



LEAN THINKING FOR STRUCTURAL ENGINEERS

Stephen Kwofie and Christine L. Pasquire



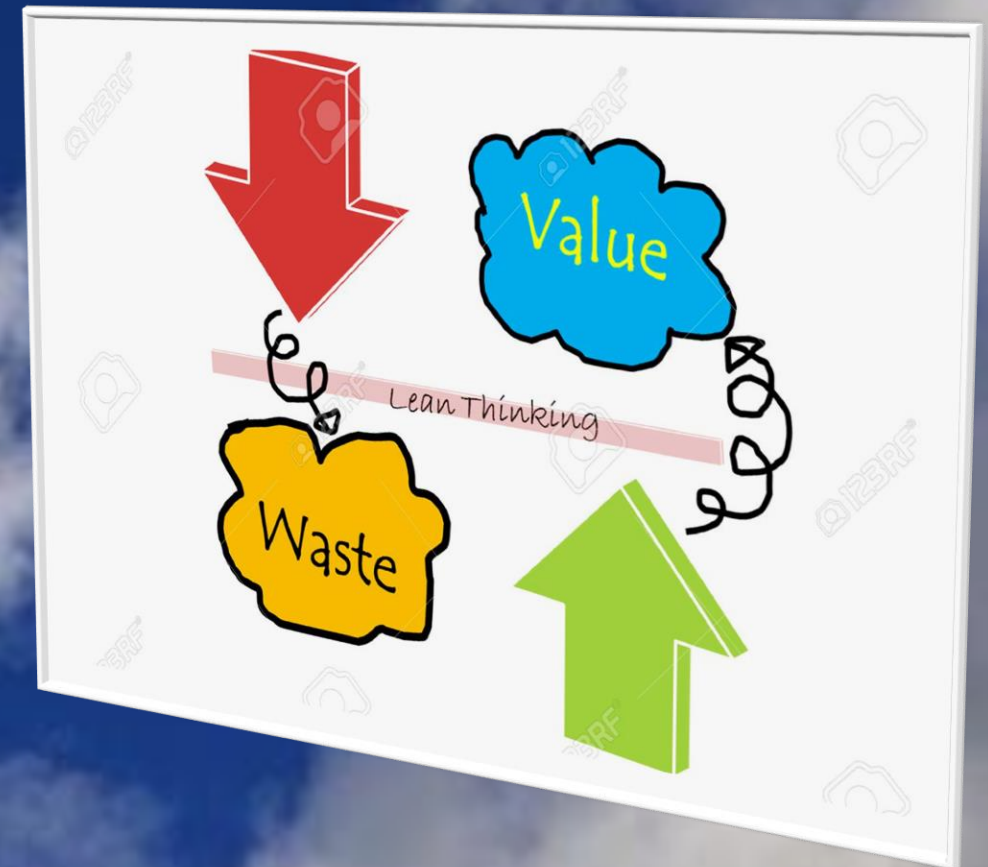
INTRODUCTION



IGLC 28

BERKELEY, CA 6-12 JULY 2020

28th ANNUAL CONFERENCE OF THE
INTERNATIONAL GROUP FOR LEAN CONSTRUCTION



RESEARCH METHOD



IGLC 28

BERKELEY, CA 6-12 JULY 2020

28th ANNUAL CONFERENCE OF THE
INTERNATIONAL GROUP FOR LEAN CONSTRUCTION

RESEARCH PHASES

Research Question
Formulation

Location of Study
Sources

Study Selection &
Evaluation

Analysis &
Synthesis of Data

Result Discussion
& Reporting

ACTIVITIES/TASK

Develop the
Research Question
to Guide the Study

Locate, Select &
Evaluate Relevant
Literature

Analyse &
Synthesize Data

Report Findings

METHODS

Define & use electronic databases

Define search period

Define inclusion & exclusion criteria

Define & use search strings

Data filtration & clean-up

Selection of method for analysis &
synthesis of qualitative research

Coding & extraction of data

TOOLS

IGLC; Emerald; Elsevier; Taylor & Francis; IEEE;
Springer; Wiley; Inderscience; EBSCO; ISI web of
Science; Google Scholar; and Research Gate

1997 - 2019

Inclusion - lean terms with design & product development;
peer reviewed articles published in journals and
proceedings of international conferences

