



LEAN TOOLS PROPOSAL TO MITIGATE DELAYS AND COST OVERRUNS IN CONSTRUCTION PROJECTS

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Literature review



33 research papers reporting overruns published from 1988 until 2018.



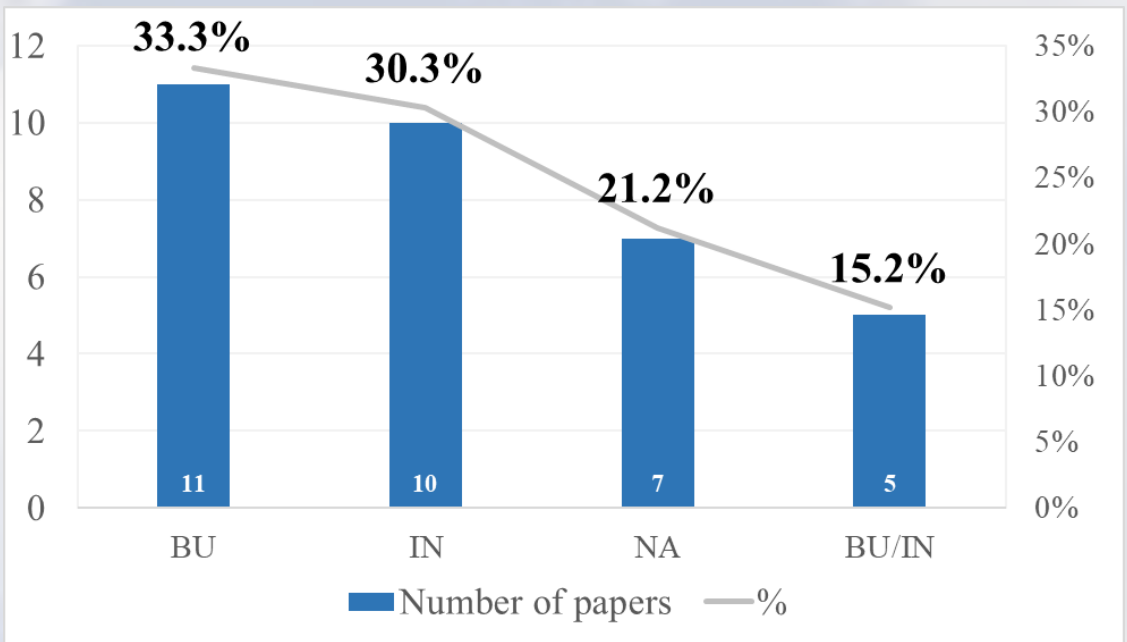
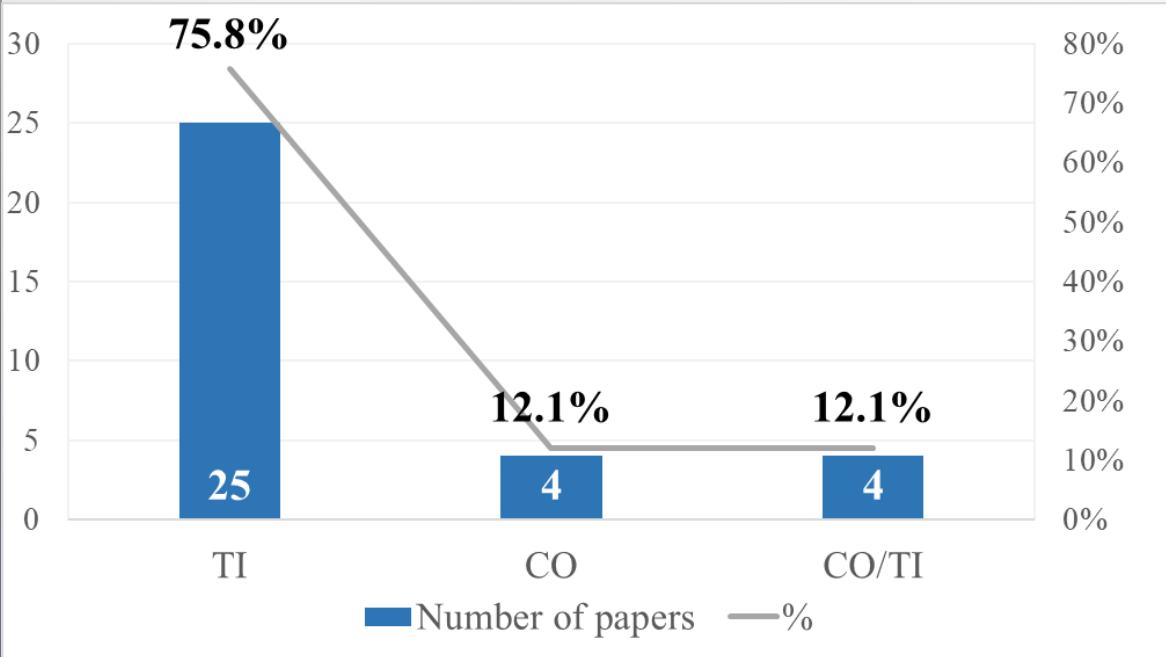
Identifying lean tools, methods and approaches that allow mitigation of the factors causing delays and cost overruns in construction projects.



