

CONTINUOUS IMPROVEMENT IN PROJECT-BASED CONSTRUCTION ORGANIZATIONS

Eder Martinez¹, Caroline Beyerle², Louis Pfister³, & Eric Forcael⁴

ABSTRACT

Continuous Improvement (CI) remains difficult to institutionalize in project-based construction organizations, where fragmented project environments and limited cross-project learning restrict the scalability of locally successful initiatives. This study applies an Action Research approach to design, implement, and evaluate a structured CI process within a multinational construction services provider. The resulting framework combines a sequential yet flexible process, standardized problem-solving methods based on PDCA and A3 thinking, digital support tools, and dedicated knowledge exchange structures. A 12-month pilot in the organization demonstrated the ability of newly formed CI teams to systematically identify problems, test solutions through structured pilots, and document insights using a digital improvement-portfolio application. Twenty-three ideas for CI were identified, ten of which progressed to piloting or implementation, covering topics such as digitalization, standardization, safety, and resource efficiency. While the process successfully stimulated local CI activity and established the foundation for cross-project learning, challenges remain in achieving consistent documentation, mobilizing teams for scaling activities, and strengthening organization-wide learning routines. The findings provide practical and theoretical insights into how structured CI systems can be adapted to project-based construction environments.

KEYWORDS

Lean construction, continuous improvement, Plan-Do-Check-Act, A3 thinking, knowledge management.

INTRODUCTION

Continuous Improvement (CI), often referred to as “Kaizen,” is a systematic and sustained effort to enhance products, services, or processes through incremental improvements over time. Therefore, CI success can be understood as the extent to which an organization deliberately identifies and improves its products, services, or processes, and whether these improvements are ultimately achieved in practice (Liker & Meier, 2006). In this regard, organizational culture plays a pivotal role in enabling the adoption of lean construction methodologies within the construction industry (Romo et al., 2025). Rooted in principles of systematic problem-solving, employee involvement, and a commitment to long-term growth, CI enables organizations to

¹ Head of Lean Division Civil Engineering, Implenia AG, Thurgauerstrasse 101A, Glattpark (Opfikon) 8152, Switzerland, eder.martinez@implenia.com, orcid.org/0000-0001-7918-9421

² Head of Lean Civil and Special Foundations Switzerland, Implenia AG, Thurgauerstrasse 101A, Glattpark (Opfikon) 8152, Switzerland, caroline.beyerle@implenia.com

³ Global Head Quality, Implenia AG, Thurgauerstrasse 101A, Glattpark (Opfikon) 8152, Switzerland, louis.pfister@implenia.com

⁴ Professor, Facultad de Ingeniería, Universidad San Sebastián, Concepción 4081339, Chile; eric.forcael@uss.cl, orcid.org/0000-0002-3036-4329

improve quality, reduce waste, and adapt effectively to change (Imai, 1986). While its origins are closely associated with manufacturing, CI has demonstrated its value across diverse production environments, including Project Based Organizations (PBOs) such as the construction industry. The Project Management Institute (PMI) identifies CI as an essential component of project management (PMI, 2021), and scholars consider organizations that successfully integrate CI to be among the most mature in management practices (Backlund et al., 2015).

Effective CI is characterized by its integration into the daily operations of every member of the organization. This includes robust systems for communication, problem-solving, performance measurement, and feedback. Additionally, CI emphasizes training, knowledge sharing, cross-functional collaboration, strategic alignment, and incentive structures (Bessant & Caffyn, 1997). Despite its proven benefits, implementing CI in construction firms presents significant challenges. Unlike manufacturing, where standardization and repetition prevail, the construction industry operates in a project-centric environment. Each project is unique, defined by specific goals, timelines, and teams. This uniqueness exacerbates industry fragmentation, complicating the development of standardized processes and the efficient transfer of knowledge, both of which are critical for successful CI implementation. The inherent tension between project management and CI further complicates this landscape. Project management typically prioritizes temporary alliances to achieve unique outcomes (Ajmal & Koskinen, 2008), whereas CI focuses on repetitive, process-oriented, and holistic improvements. Backlund and Sundqvist (2018) underscore this conflict, noting that the high level of autonomy granted to project managers in PBOs often hinders the adoption of a cohesive, organization-wide approach. This autonomy, coupled with management's strong focus on individual project performance, often runs counter to CI principles that emphasize collective learning and sustained organizational improvements. Consequently, PBOs face structural barriers to embedding CI, including limited standardization, minimal repetition, and fragmented knowledge-sharing practices.