Exclusion - lean solely referring to manufacturing &
production

lean thinking, lean design, lean product development, lean
product design, lean design management and lean product
engineering

Title review, abstract review, schematic reading

Thematic synthesis

Nvivo computer software

REPORT

Section 1

Section 2

Section 3

Section 4



LEAN THINKING CONCEPT FOR STRUCTURAL DESIGN

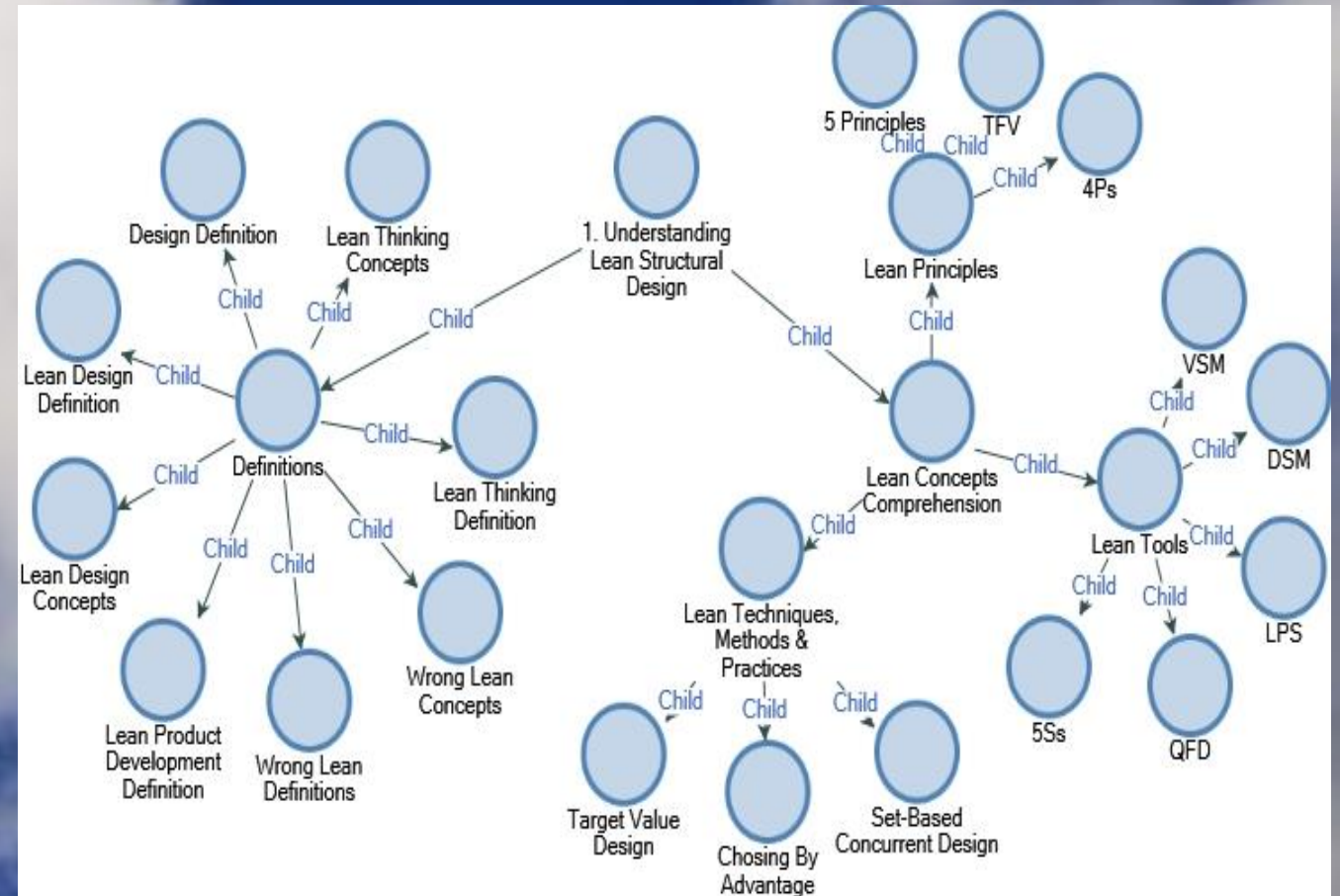


IGLC 28

BERKELEY, CA 6-12 JULY 2020

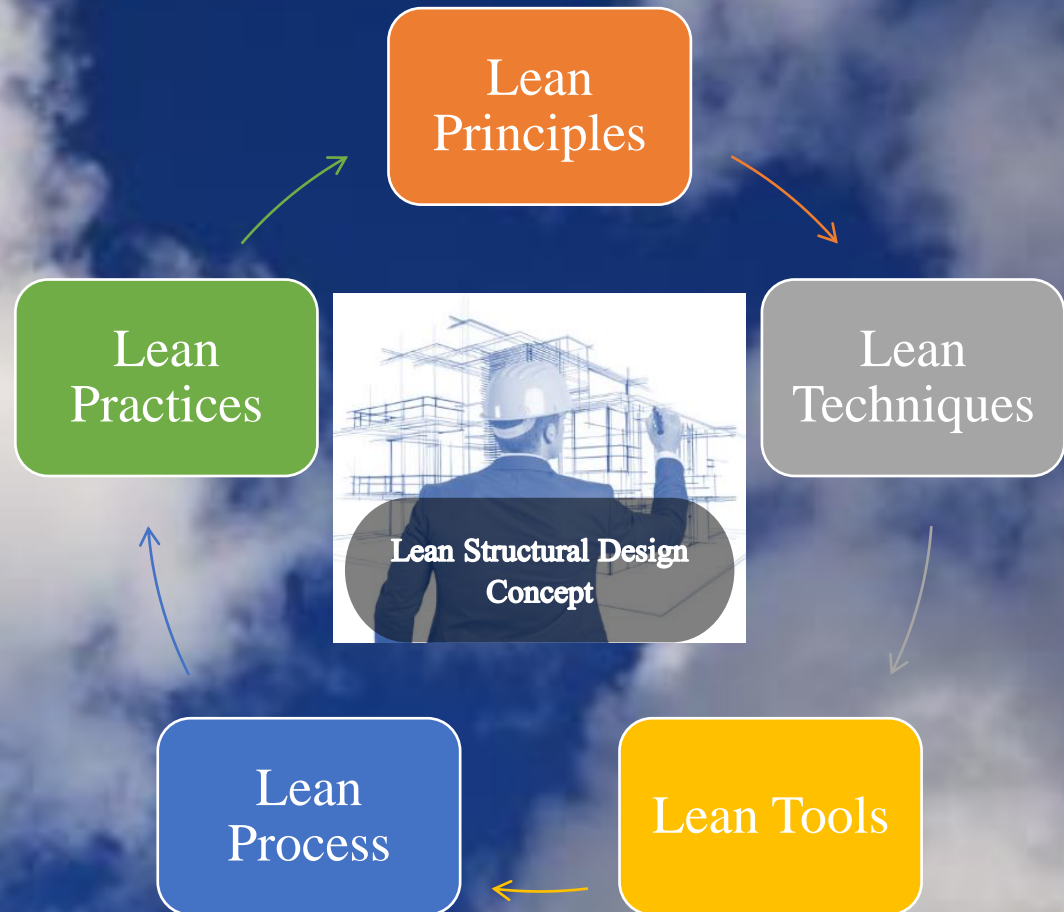
28th ANNUAL CONFERENCE OF THE
INTERNATIONAL GROUP FOR LEAN CONSTRUCTION

- Lean in the general world view has been perceived as *“lacking or deficient in flesh; lacking richness, sufficiency or productiveness; containing little or no fat; deficient in an essential quality”*
- The concept of value generation and waste reduction appear to be the spine connecting these diverse definitions of lean when applied to the manufacturing and construction industries.
- Lean thinking concept has been identified to be mainly founded on philosophy and culture