Profile of publications analyzed to identify delays and cost overruns



Number of publications per deviation reported and project type



TI: Time; CO: Cost; CO/TI: Cost and time

BU: Buildings; IN: Infrastructure; BU/IN: Buildings and infrastructure; NA: Not-Available

Lean Construction tools, methods and approaches assigned to factors



Lean Tools, Methods & Approaches

BIM

Set-Based Design (SBD)

Linguistic Action Perspective (LAP)

Choosing by Advantages (CBA)

Last Planner® System (LPS)

Gemba Walk

Jidoka

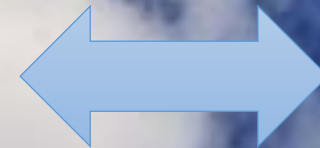
Visual Management (VM)

Integrated Project Delivery (IPD)

A3 Report

Target Value Design (TVD)

Just in Time (JIT)

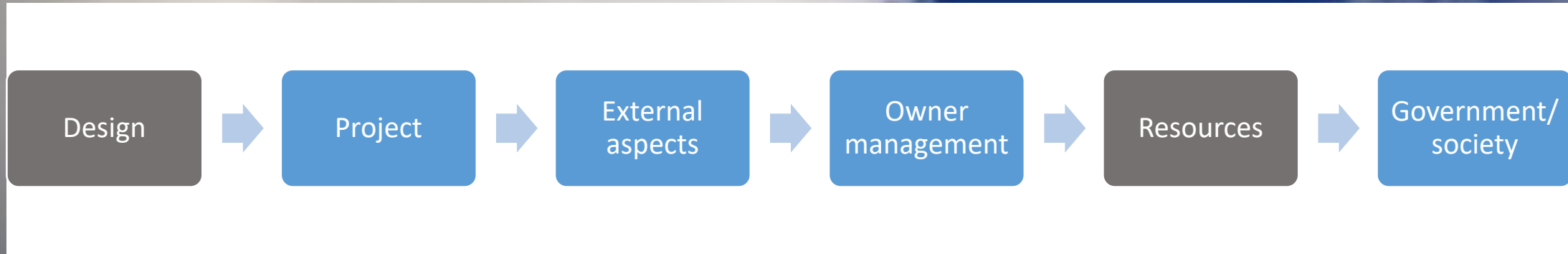


74 factors reporting time and cost deviation.



87.84%

Lean Construction tools, methods and approaches assigned to factors



Group	Factors (problems)	Main Lean tool
Design	<i>Design changes</i>	<i>Set-Based Design (SBD)</i>
	<i>Design errors</i>	<i>Set-Based Design (SBD)</i>
	<i>Preparation/ Approval of designs</i>	<i>Building Information Model (BIM)</i>
	<i>Extent of completion of pre contract design</i>	<i>Set-Based Design (SBD)</i>

Lean Construction tools, methods and approaches assigned to factors



Resources	Shortage of labors	Kanban
	Unqualified work force/ productivity	Gemba Walk
	<i>Shortage of materials</i>	<i>Just in Time (JIT)</i>
	<i>Delay in material to be supplied by the owner</i>	<i>Just in Time (JIT)</i>
	<i>Material procurement/delays</i>	<i>Just in Time (JIT)</i>
	<i>Delay in material procurement (by the contractor)</i>	<i>Just in Time (JIT)</i>
	Delay in approving sample materials	Last Planner [®] System (LPS)
	Poor interaction with vendors in the engineering and procurement stages	Target Value Design (TVD)
	<i>Shortage of fuel</i>	<i>Just in Time (JIT)</i>
	<i>Shortage of foreign currency</i>	<i>Just in Time (JIT)</i>
	Poor quality of equipment	Choosing by Advantages (CBA)
	Shortage of equipment	Just in Time (JIT)

