	☒	☐	☐	☐	☒	☒	☐	☒
	Preparation of a Lean base	☐	☐	☒	☐	☒	☒	☐	☒	☐
	Industrial training capabilities	☐	☐	☐	☐	☐	☒	☐	☒	☒
	Legal framework	☒	☒	☐	☒	☐	☒	☐	☐	☒
	External stakeholder support	☒	☒	☐	☐	☒	☐	☒	☐	☐
	Proper approval procedure from the client to top management	☒	☐	☐	☐	☐	☒	☐	☒	☒
	Increase the government's influence.	☒	☒	☒	☒	☒	☒	☒	☒	☒

The interviews reinforced that LPS implementation is constrained by both organizational and wider industrial conditions. Eleven internal capacities and eight external capacities were identified. To support consistent interpretation of Table 2, the capacities are clarified as follows.

3.2 Internal capacities

- **Professional development:** Continuous professional development (CPD) and upskilling of project staff in planning, production control, and collaborative ways of working required for LPS.
- **Knowledge about lean:** Understanding lean principles (value, flow, pull, waste reduction, continuous improvement) and how LPS operationalizes these principles on site.
- **Top management support:** Visible commitment from senior management through resourcing, policy decisions, removal of barriers, and reinforcement of LPS behaviors.
- **Required human resources (e.g., planners):** Availability of adequate planning-related roles (e.g., planners, engineers, supervisors acting as "last planners") with time and competence to run LPS routines.
- **Individual commitment:** Reliability of commitments made during planning conversations (e.g., willingness to make and keep promises, attend planning meetings, and own constraints removal).
- **Employees' resistance to change (and top management influence):** The organization's ability to manage behavioral resistance via leadership messaging, engagement, and structured change management.
- **Organization's contractual structures:** Contractual and commercial arrangements at the firm/project level that enable collaboration, timely information sharing, and joint planning rather than adversarial behaviors.
- **Communication skills:** Interpersonal and facilitation skills needed for collaborative planning (negotiation, coordination, problem-solving, and conflict management).
- **Communication medium:** Practical mechanisms/tools enabling reliable information flow (e.g., common digital platforms, visual planning boards, standard reporting formats).
- Training on LPS: Structured training that explains LPS components (phase planning, lookahead planning/constraints, weekly work planning, PPC learning) and roles/responsibilities.
- **Develop attitudes:** Building a positive mindset towards collaboration, learning, transparency, and continuous improvement is critical for sustaining LPS routines.

3.3 External capacities

- **Lean information portals:** Industry-level channels that disseminate lean/LPS knowledge (guidelines, case studies, templates, training opportunities).
- **Research and development (R&D):** Engagement of universities/professional bodies/industries in applied research, piloting, and local adaptation of LPS.
- **Preparation of a lean base:** A broader industry culture supportive of lean thinking, so LPS is not introduced in isolation.
- **Industrial training capabilities:** Capability of external training providers to deliver lean/LPS-oriented curricula (rather than purely conventional planning/control).
- **Legal framework (clarified):** The enabling environment created by policies, regulations, standard forms of contract, and public procurement requirements that can legitimize and encourage collaborative planning and reliable commitment management. In this study, legal framework is broadly used to include (i) regulatory/policy support (e.g., guidance notes, industrial mandates, procurement requirements) and (ii) contractual/procurement provisions that explicitly allow or incentivize LPS-compatible practices (e.g., early collaboration, transparent constraint management, shared planning routines).
- **External stakeholder support:** Support and cooperation from clients, consultants, suppliers, and regulators whose participation affects constraint removal and plan reliability.
- **Approval procedure from client to top management:** Decision-making and approval pathways that can either enable timely phase/lookahead planning or create delays that undermine workflow reliability.
- **Increase the government's influence:** Government-led leadership through incentives, standards, training initiatives, and sector-wide programs that accelerate adoption.