While existing literature acknowledges the feasibility of implementing CI in non-repetitive environments, significant gaps remain in understanding how CI can be effectively and systematically applied within the construction sector. Specifically, the challenges associated with aligning CI processes with the unique dynamics of project-based work remain underexplored. Furthermore, despite anecdotal evidence and successful case studies, systematic approaches to integrating CI across PBOs' organizational spectrum are lacking. This gap underscores the need for research to identify and mitigate the barriers to CI adoption in such contexts. This study addresses this knowledge gap by employing Action Research to design and implement a CI process within a large construction organization. By examining real-world applications, the research aims to provide actionable insights into strategies for integrating CI into PBOs. The study contributes to the broader understanding of performance enhancement in the construction industry, providing a foundation for overcoming the unique challenges associated with CI in project-centric environments.

RESEARCH DESIGN

This study adopts an Action Research (AR) approach. Action research is a participatory and cyclical methodology designed to simultaneously generate scientific knowledge and improve real-world practice. It is grounded in the idea that complex organizational phenomena are best understood by working directly with practitioners in the context where challenges emerge. As such, AR seeks to produce actionable knowledge while simultaneously supporting organizational development (Reason & Bradbury, 2008). The methodological characteristics of AR (its iterative structure, strong practitioner involvement, and emphasis on real-time problem solving) make it particularly well suited for applied research in the construction industry. This approach provides a robust framework for fostering close collaboration between academia and industry practitioners, enabling the generation of context-specific insights and the co-creation

of implementable solutions (Azhar et al., 2010; Connaughton & Weller, 2013). Furthermore, when integrated with lean construction theory, the AR approach provides more practical solutions in real settings (Jang et al., 2011). The AR process is commonly structured around five iterative phases: diagnosing, action planning, action taking, evaluating, and specifying learning (Susman & Evered, 1978). In line with this framework, our study adopts these phases as its methodological backbone, with the corresponding tasks carried out throughout the research cycle. The sequence and alignment of these tasks with the AR phases are summarized in Table 1.

Table 1: Research design

AR phase	Activities carried out in this study
Diagnosing: identifies and understands the primary problem to be addressed. Emphasize a holistic interpretation of the situation.	Identified the key challenges limiting CI adoption by engaging project teams and reviewing existing practices, including a pilot in a small business unit, to build a shared understanding of organizational barriers in a project-based environment.
Action Planning: defines the desired change and develops a plan to achieve it.	Co-developed a structured CI framework with practitioners, defining process steps, roles, tools, and support mechanisms to address diagnosed barriers and ensure applicability across different Business Units.
Action Taking: involves implementing the interventions designed in the planning phase. Researchers and practitioners collaboratively introduce changes into the organization.	Implemented the designed CI process as local teams applied the workflow, used the toolkit and digital app, and piloted improvement ideas in real projects with ongoing support from researchers and facilitators.
Evaluating: assessment of the outcomes by examining whether its expected theoretical effects were realized and determining the extent to which it mitigated the initial problem.	Evaluated the process in practice by reviewing generated ideas, pilot progress, documentation practices, and team experiences to determine whether the approach addressed initial barriers and enhanced cross-project visibility.
Specifying Learning: this phase involves reflecting on the actions taken and abstracting new knowledge.	Reflected on outcomes to identify effective elements, necessary refinements, and enabling organizational conditions, providing insights for strengthening CI in project-based organizations.

TOWARDS SYSTEMATIC CI ADOPTION

STUDY BACKGROUND AND DIAGNOSIS

The study examines a large construction services provider operating across several European countries and business units. In recent years, the organization has positioned lean construction as a central pillar of its operational-excellence strategy. Although substantial progress has been documented, e.g., (Martinez et al., 2024, 2025), the organization continues to face challenges in scaling improvement initiatives developed within its lean construction program.

Due to its multi-country structure, diverse project portfolios, and varying local management practices, the organization experiences significant heterogeneity in how continuous-improvement ideas are implemented. While numerous initiatives have yielded positive results at the local level, they rarely disseminate beyond their original context to

achieve broader organizational adoption. Consequently, optimization efforts with the potential to generate company-wide value remain fragmented and isolated.