Lean Construction tools, methods and approaches assigned to factors

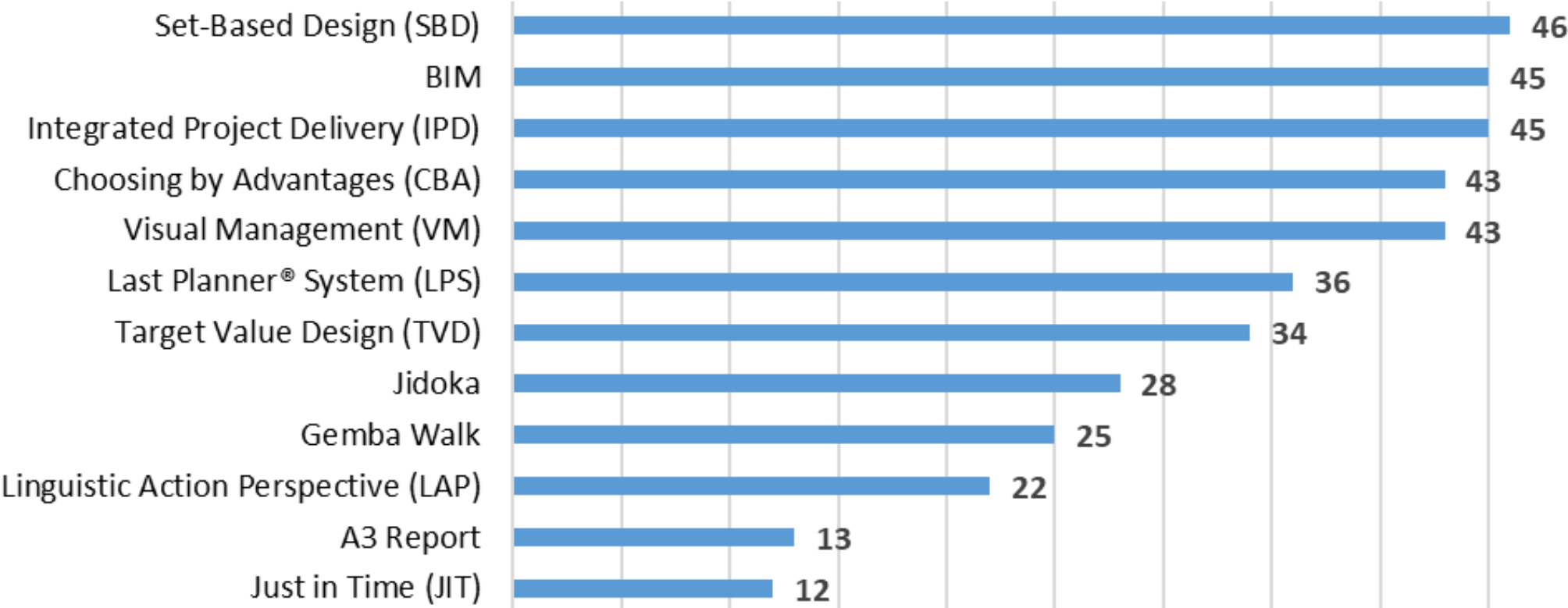


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Number of factors related



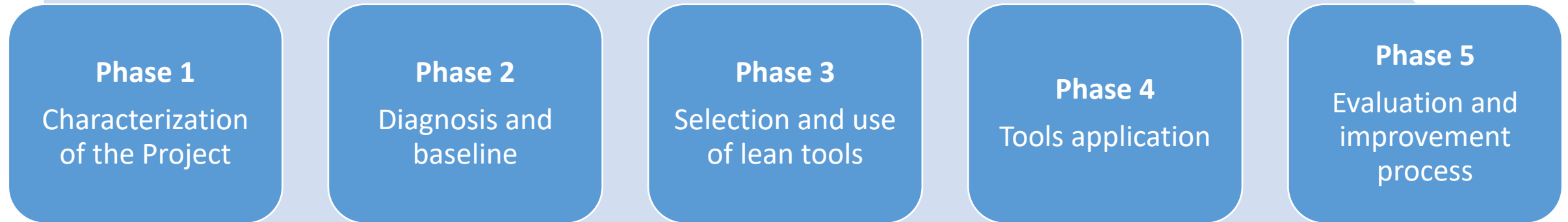
Phases of Lean Implementation Plan



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Conclusions



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In this research, a literature review has been developed in two topics, factors causing time and cost deviations and lean tools, methods, and approaches applicable to construction projects. Although it has been focused on the Web of Science database, building and infrastructure projects have been included in the first stage to have global information.

The analysis allowed assigning a lean mitigation tool, method, or approach for 87.84% of the factors. The factors on which it was not possible to assign lean tools, methods, or approaches corresponded to those related to financial aspects, to aspects of professional and workers training and factors like political or social situation, problems with inflation. On the other hand, there are factors that can be mitigated with two or more tools, for example, the meteorological factor; it can be considered a constraint in the Last Planner System and then determine the best solution through an A3 report.

Conclusions



The literature review allowed developing an in-depth analysis of the research related to factors causing delays and cost overruns in construction projects and lean tools, methods, and approaches applicable to the construction industry. Both have been a subject of interest among authors who have developed an important body of literature, and for this reason, it is proposed the integration. Future research may focus on demonstrating the effectiveness of the lean tools, methods, and approaches discussed in this article.

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