SAN DIEGO STATE UNIVERSITY
J.R. Filanc Construction Engineering and Management Program
College of Engineering

Investigation of the Use of Lean Construction Practices in Transportation Construction Projects

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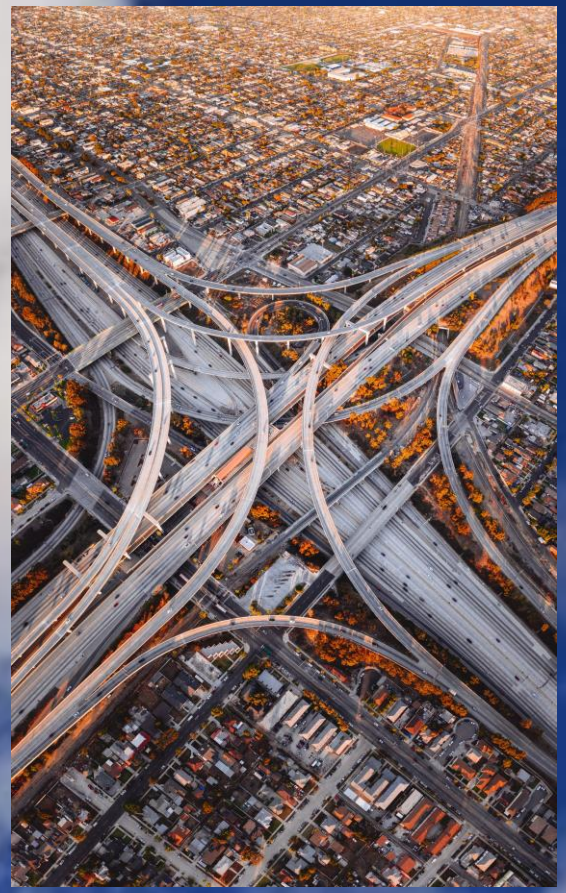
Why Transportation Projects?

- Essential to development and growth.
- Lengthy, geographically large, and disruptive to communities.
- Notoriously known for cost and schedule overruns, and their vast impact on the economy.
- High impact and benefits.



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Goals of the Study

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1. Investigate management practices currently used to deliver transportation projects in California;
2. Identify opportunities where Lean Construction practices can be applied to streamline the delivery of these projects.

Initiatives in the Transportation Sector

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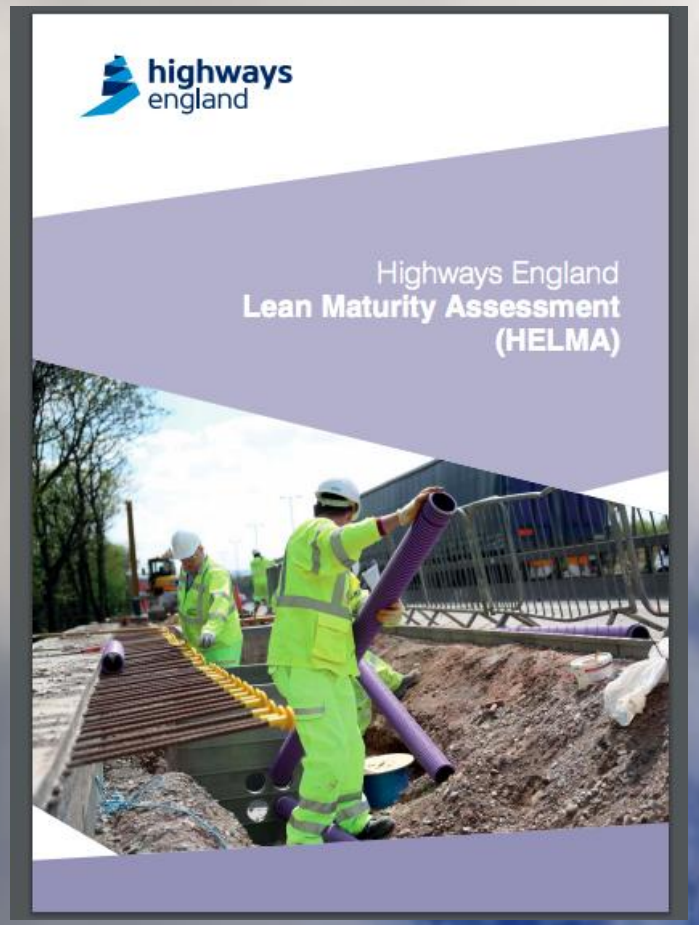