To contextualize the capacities above, respondents highlighted the impact of external approvals on maintaining LPS flow. For example, R8 emphasized that rigid approvals can disrupt planning reliability: "*The approval procedure must be flexible enough to perform the LPS stages in ideal status.*"

Regarding the legal framework, participants described the need to enable procurement/contract conditions and for clearer formal guidance to avoid LPS becoming optional under pressure. For example: "*If tender documents and contract conditions don't require collaborative planning routines, LPS becomes a 'nice-to-have' and disappears when the program gets tight; we need clearer procurement requirements and contract clauses that support it.*". This excerpt illustrates why the "legal framework" capacity was coded as an external enabling condition spanning policy/regulation and contract/procurement provisions.

Participants also described how commitment and resistance to change influence the reliability of weekly plans: "*People agree during the weekly planning meeting, but when the site gets busy, they revert to firefighting; without leadership insisting on the commitments and removing constraints, the team slowly stops following the LPS routines.*". This excerpt illustrates how commitment, reliability, and resistance affect weekly work planning and the removal of constraints.

4. Capacity-building strategies to enable LPS in the Sri Lankan construction industry

In Phase 4 (strategy elicitation stage), respondents were asked to propose practical strategies to develop the internal and external capacities required for LPS implementation in Sri Lanka. Proposed strategies were recorded, coded, and then compared against the literature review to confirm alignment and highlight context-specific additions. Table 3 summarizes the strategies identified by respondents.

Table 3 - Capacity-building strategies identified by respondents.

Capacity	Strategies	R1	R2	R3	R4	R5	R6	R7	R8	R9
Internal	Develop the communication skills of participants.	☒	☐	☐	☒	☒	☐	☒	☒	☐
	Lead proper training for employees.	☒	☒	☒	☒	☒	☒	☒	☒	☒
	Improve the leadership skills of participants.	☒	☐	☒	☒	☐	☐	☒	☐	☒
	Conduct knowledge enhancement sessions.	☐	☒	☐	☐	☒	☒	☐	☒	☒
	Human and technical resource addition	☐	☒	☐	☐	☐	☐	☒	☐	☒
	Restructure the organizations based on lean principles.	☒	☒	☐	☒	☐	☒	☐	☐	☒
	Assign experienced team leaders for each team.	☒	☐	☒	☐	☐	☒	☒	☐	☐
	Organize weekly knowledge-sharing sessions with team leaders.	☐	☐	☒	☐	☐	☒	☐	☒	☐
	Hire experienced employees for the projects.	☒	☒	☐	☒	☐	☒	☐	☒	☒
	Incentive system for the best last planners	☒	☐	☒	☐	☒	☒	☐	☒	☐
	Establish a proper communication medium.	☒	☐	☐	☒	☒	☒	☐	☒	☐
External	Improve and provide support to the construction sector through government initiatives.	☒	☐	☒	☐	☒	☐	☒	☐	☒
	Improve human capital for new projects.	☒	☐	☐	☒	☒	☐	☐	☒	☐
	Change the conventional contractual structure.	☒	☐	☒	☐	☐	☒	☐	☐	☒
	Improve legal aspects	☒	☐	☒	☒	☒	☒	☐	☒	☐
	Adopt a lean culture in the industry through relevant regulatory bodies.	☒	☐	☒	☐	☐	☐	☐	☐	☒
	Modify conventional practices of controlling and planning.	☒	☐	☐	☒	☐	☐	☐	☒	☒
	Introduce rules and regulations for planning and controlling.	☐	☒	☒	☐	☒	☒	☐	☐	☒
	Introducing stakeholder management structures.	☐	☒	☐	☒	☐	☐	☒	☐	☒
	Organize lean benefit explanation sessions for dominant construction firms and government officials.	☐	☐	☒	☒	☒	☐	☐	☐	☒
	Establish general planning and controlling standards based on LPS.	☒	☒	☐	☐	☒	☒	☐	☐	☒
	Provide incentive systems or grading systems for the firms that implement LPS.	☐	☒	☒	☐	☒	☐	☐	☒	☐
	Provide frameworks for transitioning from conventional practices to LPS.	☐	☐	☐	☒	☐	☒	☐	☒	☐
	Introduction to university courses.	☐	☐	☒	☒	☐	☒	☐	☐	☒
	Institutional induction programs, such as IESL and IQSSL.	☐	☐	☐	☒	☐	☒	☐	☒	☐

Expert interviews identified eleven internal strategies and fourteen external strategies. Figure 1 integrates the capacities and strategies into a strategic framework that can guide implementation initiatives.