The initial hypothesis is that the absence of structured mechanisms for cross-project communication and standardized routines for evaluating, transferring, and institutionalizing local improvement initiatives significantly constrains the ability to scale CI beyond the project level. To address these limitations, the organization appears to require an integrated CI architecture that supports (a) transparent sharing of implemented ideas, (b) systematic evaluation of their potential for broader applicability, and (c) a governance structure that ensures standardization and controlled scaling. Figure 1 conceptually illustrates this challenge by highlighting the gaps between local improvements and organization-wide learning.

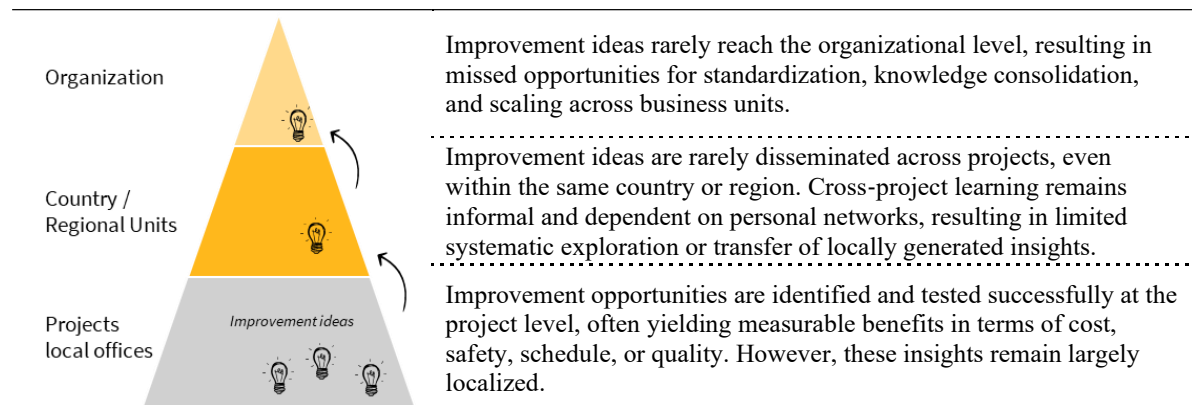


Figure 1: Conceptualization of challenges

DEVELOPMENT PROCESS

Implementing a structured CI process that facilitates the identification, evaluation, and scaling of diverse ideas is viewed as a suitable approach to address these challenges. The process was developed through a series of workshops where the perspectives of local and global functions were considered to derive a process that fits the reality of the organization and the different countries where it is present.

The local viewpoint was incorporated through the learnings and outcomes of a pilot project conducted in a business unit where local CI teams were already established. Since the initial process design was created together with operational staff, the pilot provided direct insights into how the methodology functioned in a real-life context, revealing both strengths and areas requiring refinement. The broader organizational perspective was gathered through active involvement of representatives from the organization's global support functions, including quality management, innovation, and lean construction. To capture their expertise, a series of collaborative workshops was conducted, allowing participants to assess the draft process from an organization-wide standpoint and ensure its compatibility with organization standards and structure. The process was developed iteratively across three cycles, each incorporating feedback from operational teams and corporate functions. This procedure led to clearer roles, refined decision gates, and a stronger link between local experimentation and organizational standardization.

THE CONTINUOUS IMPROVEMENT CONCEPT

The designed process aims to balance governance with organizational agility by providing a structured yet adaptable approach to problem-solving across different organizational levels. It establishes a sequential but flexible workflow that guides improvement ideas from initial generation to potential organization-wide deployment.

Its design is anchored in three core principles. First, employees closest to operations are best positioned to identify problems and propose meaningful solutions; their practical expertise serves as the starting point for the process. Second, selected ideas are tested in pilot projects using a structured problem-solving method based on the Plan–Do–Check–Act cycle, ensuring that solutions are validated in a disciplined and evidence-based manner before wider application. Third, ideas that demonstrate strong value potential can be scaled through a governed process that supports coordinated and consistent division-wide implementation. Together, these principles establish a framework that preserves local ownership while enabling promising solutions to be evaluated, tested, and institutionalized in a systematic and scalable way. The resulting concept, including both the process and its supporting implementation materials, is delivered through three main outputs.

