QUALITATIVE ANALYSIS OF LEAN TOOLS IN CONSTRUCTION SECTOR IN COLOMBIA

Fran Marcela Castiblanco, Master Student Industrial Engineering ECIJG, fran.castiblanco@mail.escuelaing.edu.co
Ivonne Angélica Castiblanco, Professor Industrial Engineering ECIJG, ivonne.castiblanco@escuelaing.edu.co
Joan Paola Cruz, Professor Industrial Engineering ECIJG, joan.cruz@escuelaing.edu.co

Bogotá D.C., Colombia

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COLOMBIA

LEAST TECHNOLOGICAL PROGRESS

LEAN THINKING TOOLS

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ESCUELA
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COLOMBIAN CONTEXT

Civil construction sector in Colombia is one of the main economic development axes

Most constructions regardless the type are carried out with poor planning

Most traditional construction processes are carried out manually

The conventional system in Colombia to plan and execute construction works differs from lean thinking

RESEARCH METHOD

Search for experts: State of the art

Systematic classification of papers

Affinity analysis

Pareto chart

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1. SEARCH FOR EXPERTS

Secondary sources of information from experts	84 documents	Nationals and foreigners
Last five years	254 mentions of lean thinking and lean construction tools	Categorized by means of affinity in 23 selected causes

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1. SEARCH FOR EXPERTS

Table 1. Characteristics of the experts consulted by geographic context

Country	Number of experts from the country	Percentage of experts
Germany	5	5,95%
Australia	1	1,19%
Brazil	15	17,86%
Chile	9	10,71%
Colombia	5	5,95%
Ecuador	1	1,19%
United States	12	14,29%
Estonia	1	1,19%
Finland	1	1,19%
India	7	8,33%
England	5	5,95%
Ireland	1	1,19%
Lebanon	4	4,76%
Morocco	1	1,19%
Mexico	1	1,19%
Norway	8	9,52%
New Zealand	1	1,19%
Netherlands	1	1,19%
Pakistan	1	1,19%
Palestine	1	1,19%
Peru	1	1,19%
South Africa	2	2,38%
Total	**84**	**100%**

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1. SEARCH FOR EXPERTS
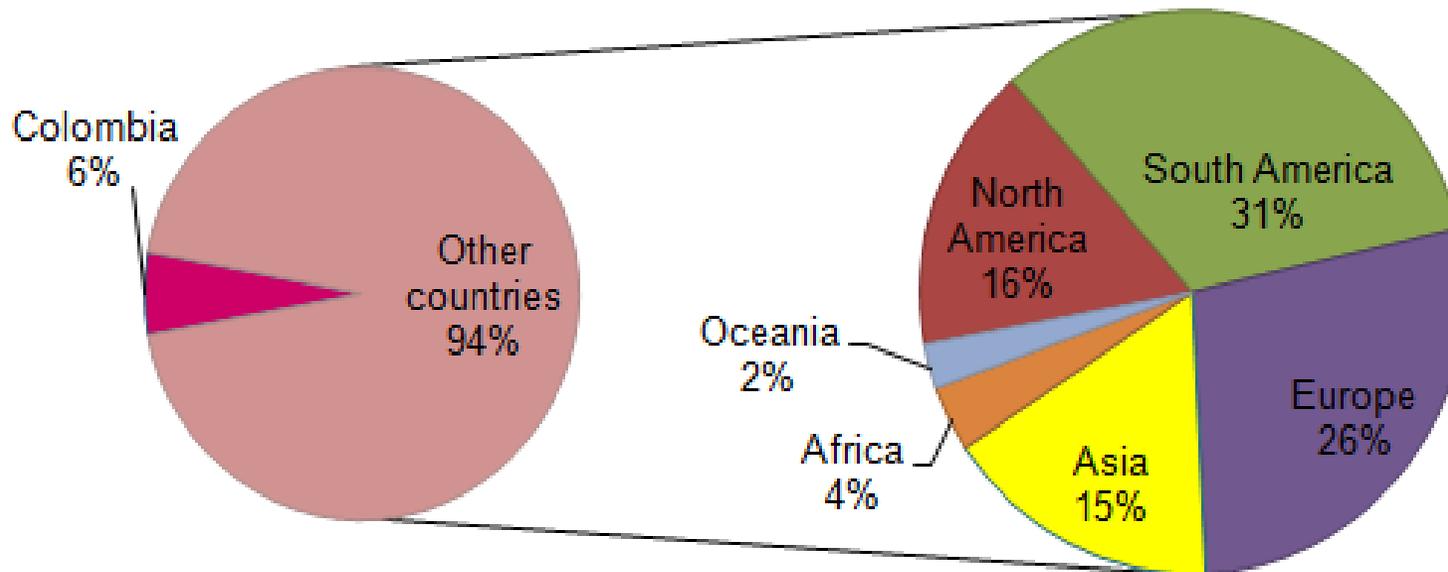
Table 2. Characteristics of the sources by nationality and age of the publication

