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PROCESS COMPLEXITY AT THE PRE-CONSTRUCTION PHASE:
A LEAN BASED SOLUTION
Work-In-Progress

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OUTLINE

- Research Motivation/ Problem Statement
- Research Objectives
- Research Method
- Conceptual framework
- Anticipated results
- Benefits to the industry
- Outstanding work
- References

- Poor performance of the pre-construction stage will negatively influence the progress of following works, consequently impairing the overall project’s performance (Waly and Thabet, 2002; Kolltveit and Gronhaug, 2004).
- Previous studies done to improve the pre-construction stage were not holistically envisioned and focused only in improving certain aspects within the stage (Freire and Alarcon, 2002; Hagstrom and Wollner, 2011).
- The importance of addressing process complexity is undermined due to limited research found in this area. It is extremely critical to address process complexity as it is the root cause for subsequent problems (Hogan et al. 2012), as shown in the following diagram.

**Diagram:**

- **Visible Symptoms**
  - Waiting time, defect, excessive motion, processing time.

- **Structural Factors**
  - Organisation, outdated metrics.

- **Root causes**
  - Deficient end-to-end process management, minimal waste elimination.

Aim
- To establish a conceptual framework that applies lean thinking to reduce process complexity at the pre-construction stage.

Objectives
- To define process complexity
- To provide linkage between lean thinking, process complexity and the pre-construction stage
- To propose lean based solutions to improve process complexity at the pre-construction stage
- To demonstrate the application of the framework in real project.

RESEARCH METHOD: DATA & SCOPE

Scope of Research
- Pre-construction stage
- Process complexity
- Public construction project

Data
- Case study (Interviews, document review)

Empirical data gathering stages

- **Stage 1:** Case selection. Interview with project manager and personnel involved in order to understand the flow of work at the pre-construction stage.

- **Stage 2:** Conduct case study by collecting pre-construction records, documents, time, processes, participants, etc.

- **Stage 3:** Data from case study is represented in the form of lean based mapping using Value Stream Map (VSM) and process map. Current map that represents the present processes is produced.

Method of data analysis
- Data will be analysed based on the current map, to distinguish the complexity of the system.

Metrics and measurement standard
- Control-Flow Complexity (CFC) metrics (Cardoso, 2006).
  - Using an established equation, complexity of the processes could be calculated and results will be in the form of a round figure. The higher the value, the more complex the processes are.
- Lean government metrics (US EPA, 2009).
  - Variables include: Lead time, process steps, decisions, delays, handoffs and loops.
  - The occurrence rate of those variables will be determined from the current map and lean based strategies will be proposed to reduce the amount of those waste.

## Research Method: Research Plan

<table>
<thead>
<tr>
<th>Research Works</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jul</td>
</tr>
<tr>
<td>Establish the foundation of study</td>
<td></td>
</tr>
<tr>
<td>Conceptual Framework</td>
<td></td>
</tr>
<tr>
<td>Data collection</td>
<td></td>
</tr>
<tr>
<td>Data analysis</td>
<td></td>
</tr>
<tr>
<td>Discussion, suggestions and conclusion</td>
<td></td>
</tr>
</tbody>
</table>


**Research Model/Conceptual Framework**

- **Inception**
- **Design**
- **Tendering**

**Pre-construction Stage**

**Lean Diagnostic**
- Lean tools: VSM, process map, 5 Why’s

**Lean Improvement**
- 11 principles:
  - Reduce waste
  - Increase value
  - Reduce variability
  - Streamline processes
  - Flexibility
  - Transparency
  - Control
  - Continuous improvement
  - Balance
  - Benchmarking

**Process Complexity**

**Efficiency**
- Smooth flow
- Streamlining

**Value**
- Time
- Cost
- Lean waste
- Defect

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Objective 1
- Process complexity is defined with adoption from Business Process Management (BPM).
- The metrics and measurement standards were later derived from BPM based Control-Flow Complexity metrics and lean government metrics.
- The metrics and measurement standards will be used to assess complexity in processes quantitatively.

Objective 2
- The establishment of relationship between lean thinking, process complexity and pre-construction stage enables the pre-construction complexity to be viewed from a lean perspective, subsequently improving the system using lean approaches.

Objective 3
- Lean based solution to improve the current processes is derived in relation to the 11 lean principles.

Objective 4
- The framework is modelled based on real case study. Quantitative value of complexity on real project can be expected and future improved state is anticipated with recommended improvement strategies that abide the lean principles.

Significance of Research

- **Theoretical**
  - Introduced the perspective of process complexity as a waste, from the administration waste standpoint.
  - The established metrics and measurement standards allow for rich and comprehensive understanding of complexity within the current state.

- **Practical**
  - Allows identification and improvements to be made for the commonly neglected aspect of process complexity.
  - Positive improvements taken to address the root cause (process complexity) will have positive influence on other aspects of work that eventually increases project’s performance.

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OUTSTANDING WORK

- Data analysis
- Discussion, recommendation and conclusion

REFERENCES


THANK YOU