HOUSE OF CARDS – A SIMULATION OF LEAN CONSTRUCTION PRINCIPLES

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BACKGROUND AND IDENTIFICATION OF PROBLEM

Simulations are an excellent tool to demonstrate the application of lean principles to construction. The "House of Cards" simulation was developed by the authors as a simple, effective tool to demonstrate lean principles. The simulation is played with a standard deck of 52 playing cards and 3-4 players. The game proceeds through six phases that take 30-60 minutes to cumulatively complete. The simulation may be used by small groups familiar with lean principles, or by a facilitator in larger groups with minimal costs of materials (a deck of cards for every 3-4 players).

RESEARCH AIM AND METHODOLOGY

The objective of the simulation is to play the cards as quickly as possible to construct a 13-story building, where different suits represent different construction trades. There are six phases starting with a worst case scenario and move to a best-case scenario by implementing small improvements based on lean principles. Gameplay of the simulation is shown in Figure 1.

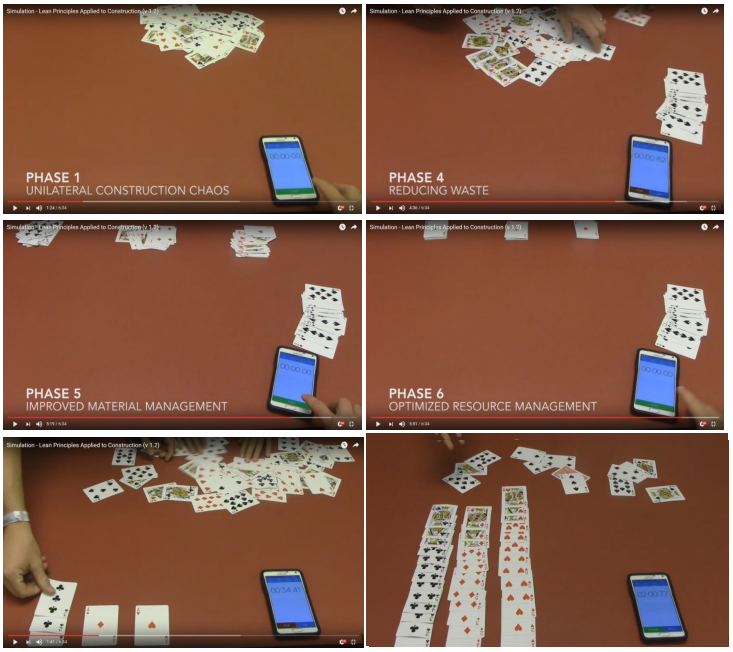

Figure 1: Gameplay of Simulation

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RESEARCH FINDINGS

Table 1: Lean principles used in phase (multiple X's indicate additional measures were taken for that principle in the given phase)

Principle	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
5S		X	X	X	XX	XXX
Collaboration			X	X	X	X
Waste Reduction				X	X	X
Reducing Cycle Time		X	X	X	X	X
Kaizen		X	X	X	X	X

Table 2: Simulation results (data based on 3 iterations)

Iteration	Average Cycle Time (seconds)	Improvement from previous phase	Improvement from baseline
1	120	N/A	N/A
2	74	38%	38%
3	58	22%	52%
4	52	10%	57%
5	31	40%	74%
6	15	52%	88%

SUMMARY

- Each phase demonstrates an improvement based on a lean principle. Pre- and post-phase discussion facilitates the learning process to apply the principles.
- The simulation teaches concepts of 5S, collaboration, waste reduction, reducing the cycle time, and *kaizen*.
- The simulation can be scaled to accommodate additional players, in groups of 3-4 players.
- There is a video on YouTube to complement the report, demonstrate gameplay, and provide opportunities for constructive feedback.[5]
- Should you have any questions or feedback to improve the simulation, please contact the authors by email or by providing comments on the YouTube video.

[5] "Simulation - Lean Principles Applied to Construction (v 1.2)" https://www.youtube.com/watch?v=cL60KAm0K-I