PROCESS AND GOVERNABILITY

A process description with clear workflows was developed to be implemented at different organizational levels. The process begins with an identification phase led by operational teams, who identify improvement opportunities during local workshops or through observations in daily work. The teams prioritize the ideas they consider most relevant, refine the problem definition, and formulate an initial decision basis outlining expected benefits, resource needs, and alignment with local stakeholders. This bottom-up approach ensures that improvement efforts originate from practical experience and address concrete challenges encountered on construction projects.

Once an idea is selected for further exploration, the process transitions into a structured Analyse phase. In this phase, the improvement team examines the current situation, clarifies root causes, evaluates solution options, and develops a clear plan with defined success criteria. This step is essential for bridging intuitive problem recognition with evidence-based decision-making. Ideas showing potential advance to the pilot stage, where they are tested in real project conditions using a structured Plan–Do–Check–Act methodology. The pilot phase allows the organization to validate whether a proposed solution delivers the intended effects, adjust the concept where necessary, and determine whether it is robust enough to be introduced more broadly (e.g., by applying the solution in one project). Eventually, this phase serves as a controlled learning space that reduces implementation risk and generates practical experience before any commitment to broader adoption. Solutions that demonstrate clear benefits in the pilot phase move to the implementation stage, where preparation for wide deployment takes place (e.g., more projects or use in a whole country/region). This final phase addresses a known weakness identified in the initial diagnostic. Namely, the absence of a systematic mechanism for transforming local successes into standardized and scalable practices across different contexts within the company.



Figure 2: CI process overview

The process relies in 4 main roles. **1) CI Teams:** These are temporary, locally formed continuous-improvement teams led by a CI facilitator. They bring together representatives from both operational and support functions (such as project managers, foremen, engineers, HR, and finance) to ensure that improvement initiatives reflect diverse perspectives and the realities of operations and on-site execution. Their role is to identify improvement opportunities, propose solutions, and assess the feasibility and impact of implementing these ideas at the local level. **2) Facilitator:** Coordinates the CI team, prepares and conducts ideation and prioritization

workshops, and guides the group through structured problem-solving methods. In many cases, this role is fulfilled by a local lean specialist who ensures methodological rigor and supports the team throughout the process. **3) Management Teams:** Management provides strategic direction and allocates the resources needed for CI activities. CI teams and facilitators engage with management to present identified opportunities, discuss priorities, and obtain decisions on which ideas should proceed to piloting or implementation. Their involvement ensures alignment with organizational goals and enables the mobilization of necessary support and resources. **4) Implementation Teams:** When an idea moves into piloting or full implementation, a dedicated implementation team is formed. Its composition may differ from the CI team if additional competencies or technical expertise are required. This team is responsible for executing the pilot or rollout and ensuring that the defined objectives are achieved within the agreed scope, timeline, and resource constraints.

TOOLS AND METHODS

The process is supported by a “CI toolkit” designed as a plug-and-play resource that provides the methods and tools required for structured problem-solving. At the centre of the toolkit are the PDCA cycle and the A3 report, which together offer the logic and format for guiding and documenting improvement work.

The A3 report serves as the central structuring and communication tool for CI activities. Its primary role is to ensure that improvement ideas/initiatives follow a disciplined problem-solving logic, while remaining concise, transparent, and aligned with the PDCA cycle. The A3 functions as both a thinking process and a standardized document, supporting teams in clarifying problems, analyzing causes, developing countermeasures, and validating results. The A3 also acts as the formal medium through which temporary CI teams and facilitators document insights from pilots, making the reasoning, data, and lessons learned visible to others in the organization. This process aims to support the overarching ambition of enabling cross-project learning and preventing ideas from remaining localized. The A3 also intends to function as the key decision document for scaling. By providing a clear description of the problem, the tested countermeasures, and the validated results, the A3 enables managers (for example, the management team) to make informed decisions about whether a solution should be pursued, standardized, or even discarded. While the A3 report provides the overarching thinking structure and standard format for documenting the problem-solving process, the CI toolkit supplies the specific methods, templates, and analytical instruments needed to complete each step effectively. Its primary function is to operationalize the problem-solving approach by providing concrete guidance on how to understand the problem, analyse root causes, and test potential solutions. The toolkit includes standardized instruments such as root-cause analysis methods, process-mapping techniques, templates for problem definition, and evaluation forms for pilots. These resources help temporary CI teams work systematically and consistently across construction units and Business Units, ensuring a common standard and strengthening organization-wide learning.

