

Supplementary Material : Evaluation survey

IDENTIFICATION OF BARRIERS TO LEAN CONSTRUCTION IMPLEMENTATION

Lean Construction has been implemented in Peru for more than 20 years and many benefits have been found in its implementation; however, barriers have also been found that prevent its correct implementation in different construction projects.

The present research "The current status of Lean Construction Implementation in Organizations in Peru and proposal of a Roadmap" for the National University of Engineering, Faculty of Civil Engineering. The data will be protected and used confidentially, the results of all stages of the research will be shared with you at the email address you provide.

Please make sure you have set aside at least 12 min to answer this survey, TAKE THE TIME YOU NEED, otherwise the evaluation will not be useful.

GENERAL INFORMATION

1. NAME

2. LAST NAME

3. EMAIL

4. MAJOR PROFFESION

- Student
- Civil Engineer
- Architect
- Supplier
- Construction Worker
- Other

EMPLOYMENT AND PROFESSIONAL INFORMATION

5. YEARS OF PROFESSIONAL EXPERIENCE (IN YEARS)

1 to 5 years	6 to 10 years	11 to 15 years	15 to 20 years	More than 20 years
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6. Work experience implementing or managing with Lean Construction

2 to 3 years	3 to 5 years	5 to 8 years	8 to 10 years	More than 10 years
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7. Role in your project or organization

- Construction
- Consulting and project supervision
- Project formulation and design
- Project logistics and maintenance
- Suppliers
- Other

8. main line of business of your organization

- Project design and formulation
- Construction
- Maintenance and related
- Suppliers
- Supervision and consulting
- Subcontractor

9. What is the type of project you work on most frequently?

- Buildings
- Infrastructure
- Industrial plants
- Energy and oil
- Other

10. SIZE OF ENTERPRISE

- micro (1 to 10 people)
- small (10 to 50 people)
- medium (50 to 250 people)
- Large (more than 250 people)

PERCEPCIONES DE LEAN CONSTRUCCION

We want to know how you perceive Lean Construction and what level of maturity it has in Peruvian organizations.

11. HOW LONG HAVE YOU LISTENED TO AND BEEN INTERESTED IN LEAN CONSTRUCTION?

0 to 5 years	5 to 10 years	10 to 15 years	15 to 20 years	More than 20 years
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12. During your time at university, were you familiar with Lean concepts and principles?

You can relate it to a course that is related to Lean Construction. YES/ NO

13. WHERE DID YOU LEARN ABOUT LEAN CONSTRUCTION?

- IN THE PROJECT OR WORK
- AT THE UNIVERSITY
- IN A DIPLOMA COURSE
- A FREE COURSE
- OTHER

14. HOW DIFFICULT WAS IT TO IMPLEMENT LEAN CONSTRUCTION IN YOUR ORGANIZATION?

- VERY DIFFICULT
- DIFFICULT
- MODERATE
- EASY
- NOT YET KNOWN OR NOT YET IMPLEMENTED

15. HOW DID YOU START, OR DO YOU THINK LEAN CONSTRUCTION SHOULD BE IMPLEMENTED IN YOUR COMPANY?

From your point of view, what do you think is the best alternative or the best result that you obtained?

- HIRE PEOPLE WITH EXPERIENCE
- HIRE EXTERNAL CONSULTANTS
- TRAIN STAFF AND LEARN GRADUALLY
- BUILD LEARNING ADAPTED TO THE ORGANIZATION

16. Indicate which Lean tools you are most familiar with or use in your project or organization.

Rate how often it is used in your project or organization.

Item	Never = 1	Rarely = 2	Occasionally = 3	Frequently = 4	Very Frequently = 5
Plus/ delta o feedback					
Lean Coffee					
Kaizen y/o continuous improvement					
Big Room					
A3 Report					
Value Stream Mapping (VSM)					
Visual Management					
Last Planner System (LPS)					
Target Value Delivery (TVD)					
Set Based Design (SBD)					
Choosing By Advantages (CBA)					
Condition of Satisfaction (COS)					
Working Sample					
Kanban					
Gemba Walk					

17. MENTION IF YOU KNOW OF OTHER TOOLS OR USE THEM IN YOUR PROJECT

18. A NUMBER OF BENEFITS ASSOCIATED WITH LEAN CONSTRUCTION ARE AS FOLLOWS

Benefits	Strongly disagree = 1	Somewhat disagree = 2	Neither agree nor disagree = 3	Somewhat in agreement = 4	Strongly agree = 5
Improve project scope and definition					
Reduce construction time					
Reduce construction cost					
Improve project quality					
Improve construction planning					
Improve quality of information					
Improve coordination with teams					
Avoid rework					

Identify waste and minimize it					
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LEAN IMPLEMENTATION BARRIERS (PART 1)

We have conducted an extensive literature review to identify barriers to the implementation of Lean in organizations and projects, to which we will present the most relevant ones that we have classified into 4 groups: culture and people issues; Lean tools that are applied in projects; Lean philosophy on value, waste, and flow; and finally other barriers where policies, education, and work environment are considered.

Performance in culture and habits of people in your organization or project.