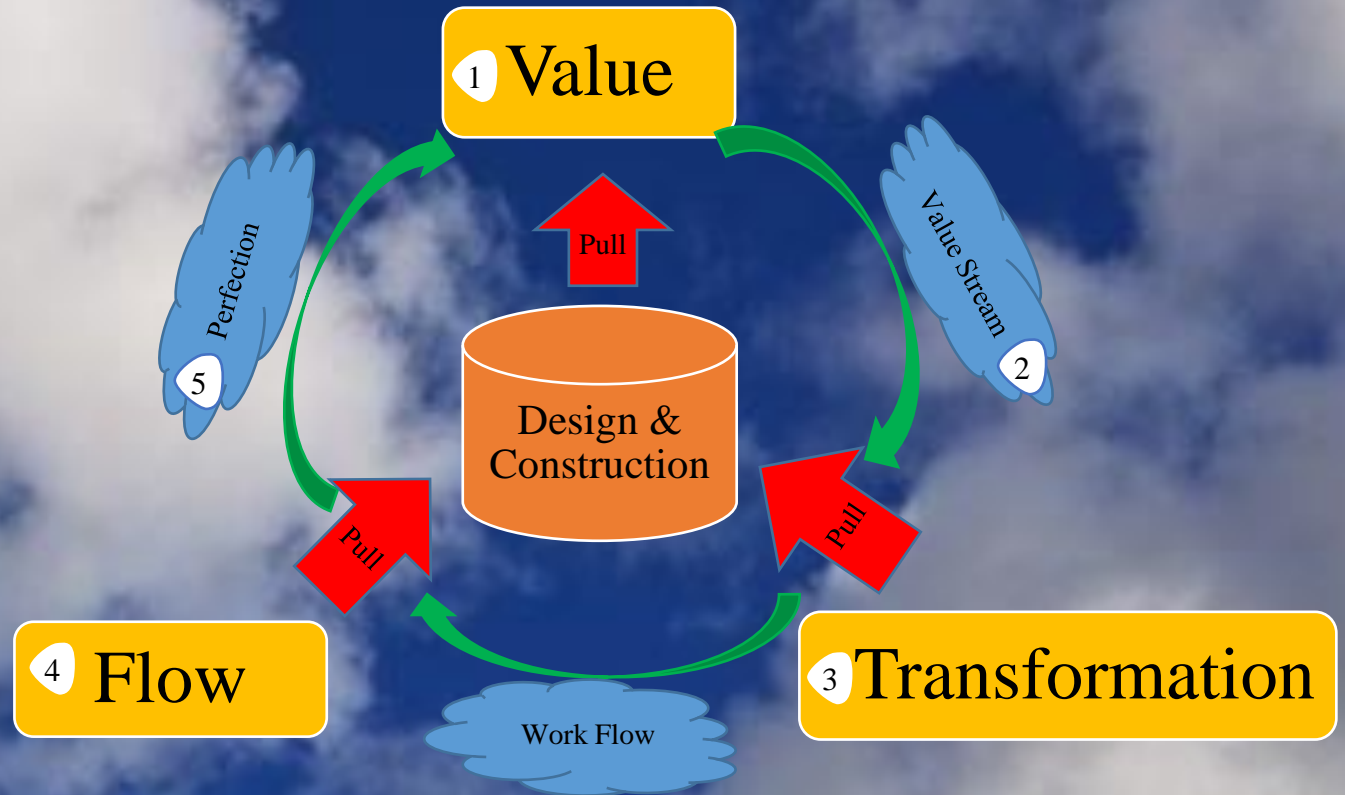
DEFINITION OF LEAN STRUCTURAL DESIGN

- In construction, lean applied to product development achieves the design management field of work and thus called “lean design” when applied to building projects.
- Lean design is an extension of lean thinking in the design phase, which creates the potential for high value in the whole process with well-defined systems, structures and materials to meet customer needs
- Lean design therefore relates to the principles, methods, techniques, practices and tools contemporarily used in managing designs or product development process to generate value for customers.