In Figure 3, a low-code application was developed to serve as the digital platform for documenting and sharing information on continuous-improvement initiatives across the organization. The platform provides a standardized structure for progressively capturing data on improvement ideas, including pilot results and implementation summaries, ensuring that insights remain accessible beyond the temporary CI teams that generated them. Facilitators and CI teams can continuously update information as ideas advance through the process, moving them between phases (see Figure 2) as they mature. Each phase allows new data to be added, reflecting the team’s evolving understanding of the problem and the countermeasures being tested. By centralizing this information, the application enables users to review and compare ongoing and completed CI projects, identify proven solutions, avoid duplicating efforts, and

support evidence-based scaling decisions. In this way, the platform complements the A3 methodology by acting as the organizational repository through which learning is shared, and transparency is strengthened across the CI concept. Furthermore, all stored data can be exported into an A3-like report for communication, reporting, or knowledge-transfer purposes.

Figure 3: Improvement portfolio app

TRAINING AND COACHING

A central organizational team supports the distributed improvement teams by facilitating their onboarding to the process and coaching them in applying the accompanying methods and tools. This team plays a critical coordinating role by ensuring consistent application of the process across Construction Units and Business Units, helping teams overcome methodological challenges during pilots, and continuously refining the overall approach based on lessons learned from ongoing projects. To institutionalize cross-project learning, a quarterly remote exchange has been established as the standard interaction format. During these sessions, representatives from improvement teams share progress updates, emerging insights, and early results from their CI projects. This recurring forum provides a platform for higher-level knowledge sharing, enabling teams to learn from each other and identify ideas that may be relevant beyond their immediate context. It also helps surface initiatives that could be adapted for other countries or projects, or that show potential for scaling into organizational standards. Through this mechanism, the central team strengthens cross-project learning and contributes to the overall coherence and maturity of the CI system.

RESULTS

The proposed process, together with all supporting implementation elements (including methods and tools, the digital improvement-portfolio application, and standardized templates) was piloted over a 12-month period across multiple Business Units in different countries. During this pilot, 66% of the Business Units (6 out of 9) established and actively operated local CI teams. These teams identified 23 improvement ideas, of which 10 advanced to pilot testing or full implementation. All initiatives were progressively documented in the digital platform, creating the first structured foundation for cross-project learning and enabling transparent visibility of maturing ideas across the organization. This deployment demonstrated an increase in structured CI activities across units and business areas. The emerging portfolio reflects both the operational relevance of identified problems and the growing capability of newly formed

CI teams to apply the problem-solving approach. Initiatives spanned digitalization, standardization, process optimization, and environmental sustainability, indicating that the methodology was versatile enough to be applied across diverse contexts within the organization.

Two initiatives illustrate the approach to continuous improvement. An online app was ideated and implemented to tackle inefficiencies in managing surplus of construction materials among projects, which were previously handled informally, leading to unnecessary disposal costs and lost reuse opportunities. By creating a transparent, standardized market platform for internal material exchange/sale, the initiative enabled more than CHF 65,000 savings of materials to be reused and generated over 50 listings in the first five months of use. By end of 2025, 38 active postings across Switzerland and Germany confirmed sustained adoption and improved cross-site coordination. Another idea channelled through this process is a “digital drilling protocol” initiative targeting the long cycle times and errors associated with manual, paper-based drilling records. The original process required 55–60 minutes per protocol, delaying progress updates and invoicing. After redesigning the workflow so data is captured directly at the point of work, protocol time dropped to 8.5 minutes, an 80% improvement. Applied to typical drilling volumes, annual data processing costs decreased in a similar percentage enabling potential yearly savings of around 200 k CHF while freeing site personnel for more value-adding tasks. The method has already been transferred to a second major project, demonstrating both replicability and maturity in continuous improvement practice.

The first year of implementation generated clear momentum. Teams showed they could define problems systematically, test solutions through structured pilots, and make their results visible across the organization. The diversity of topics and countries involved demonstrated the approach’s adaptability.