4.1 Brief explanation of the identified strategies

To support the consistent interpretation of Table 3, each strategy is clarified as follows.

4.1.1 Internal strategies

- **Develop communication skills:** Train project teams in facilitation, negotiation, coordination, and problem-solving required for collaborative planning routines.
- **Lead proper training for employees:** Provide structured LPS training aligned to roles and phases (phase planning, lookahead/constraints, weekly work planning, learning via PPC).
- **Improve leadership skills:** Strengthen leadership behaviors that enable commitment planning, remove constraints, and sustain improvement cycles.
- **Conduct knowledge enhancement sessions:** Run periodic CPD sessions, lessons learned, and communities of practice on lean/LPS concepts and site applications.
- **Human and technical resource addition:** Assign sufficient planning-related staff and provide tools/software and time allocation required for LPS routines.
- **Restructure organizations based on lean principles:** Align organizational processes, responsibilities, and reporting to support flow, transparency, and continuous improvement.
- **Assign experienced team leaders:** Appoint competent "last planners" and team leaders to guide commitment planning and constraint removal.
- **Weekly knowledge-sharing sessions:** Institutionalize short weekly forums to review constraints, share learning, and stabilize planning practices.
- **Hire experienced employees:** Recruit staff with relevant planning/lean experience to accelerate implementation and mentoring.
- **Incentive system for best last planners:** Reward reliable planning behavior and performance (e.g., consistent commitments, effective constraints removal, improved PPC).
- **Establish a proper communication medium:** Implement formal communication platforms (digital or visual) to ensure timely information flows across parties.

4.1.2 External strategies

- **Government initiatives/support:** Provide sector-level support (guidelines, pilot programs, funding/training support) to enable adoption.
- **Improve human capital for new projects:** Strengthen education and training pipelines so new entrants understand lean/LPS-based planning and control.
- **Change conventional contractual structure:** Promote contract/procurement models that encourage collaboration and joint planning rather than purely transactional control.
- **Improve legal aspects:** Embed LPS-supportive provisions in relevant standards, public procurement requirements, or regulatory guidance to legitimize new ways of planning and controlling.
- **Adopt lean culture through regulatory bodies:** Use professional bodies and regulators to normalize lean language/practices and promote industry-wide awareness.
- **Modify conventional controlling and planning practices:** Encourage modern planning/control methods that complement LPS implementation rather than contradict it.
- **Introduce rules/regulations for planning and controlling:** Provide sector-level standards that define minimum expectations for planning reliability and transparency.
- **Introduce stakeholder management structures:** Standardize approaches to identify/manage external stakeholders whose actions create constraints to workflow.
- **Lean benefit explanation sessions:** Engage dominant firms and public officials to reduce resistance and build shared understanding of benefits.
- **Establish planning/control standards based on LPS:** Develop standard templates, routines, and reporting structures that are compatible with LPS.
- **Incentive/grading systems for firms implementing LPS:** Encourage adoption through recognition, grading, or procurement advantages.
- **Frameworks for transitioning from conventional practices:** Provide step-by-step implementation roadmaps to reduce risk and improve consistency.
- **Introduction to university courses:** Integrate LPS/lean planning into curricula to build long-term capability.
- **Institutional induction programs (e.g., IESL, IQSSL):** Include LPS modules in professional induction/CPD to mainstream competence.

Respondents emphasized that leadership behaviors strongly influence on-site planning performance. One respondent noted: *"A crew's success depends on the leader's ability to encourage, direct, and manage the team members' skills efficiently."* This excerpt emphasizes the importance of managing people in teams.