Characteristic	Total	Percentage
Colombian authors	5	5,95%
Foreign authors	79	94,05%
Sources of up to 5 years	82	97,62%
Sources over 5 years	2	2,38%

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2. AFFINITY ANALYSIS

31 lean tools

23 categories

Table 3. Proposed affinity of lean tools

Initial category	Fine-tuned lean tool
Building Information models (BIM) 4D Building Information Modeling (BIM)	Building Information models (BIM)
Choosing by Advantages (CBA) Best Value Procurement (BVP)	Choosing by Advantages (CBA)
Waste walk Gemba	Gemba walk
Value Stream Mapping (VSM) Overall Process Analysis (OPA)	Value Stream Mapping (VSM)
Visual Management Poka Yoke Customization choice board Display boards	Visual Management (VM)
Chrono-analysis Work Sampling (WS)	Work Sampling (WS)

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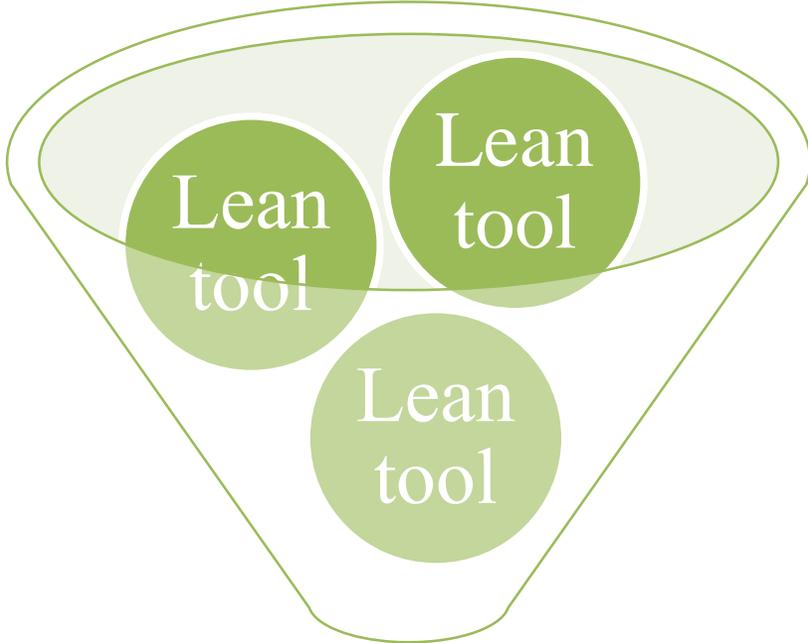
3. PARETO ANALYSIS

Table 4. Lean tools most named by the experts

Fine-tuned lean tool	Frequency	Accumulated frequency	% total	% total accumulated
Last Planner® System (LPS)	46	46	18,11%	18,11%
Building Information Models (BIM)	41	87	16,14%	34,25%
Visual management (VM)	26	113	10,24%	44,49%
Value Stream Mapping (VSM)	17	130	6,69%	51,18%
Target Value Design (TVD)	16	146	6,30%	57,48%
5S	16	162	6,30%	63,78%
Integrated Project Delivery (IPD)	14	176	5,51%	69,29%
Choosing by Advantages (CBA)	13	189	5,12%	74,41%
Kanban	12	201	4,72%	79,13%
Takt Planning and Takt Control (TPTC)	8	209	3,15%	82,28%
A3 report	8	217	3,15%	85,43%
Andon	5	222	1,97%	87,40%
Set-Based Design (SBD)	5	227	1,97%	89,37%
Gemba walk	5	232	1,97%	91,34%
Just in Time (JIT)	4	236	1,57%	92,91%
Heijunka	4	240	1,57%	94,49%
Work Sampling (WS)	4	244	1,57%	96,06%
RFID	2	246	0,79%	96,85%
5 Whys	2	248	0,79%	97,64%
Jidoka	2	250	0,79%	98,43%
Value Engineering	2	252	0,79%	99,21%
Modelo Means - End	1	253	0,39%	99,61%
SMED	1	254	0,39%	100,00%
Total	254			

