Dynamics model of the flow management of construction projects: study of case

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Introduction

This research reviews the issues associated with the obstruction of the workflow in the management of infrastructure construction projects in a public university in Colombia.
Case study

The case study is about the production process of construction projects planned for a year in a public university

• The university plans investment in infrastructure for each fiscal year according to a strategic plan.

• Financing for these projects is from the collection of a specific tax of Regional Government (RG) order, and it's transferred monthly to the university.

• The contracting of the construction is carried out when the financial resource has been transferred, and it has been confirmed the construction project has the highest level of constructability possible.

• After contracting, the construction of the project is carried out.

• Construction production process originate relations and flows into functional areas in the organization
Case study: Problem map

Evaluation of Policies in the Management of Construction Projects

- Planned Change in Cost
  \[ VCP = \frac{CF}{CPI} \]

- Total Time IP Projects
  \[ TE = \frac{TR}{TP} \]

- Maturation of Construction Projects

- Availability of Investment Resources in IP

- Efficiency Implementation
  \[ EP = \frac{PE}{PI} \]

- Finished Projects on Annuity
  \[ PP = \frac{TRA}{PI} \]

- Administrative Processes

- System Performance Indicators

- Defining Parameters Scenarios

Maturation of Construction Projects

Administrative Processes

Availability of Investment Resources in IP

Efficiency Implementation

Finished Projects on Annuity

Planned Change in Cost
System Dynamics

• The fundamental objective of Systems Dynamics is to understand the structural causes that cause the behavior of the system.

• Understanding the structural causes implies increasing knowledge about each element of the system's role, and seeing how different actions, carried out on parts of the system, accentuate or attenuate the behavioral trends implicit in it.

• System Dynamics finds its main applications in these complex and poorly defined environments, where human decisions are usually guided by logic intervene.
Lean principles and the mapping of the value stream

The five lean principles described by Jones and Womack (2002) in the improvement of the efficiency in value flows, they are:

1. To specify the value of the client from the point of view,
2. **To identify the flow of value, including the activities that add value or do not add value for the client,**
3. Allow that the project flows quickly without problems and through all the sub-processes,
4. To synchronize sub-processes capacity and demand, so that the work is realized in agreement with the scheme of pull production,
5. Reach perfection through continuous value flow improvement.
Lean principles and the mapping of the value stream

“To identify the flow of value, including the activities that add value or do not add value for the client,”
Value Stream Mapping

• It is a graphical tool that integrates material and information flows used for the standardized icons in a graph, showing a “Mapping Big Picture” of the value flow.

• Jones and Womack (2002) define the VSM as the process of the map the flow of materials and information.

• This map is used to present the current processed state and after a map of the future state is proposed.
VALUE FLOW MAP
Zoom: Authorization availability

Current state: Transfer and allocation of money

Mapping with SIPOC Z
Current state map
Forrester diagram
Current state

101 Weeks
The simulated improve contains

As you can see in the next table

Factor A: Approval of Investment earlier. The transfer of the collected resources faster.

Factor C: Improve Administrative Processes
# Behavioral of indicators from analysis scenarios

<table>
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<tr>
<th>SCENARIO</th>
<th>FACTOR</th>
<th>1/TE</th>
<th>PP/0.9120</th>
<th>1/VCP</th>
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<th>Local Improv</th>
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<td>0.530</td>
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<td>24.3%</td>
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<tr>
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<td>6</td>
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<td>0.42</td>
<td>0.98</td>
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<td>24.3%</td>
</tr>
<tr>
<td>7</td>
<td>A,B,C</td>
<td>1.04</td>
<td>1.00</td>
<td>1.04</td>
<td>1.084</td>
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Future state

52 Weeks
Future state map

- Bank projects IP
- Contract and legalization
- Construction
- Construction Redesigns
- works delivery
- Customer Delivery
- Management
- Fiscal Planning
- Institutional Planning
- Directive Board
- President
- General Bank Projects
- Customers
- Controls (Interventoria)
- Maintenance Area

- 2 Profesionals
- 1 Professional
- 5 days
- 120 days
- 5 days
- 5 days
- 5 days
- 5 days
- 5 days
- 5 days
- 1 day

TCT 236 days / 5 days/week = 47.2 weeks
TCT = 206 days / 5 days/week = 41.2 weeks
The application of Lean tools, for this case, contributes to achieving the economical use of personnel involved in the management process, such as an increase in value-added for customers.
Conclusions

It validates that the symptoms of problems seen in a value flow should be analyzed with a systematic approach to understanding the root of the problems and their consequences, as well as the effectiveness of improvement actions.
Conclusions

Lean Thinking has been developed by the manufacturers years with good results, especially when a business culture is consolidated around this thought in institutions like the study, parallel to the intervention of the factors you should build this culture removal waste as a common mission to help streamline the flow in this and other business processes.
Mapping the value stream is essential to identify underlying structures in the value flow, in addition to activities that add no value, to propose formulating structural measures to expedite the flow of the mainstream, and projects to can fulfill planned targets.
And that’s all for now I hope you have enjoyed this presentation as I did. If you want to contact me, my email is sandra.cano@correounivalle.edu.co