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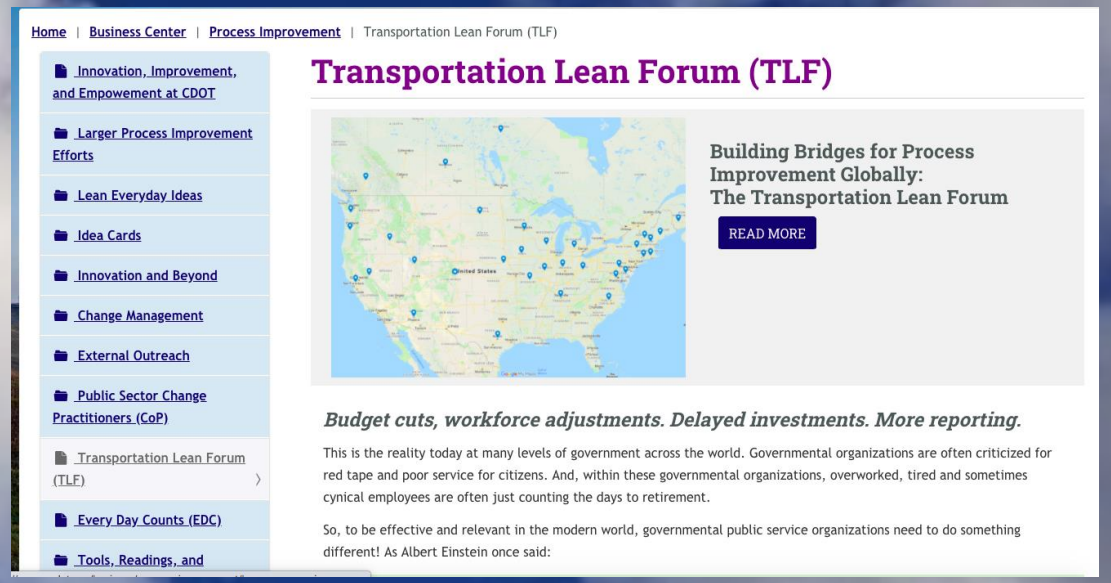

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Research Method

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Literature Review

- Challenges
- Potential Solutions based on the Lean Literature

Research Protocol

- Reviewed by SDSU IRB
- Exempt

Data Collection

- Interviews
- Site visits

Data analysis

- Code answers into major categories
- Map data to LC practices as potential solutions

Al Heet, M.R.A.H. 2018. *Use of Lean Construction Practices in Transportation Construction Projects*. MS Thesis. Dept. of Civil, Construction, and Environmental Engineering, San Diego State University.

Project Characteristics

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Interview	Company	Project Type*	Total Project Cost in Million US$	Duration (Months)	Delivery Method
I	A	Highway	26.50	30	DBB
II	A	Bridge, Highway	16	23	DBB
III	A	Bridge, Highway, and Transit	700	48	CM/GC
IV	B	Highway	9	28	DBB
V	B	(Continuous improvement program)			
VI	C	Bridge, Highway, and Transit	1,200	56	CM/GC
VII	D	Highway	22	24	DBB
VIII	E	Transit	237	35	CM/GC
IX	F	Bridge, Road Improvement	43.5	31	DBB
X	DoT	(Multiple projects – Institutional view)			

*Most projects are located in Southern California, except for Interview VII located in the Northeastern States. DoT=Department of Transportationl DBB=Design-Bid-Build; DB=Design-Build; CM/GC=Construction Management at Risk.

Findings & Discussion

Challenge	Reported on Interview	Lean-inspired tools and techniques
Relocation and positioning of utilities	I, II, and IV	Use of tools to improve transparency including BIM, and visual management techniques (e.g., boards) to report issues and disseminate information
Communication with and handling needs/expectations of multiple stakeholders related to land use and involved communities	I, III, IV, and VI	Supporting collaborative relationships among stakeholders through more collaborative delivery methods; use of Choosing by Advantages and Benefit Realization processes to capture needs, assess them and make informed decisions.
Scheduling of crews with interrelated work, stop and go problems, no continuous flow, segmentation	I and IV	Use of LPS-related concepts and tools to promote reliable and continuous flows of work. Use of line of balance schedules to promote flow and visualization of work.
Shortage of manpower	VII	Develop people through partnerships with local entities to educate construction workers. Support organizations such as The Beavers who promote goodwill, friendliness and consideration within the heavy engineering construction industry.

Findings & Discussion

Challenge	Reported on Interview	Lean-inspired tools and techniques
Design-related issues, incomplete plans and/or differing site conditions, errors in specifications	II, IV, and VI	Pilot/use more collaborative delivery methods to foster early collaboration during the design stage. Use tools and processes to improve communication and transparency such as: BIM, co-locate design teams, use the 'big room' format for design meetings.
Risk Management	VI	Document the items identified during RUPID- related discussions and share visual information with project stakeholders through boards, models, and animations.
Delays in deliveries and permits	I, IV, and VII	Promote early collaboration among team members and the permitting agencies to identify critical needs regarding permits. Share information about permit requirements.
Corporate culture among partners in a JV	III and VI	Benchmark practices used by JV partners and standardize preferred processes. Educate and develop people on how to use these processes.
CM/GC delivery method piloting	III, VI	Pilot initiatives commonly found in more collaborative delivery methods such as DB and Integrated Project Delivery (IPD), e.g., target value design, colocation, open book, shared risks/rewards.

Conclusions

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- LC practices found in this study:
  - Visual management – transparency, 5S
  - Collaboration initiatives
  - Root-cause analysis
  - Just-in-time delivery
- Current construction companies' management practices use CPM as their core schedule development tool.
  - An upgrade by utilizing LPS – more stable and smoother workflow.
- DoTs have the leverage to support Lean research and education.