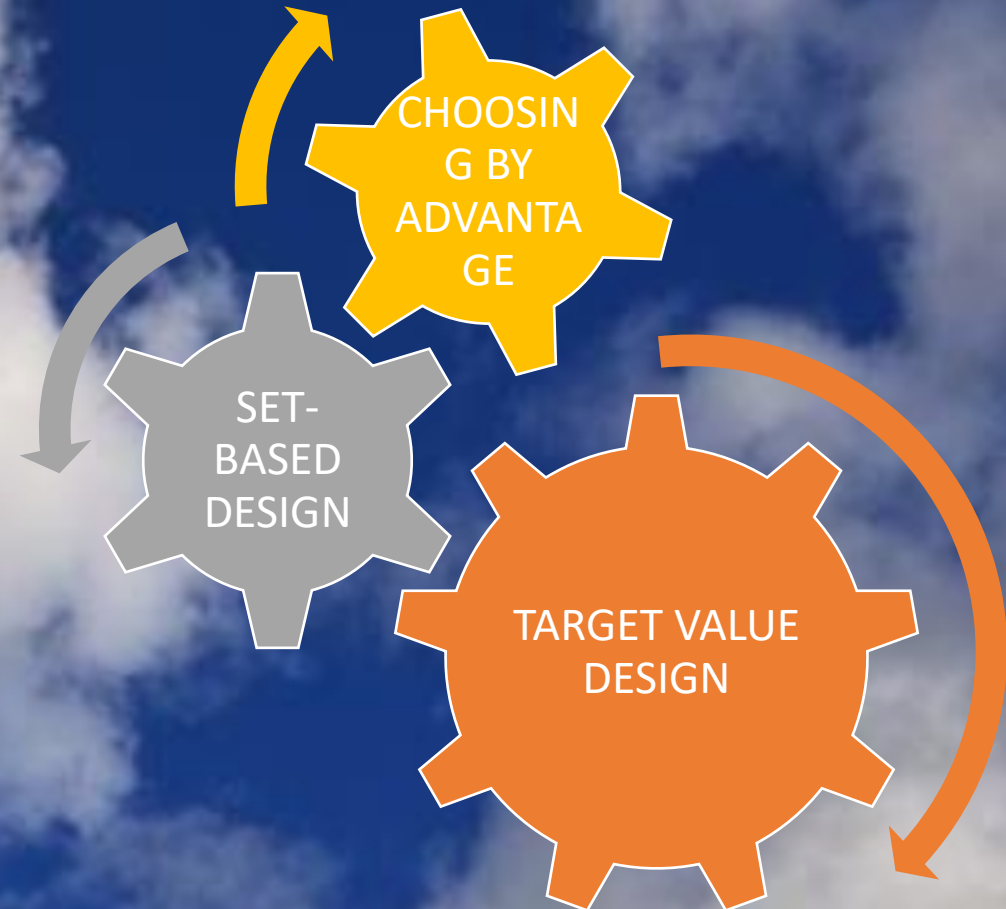
LEAN PRINCIPLES APPLICABLE TO LSD

- Value Principle
- Value Stream Principle
- Flow Principle
- Pull Principle
- Perfection Principle
- Transformation-Flow-Value Principles



LEAN TECHNIQUES AND METHODS APPLICATION TO LSD

- TVD is a management method for designing and delivering customer value aligned with defined target
- SBD are characterised by exploration of multiple design options, delays to specifications and commitment, development of extensive prototyping or simulation and convergence upon the optimum design.
- CBA is a technique for consistent good decision making on design options by focusing on the valued advantages, which is followed by actions and subsequently generate an outcome.



LEAN TOOLS FOR LSD

- VSM is a core lean tool used to capture the present state of value stream with regards to information and material flows, identify opportunities to improve flow whilst ensuring waste reduction and proposing future state showing plans of development
- QFD is one of the lean tools that facilitates identification of customer needs and requirements at the design phase
- DSM is a systematic tool for finding the optimal order originally developed by Steward (1981) and applied to represent design information flows such that design tasks are outlined and their interdependencies are assessed to show tasks to be completed both in series and parallel
- LPS is a lean tool originally designed to facilitate stabilisation of production work flow where decisions and commitment to tasks are made by the last responsible person known as the 'last planner'
- The 5S is a systematic process tool used in organising a workplace such that it contains only the materials needed and appropriately designated resulting in work efficiency, reduced waste, optimum value and productivity



CONCLUSIONS



- This paper focused on the first part of the study where an understanding of lean was gained with respect to structural designs.
- The research revealed that LSD involved the application of lean thinking concept in structural designs through lean principles, techniques, processes, practices and tools to deliver value for customers.
- This research was mainly based on literature and the practical applicability of the findings to assess the understanding and implementation of lean from SE point of views form part of the second phase of the study.
- Therefore, further research will be carried out focusing on the relationship between structural engineers and lean using case studies.
- Further studies will also be done to discuss possible hindrances to LSD and corresponding solutions.



THANK YOU FOR
YOUR TIME
ANY QUESTIONS?