DISCUSSION

This experience generated insights into how CI evolves within a project-based construction environment, revealing both the strengths of the approach and the structural limitations that must be addressed to ensure its long-term sustainability and organizational impact.

DIVERSITY IN IDEA GENERATION

A notable insight from the pilot was the diversity of pathways through which improvement ideas emerged. Ideas were generated through centrally supported initiatives, direct on-site observations, and ongoing local improvement efforts, that were integrated into the new process. Facilitators reported that CI teams actively contributed ideas to address concrete operational challenges, demonstrating meaningful engagement in structured problem-solving. At the same time, some teams approached the initiative as an opportunity to submit individual preferences or isolated requests that did not necessarily align with the principles of systematic CI. This finding reflects a natural early-stage challenge: without a shared understanding of CI concepts, participants may treat the process as a general suggestion channel rather than as a disciplined mechanism for organizational learning. This learning underscores the importance of aligning expectations across teams. Clear communication about what constitutes a CI-relevant opportunity, how prioritization works, and why not all contributions can or should be pursued is essential to maintaining focus and avoiding frustration. CI literature suggests these issues are typical in emerging CI systems and can be addressed through targeted training, strengthened facilitation practices, and continuous reinforcement of the strategic intent behind the CI programs (Bessant & Francis, 1999).

DOCUMENTATION AND COMMUNICATION

Properly documenting the ideas and practices for communication across different team emerged as an area with room for improvement. Although the application was designed to standardize

PDCA documentation and enhance cross-project visibility, adoption varied across teams. Several initiatives were incompletely documented or not uploaded, limiting transparency and weakening one of the core mechanisms of continuous-improvement systems; making problems, insights, and experiments visible beyond the originating team. As a result, the app's dual function as both a documentation tool and knowledge-sharing platform was only partially realized, and inconsistent use reduced the reliability of aggregated reporting. This finding also contributed to unintentional duplication of ideas, as some initiatives were pursued in parallel across different forums without awareness of each other. However, the quarterly exchange meetings proved effective in identifying these overlaps early, facilitating collaboration between teams and helping unify solutions where possible. These sessions demonstrated the system's potential to foster cross-project learning, even when documentation practices were still maturing.

CI BEYOND PROJECTS

Our experience shows that the main barrier in continuous improvement is not idea generation or local problem-solving (where project teams already perform strongly) but the scaling and institutionalization of these local improvements (Bessant & Caffyn, 1997; van Aken & Berends, 2018). While prior research recognizes this difficulty at a general level, our study adds empirical evidence from a real construction context demonstrating why scaling fails: local teams gain little direct benefit from the additional effort required to document, generalize, and support diffusion of their solutions (e.g., Anand et al., 2009). This motivational gap, combined with limited central support for scaling, prevents local improvements from becoming organization-wide routines.

During the implementation of this CI process, we have found improvement ideas that are “good locally” but struggle to translate into stable, organization-wide routines. This tension can be interpreted through the lens of organizational learning and knowledge-transfer theory. Horizontal scaling of CI solutions requires not only technical validity but also mechanisms for codifying, sharing, and recontextualizing knowledge across projects and regions (Boh, 2007). While in principle the CI process implemented in this study (including the A3 methodology, and the digital app) provide such mechanisms in principle, the case shows that they are not automatically used to their full potential. A key reason stemming from this experience is motivational: once a local team has stabilized its own situation, the additional effort required to document, generalize, and support scaling typically yields limited direct benefit for that team. This finding is consistent with research on knowledge sharing and “extra-role” behaviour, which highlights that employees often underinvest in activities that primarily benefit the wider organization rather than their immediate unit (Cabrera & Cabrera, 2002; Cooper et al., 2002).

From this perspective, the question is not only how to scale improvements, but also why local actors should invest in scaling work that may not improve their own project outcomes. Prior studies emphasize that effective CI systems combine process design with enabling conditions such as recognition, autonomy, and targeted incentives for knowledge sharing (Anand et al., 2009; Bessant & Francis, 1999). In our experience, this points to two complementary levers. First, the placement of incentives (formal or informal) that acknowledge and reward contributions to organization-wide standards rather than only local project performance. This result aligns with research showing that both intrinsic motivation (e.g., professional pride, learning) and extrinsic mechanisms (e.g., visibility, career opportunities) shape willingness to share and scale improvements (Osterloh & Frey, 2000). Second, the availability of central resources dedicated to scaling becomes critical, as it reduces the dependency on local teams to carry the full burden of generalization and rollout. As pointed out by Anand et al. (2009), it is a fallacy that CI systems can succeed “... simply by training people

in new process improvement methods without putting in place mechanisms for managing and maintaining CI initiatives.”