The local culture in the organization and people's habits help the implementation of Lean to be sustainable and generate better gradual performance of the adapted processes. What is the degree of use of the following statements in your project?

Barriers	Never = 1	Rarely = 2	Occasionally = 3	Frequently = 4	Very Frequently = 5
The people on your team document the information from each project and share it with other teams so that they can improve and not make the same mistakes.					
The people in your project can identify and select tools appropriate to a problem.					
People on your team communicate quickly and easily with senior management to announce problems or improvement initiatives.					
When implementing Lean there is resistance to change.					
People in coordination meetings respect the opinions of others.					
My teams in my organization make quick decisions without the need for approval.					
In my organization, when a person makes a commitment, they deliver on time.					

LEAN IMPLEMENTATION BARRIERS (PART 2)

We have conducted an extensive literature review to identify barriers to the implementation of Lean in organizations and projects, to which we will present the most relevant ones that we have classified into 4 groups: culture and people issues; Lean tools that are applied in projects; Lean philosophy on value, waste and flow; and finally other barriers where policies, education, and work environment are taken into account.

Barriers related to the Lean philosophy

The Lean philosophy enables people to focus on Lean principles, customer value, optimize the whole and work collaboratively. How much use is your project making of the following statements?

Barriers	Never = 1	Rarely = 2	Occasionally = 3	Frequently = 4	Very Frequently = 5
The people on your team understand lean thinking and its benefits.					
Your team members can deliver transparent, understandable, and real information.					

In my projects, we focus on a global rather than local optimization of the project.					
Your project teams coordinate with suppliers, subcontractors, customers, and other stakeholders to properly deliver your project deliverable.					
My organization recognizes that implementing Lean generates better long-term benefits.					
Your organization focuses on identifying customer value and guides teams to produce based on customer requirements and project constraints, cost, schedule, etc.					
The company helps new project stakeholders to start their Lean journey and to integrate quickly into the teams.					
Their projects generate leaders who can motivate and sustain Lean practices.					
My customers do not require Lean implementation in their contracts.					
In my projects, I can identify value-adding and non-value-adding activities.					
I do not implement Lean in my projects because the State does not require it.					

LEAN IMPLEMENTATION BARRIERS (PART 3)

We have conducted an extensive literature review to identify barriers to the implementation of Lean in organizations and projects, to which we will present the most relevant ones that we have classified into 4 groups: culture and people issues; Lean tools that are applied in projects; Lean philosophy on value, waste and flow; and finally other barriers where policies, education, and work environment are taken into account.

Barriers related to Lean tools or technology

Performing a comprehensive and collaborative process with the client helps to generate optimal results in design, planning, decision making, and having more satisfied clients. What is the degree of use of the following statements in your project?

Barriers	Never = 1	Rarely = 2	Occasionally = 3	Frequently = 4	Very Frequently = 5
Continually provides feedback on daily activities to the team.					
The people on your team continually propose improvements to their work.					
The company uses indicators to measure the performance and progress of project teams.					
The projects they participate in are planned in advance, and they make decisions based on real data using Lean tools.					
In the planning of its projects, it involves foremen, engineers, and other stakeholders.					
Your organization coordinates the tools to be used and Lean strategies before starting projects.					

Your organization collaborates with all project stakeholders at all levels and early stages of project design and construction.					
The people on your team understand that sustaining Lean requires culture and philosophy.					

LEAN IMPLEMENTATION BARRIERS (PART 4)

We have conducted an extensive literature review to identify barriers to the implementation of Lean in organizations and projects, to which we will present the most relevant ones that we have classified into 4 groups: culture and people issues; Lean tools that are applied in projects; Lean philosophy on value, waste and flow; and finally other barriers where policies, education, and work environment are taken into account.

Other Lean barriers

These premises refer to education and government policies, among others. What is the degree of use of the following statements in your project?

Barriers	Never = 1	Rarely = 2	Occasionally = 3	Frequently = 4	Very Frequently = 5
When implementing Lean, reference other bibliographies or successful strategies from other organizations to obtain a starting point.					
The new professionals who join your project know and have the ability to work under Lean thinking.					
Your organization's top management continually supports Lean implementation, demonstrating leadership and motivation.					
The implementers in your project demonstrate solid knowledge and adequate experience in Lean.					
Your organization makes agreements and alliances with academia to improve the various difficulties.					
People and management perceive Lean implementation as excessive use of resources in terms of cost and time.					

FINAL ASPECTS

- 19. If you have other difficulties in implementing Lean, learning, or teaching, please describe them in detail.**

Mention the barriers that hindered you in your project.

- 20. For you, what is the most important aspect to consider for a proper Lean implementation?**

Please mention the aspects that have given you positive results during your Lean implementation.

- 21. Would like to receive the results of the survey and further research that this project will have**

This information will be sent to the email address you provided.

- 22. If you have suggestions to improve the SURVEY, please mention it.**

This survey is subject to continuous improvement, so your feedback is important.

FINALLY

The survey had a second part, which was aimed at university students, to learn about their competencies. This collection was for benchmarking purposes, which will be part of a future publication. On the other hand, the statements of the barriers to lean implementation have been taken to a positive syntax context to avoid influencing the answers of the participants (recommendation of the experts of the study).