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3. PARETO ANALYSIS

Search for experts Pareto Chart

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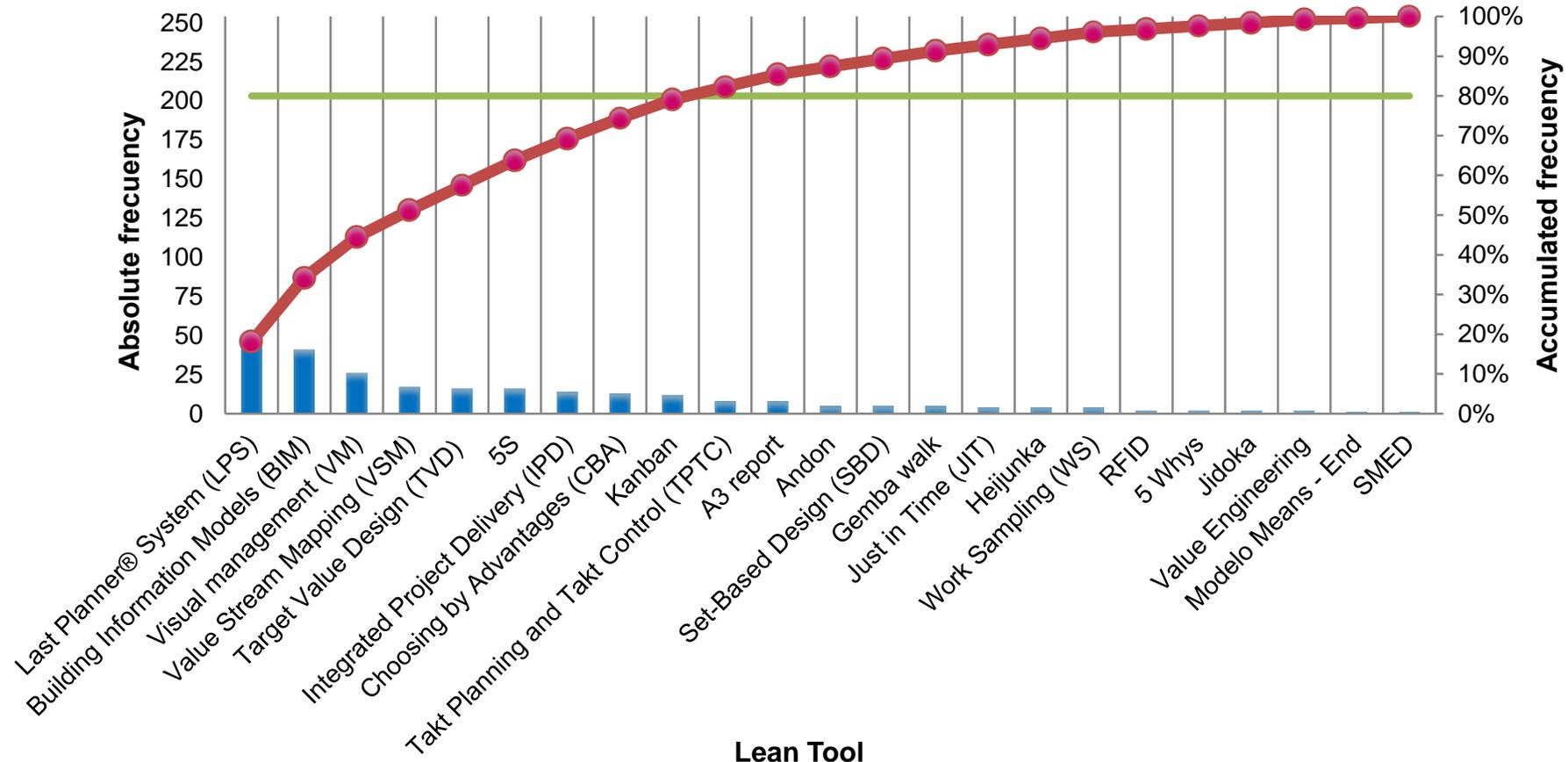
CONCLUSIONS

In Latin America, Brazil and Chile are the countries that have excelled in the development of advanced technologies to improve productivity in the construction sector.

The Last Planner System® is the most used lean tool for the planning of works through the use of balance lines as a tool for visualizing the master plan and weekly meetings and daily walks

Companies are realizing the importance of incorporating this philosophy in organizations, guiding the purchase of software and looking for management systems that already have the methodology incorporated.

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CONCLUSIONS

Nine lean tools represent 80% are: Last Planner System®, Building Information Models, Visual Management, Value Stream Mapping, Target Value Design, 5S, Integrated Project Delivery, Choosing by Advantages and Kanban, adding 201 mentions of the total 254.

Colombia requires a change of philosophy in the construction companies. Additionally it needs a change of culture and strong commitment from all stakeholders.

This study is part of a subsequent project that will take the conclusions of this qualitative analysis to suggest a guiding tool that correlates applicable lean approaches with the main actors of the supply chain of high value housing projects in Bogotá.

Thanks

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