Overall, this study indicates that advancing CI “beyond projects” requires more than a technically sound process. It also depends on the deliberate design of motivational structures and central scaling capabilities that make it both feasible and worthwhile for local teams to contribute to solutions that may not generate immediate benefits for their own projects. This finding represents a limitation of the current approach at its present maturity level, but at the same time, an important insight for strengthening the organizational CI architecture.

Taken together, the learnings indicate that the process has successfully mobilized local teams, stimulated idea generation, and established an initial structure for cross-organizational improvement work. However, the initiative is still in an early CI maturity phase and can be seen as a promising beginning, but not yet a fully institutionalized system. The core challenge ahead will be to strengthen the integrative components (standard documentation practices, coordinated governance, and structured learning routines) so that the organization can evolve from isolated improvement activities toward a coherent, division-wide CI culture.

LIMITATIONS

This study has limitations inherent to Action Research, as insights come from a single construction firm and a pilot with limited Business Units, reflecting local culture, maturity, and project specifics. Like typical AR, conclusions are based on a few cases with uncontrolled confounding factors, limiting broad generalization. Researcher involvement in implementation may also have influenced team behaviour, a common issue in participatory approaches. Despite these limitations, the study offers practical insights for implementing CI in construction, with findings serving as an initial foundation rather than proof of system-wide success. Continued monitoring will gather further data, track CI maturity, and refine the process as adoption grows.

CONCLUSIONS

This study demonstrates that structured CI systems can be effectively introduced into project-based construction organizations when supported by transparent processes, standardized problem-solving methods, and an enabling organizational communication and information-sharing infrastructure. The experience in this case shows that local teams are capable of systematically identifying problems, running disciplined pilots, and generating operational improvements across diverse contexts. The integration of PDCA-based methods, A3 reporting, and a low-code digital platform provided the essential framework for creating visibility, comparability, and early forms of cross-project learning.

The results also confirm well-established findings in organizational learning research: the main bottleneck lies not in idea generation but in translating local improvements into scalable, organization-level standards. Variability in documentation, limited incentives for teams to invest in scaling work, and competing project priorities constrained the full realization of the system’s potential. These constraints highlight that CI in project-based environments, particularly in construction organizations, requires more than well-designed processes; it depends equally on motivational structures, central support capabilities, and routines that protect time and attention for learning activities.

This action research study offers two main contributions. First, it provides a practical framework for structuring CI in construction organizations, demonstrating how local experimentation can be connected to governed scaling pathways. Second, the findings call for further development of incentives, documentation discipline, and cross-unit governance to enable sustained organizational learning. Future research should explore how CI systems evolve as maturity increases, how digital platforms can better support knowledge transfer, and

how project-based organizations can balance local autonomy with the need for organization-wide standardization.