Respondents also stressed the importance of a single communication medium to maintain transparent tracking of commitments and constraints: *"WhatsApp messages and phone calls are not enough constraints and promises get lost; we need one shared platform or visible board that everyone updates daily so the plan stays reliable".*

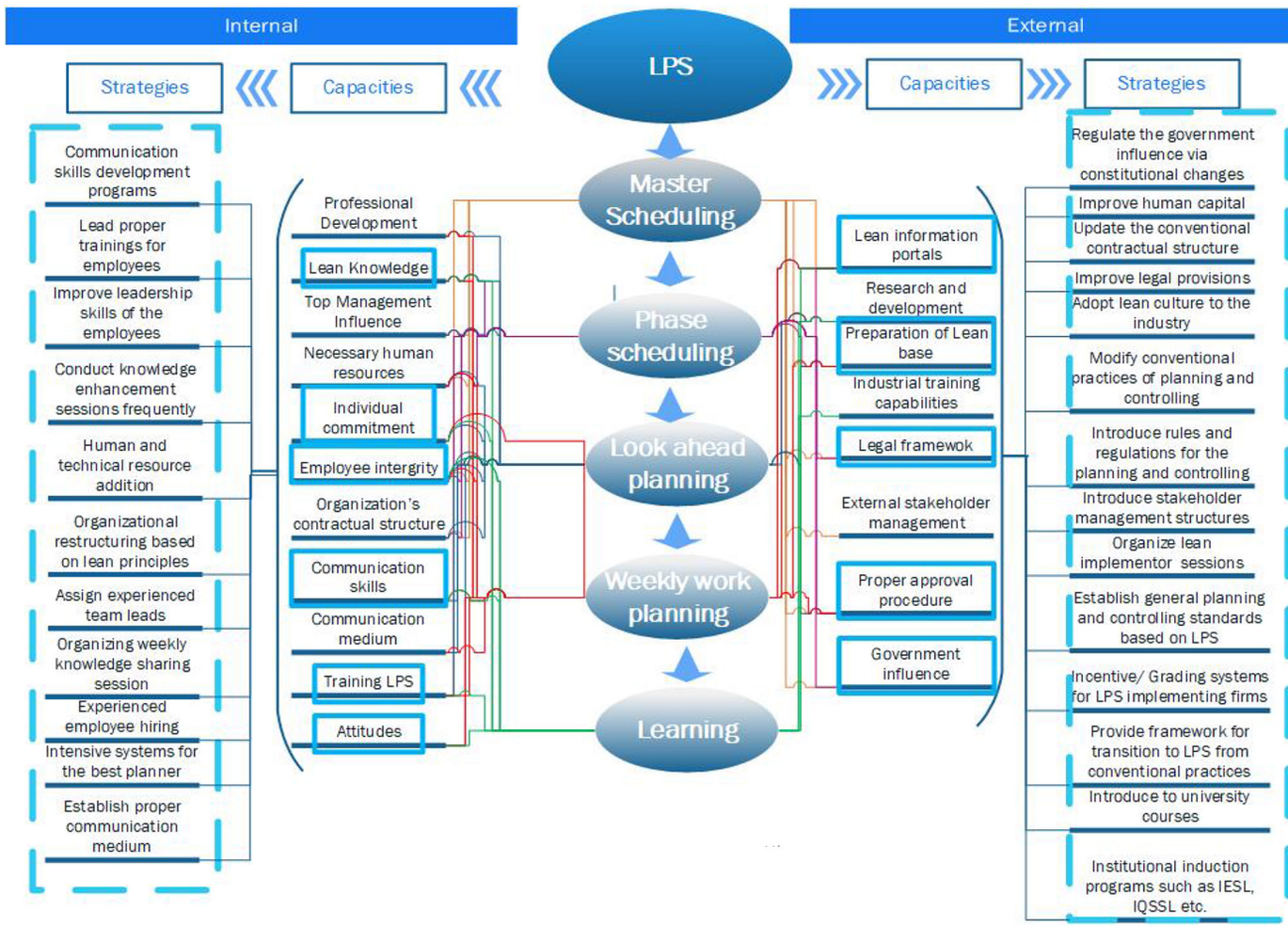

Figure 1 - Strategic framework.

This excerpt emphasizes the importance of having one formal medium of communication.

Finally, respondents linked contractual/legal arrangements to behavior: *"When the contract drives everyone to protect their own scope, people avoid making transparent promises; if we include a requirement for joint planning and shared performance measures, LPS becomes easier to sustain,"* stressing the importance of central regulations.