REFERENCES

- Ajmal, M. M., & Koskinen, K. U. (2008). Knowledge Transfer in Project-Based Organizations: An Organizational Culture Perspective. *Project Management Journal*, 39(1), 7–15. <https://doi.org/10.1002/pmj.20031>
- Anand, G., Ward, P. T., Tatikonda, M. V., & Schilling, D. A. (2009). Dynamic capabilities through continuous improvement infrastructure. *Journal of Operations Management*, 27(6), 444–461. <https://doi.org/10.1016/j.jom.2009.02.002>
- Azhar, S., Ahmad, I., & Sein, M. K. (2010). Action Research as a Proactive Research Method for Construction Engineering and Management. *Journal of Construction Engineering & Management*, 136(1), 87–98. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0000081](https://doi.org/10.1061/(ASCE)CO.1943-7862.0000081)
- Backlund, F., Chron  r, D., & Sundqvist, E. (2015). Maturity assessment: Towards continuous improvements for project-based organisations? *International Journal of Managing Projects in Business*, 8(2), 256–278. (world). <https://doi.org/10.1108/IJMPB-05-2014-0047>
- Backlund, F., & Sundqvist, E. (2018). Continuous improvement: Challenges for the project-based organization. *International Journal of Quality & Reliability Management*, 35(7), 1306–1320. (world). <https://doi.org/10.1108/IJQRM-12-2016-0229>
- Bessant, J., & Caffyn, S. (1997). High-involvement innovation through continuous improvement. *International Journal of Technology Management*, 14(1), 7. <https://doi.org/10.1504/IJTM.1997.001705>
- Bessant, J., & Francis, D. (1999). Developing strategic continuous improvement capability. *International Journal of Operations & Production Management*, 19(11), 1106–1119. <https://doi.org/10.1108/01443579910291032>
- Boh, W. F. (2007). Mechanisms for sharing knowledge in project-based organizations. *Information and Organization*, 17(1), 27–58. <https://doi.org/10.1016/j.infoandorg.2006.10.001>
- Cabrera, A., & Cabrera, E. F. (2002). Knowledge-Sharing Dilemmas. *Organization Studies*, 23(5), 687–710. <https://doi.org/10.1177/0170840602235001>
- Connaughton, J., & Weller, S. (2013). *Improving collaboration in construction: An opportunity for action research* (S. D. Smith & D. D. Ahiaga-Dagbui, Eds.; pp. 1125–1134). Association of Researchers in Construction Management. <http://www.arcom.ac.uk/>
- Cooper, K. G., Lyneis, J. M., & Bryant, B. J. (2002). Learning to learn, from past to future. *International Journal of Project Management*, 20(3), 213–219. [https://doi.org/10.1016/S0263-7863\(01\)00071-0](https://doi.org/10.1016/S0263-7863(01)00071-0)
- Imai, M. (1986). *Kaizen (Ky'zen), the key to Japan's competitive success*. Random House Business Division. <http://search.ebscohost.com/login.aspx?direct=true&db=cat04202a&AN=ucb.b13947140&site=eds-live>
- Jang, W.-S., Choi, S., Han, S. H., Im, K., & Jung, D. (2011). Integrated Framework for Productivity Improvement: Action Research Approach with Lean Construction Theory. *International Symposium on Automation and Robotics in Construction (ISARC) Proceedings, 2011 Proceedings of the 28th ISARC, Seoul, Korea*, 1134–1140. <https://doi.org/10.22260/ISARC2011/0207>
- Liker, J. K., & Meier, D. (2006). *The Toyota way fieldbook: A practical guide for implementing Toyota's 4Ps*. McGraw-Hill. <http://search.ebscohost.com/login.aspx?direct=true&db=cat04202a&AN=ucb.b15243863&site=eds-live>

- Martinez, E., Pfister, L., & Alarcón, L. F. (2024). *Designing an Effective Training Program for Systematic Lean Construction Implementation*. 1314–1323. <https://doi.org/doi.org/10.24928/2024/0234>
- Martinez, E., Pfister, L., & Forcael, E. (2025). *The Impact of Lean Training Programs on Behavior and Organizational Performance*. 1562–1572. <https://iglc.net/papers/Details/2392>
- Osterloh, M., & Frey, B. S. (2000). Motivation, Knowledge Transfer, and Organizational Forms. *Organization Science*, 11(5), 538–550. <https://doi.org/10.1287/orsc.11.5.538.15204>
- PMI. (2021). *A Guide to the Project Management Body of Knowledge—PMBOK 7th edition* (Number July).
- Reason, P., & Bradbury, H. (2008). *The SAGE Handbook of Action Research*. SAGE Publications Ltd. <https://doi.org/10.4135/9781848607934>
- Romo, R., Orozco, F., Moreno, F., Francesconi, C., Valdebenito, R., & Forcael, E. (2025). *Lean Construction Barriers From the Organizational Culture Lens*. 1321–1332. <https://iglc.net/Papers/Details/2427>
- Susman, G. I., & Evered, R. D. (1978). An Assessment of the Scientific Merits of Action Research. *Administrative Science Quarterly*, 23(4), 582–603. <https://doi.org/10.2307/2392581>
- van Aken, J. E., & Berends, H. (2018). *Problem Solving in Organizations: A Methodological Handbook for Business and Management Students* (3rd ed.). Cambridge University Press. Cambridge Core. <https://doi.org/10.1017/9781108236164>