Figure 1 synthesizes the study findings by mapping internal and external capacities into practical capacity-building strategies. The framework combines (i) capacities derived from literature and (ii) context-specific capacities surfaced by interviewees, reflecting the socio-technical nature of LPS implementation.

Internal capacities emphasized by respondents include professional development and LPS-specific training, lean knowledge, individual commitment, leadership support, appropriate resourcing (including planners and field management capability), and effective communication practices and media. These capacities directly support LPS routines, such as pull planning workshops, lookahead constraint removal, and weekly commitment planning (Ballard & Tommelein, 2021).

External capacities reflect the wider implementation environment. In this study, 'legal framework' is interpreted broadly to include supportive procurement and contracting arrangements (e.g., provisions that encourage collaboration and shared planning), regulatory guidance or client requirements that legitimize LPS practices, and dispute resolution norms that reinforce commitment reliability. Respondents also highlighted the need for flexible client-approval procedures, as overly rigid approvals can delay phase planning and constraint removal. As noted by R8, "The approval procedure must be flexible enough to perform the LPS stages in an ideal status."

Strategies proposed by participants prioritize structured LPS training and coaching, leadership development, and organizational-level communication improvements. For example, one interviewee stressed the role of leadership in maintaining crew performance: "A crew's success depends on the leader's ability to encourage, direct, and manage the team members' skills efficiently." External strategies focus on strengthening institutional support (e.g., CPD and induction programs through professional bodies, establishing lean information portals, and developing, enabling contractual and regulatory mechanisms that make collaborative planning easier to adopt at scale.

5. Conclusions

This study developed a strategic framework for capacity requirements and capacity-building strategies to implement the Last Planner System (LPS) in the Sri Lankan construction industry. Based on a literature synthesis and nine expert interviews, nineteen capacities were identified and classified into eleven internal capacities (e.g., LPS/lean knowledge, structured training, leadership and management change, commitment, communication practices and media, appropriate resourcing, and supportive organizational arrangements) and eight external capacities (e.g., client approval practices, stakeholder support, lean information infrastructure, industrial training capability, and enabling legal and regulatory frameworks). Twenty-five capacity-building strategies were consolidated, highlighting the need for phase-based LPS training and coaching, leadership development, improved communication routines, and industrial-level mechanisms, such as CPD and induction programs, lean information portals, as well as collaborative contracting and procurement provisions. The findings also help situate LPS within the broader international evidence base: LPS has been implemented and evaluated in diverse regions (e.g., Europe, the Middle East, South Asia, and Latin America) and is commonly reported to improve planning reliability and collaboration when implemented as a complete system rather than a set of isolated tools (Daniel et al., 2017; Pathirana et al., 2026; Bhatla et al., 2016; Ballard & Tommelein, 2021).

5.1 Limitations and future research

This study is based on expert interviews and therefore reflects the perspectives of a specific group of experienced professionals. While the results provide actionable guidance, they may not capture the full diversity of constraints faced by small and medium-sized contractors or by highly repetitive housing projects. Future research could: (i) test the framework through longitudinal case studies of live LPS implementations in Sri Lanka; (ii) quantify performance impacts (e.g., PPC trends, rework reduction, schedule reliability); and (iii) investigate how digital tools and automation can support constraint management and learning routines within Sri Lankan project environments (Agrawal *et al*., 2024).

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Received: 26 August 2025 - Accepted: 21 March 2026.

Authors' contributions

Hashan Madushanka (Corresponding author): *writing - original draft (lead), writing - review & editing (lead);* **Udara Arachchige:** *resources (supporting).*

Funding information

There are no funders to report for this submission.

Conflict of interests

The authors declare that there is no conflict of interest.

Data availability

The author states that this manuscript is derived from the Dissertation Project of Hashan Madushanka, entitled "Capacity Building for Enabling Last Planner System in Sri Lankan Construction Industry," submitted in April 2022 to the Department of Building Economics, University of Moratuwa, in partial fulfillment of the requirements for the B.Sc. (Hons) in Quantity Surveying Degree Program. The data associated with this study are available through the QR code provided below.

Associate Editor

Humberto Varum