

PROJECT FLEXIBILITY AND LEAN CONSTRUCTION

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1 BACKGROUND

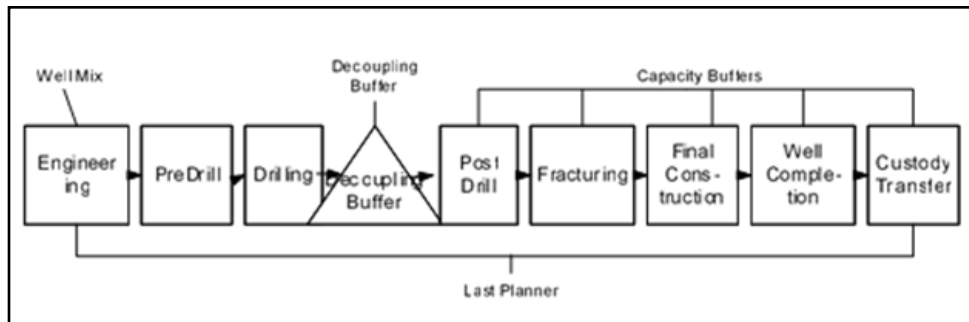
Variation is understood to be of two basic kinds: 1) Statistically describable variation, for which the mitigation strategy is a) variation reduction and b) buffering the ‘at-that-time’ irreducible variation; *and* 2) Low probability/high impact changes, for which creating flexibility, to adapt changes with least disturbance, is the appropriate strategy.

2 RESEARCH AIM AND METHODOLOGY

This paper applies two industry cases to identify and illustrate the above distinction, and offers a framework for managing variation in projects. Subsequent papers will apply that framework to produce project execution strategies and master schedules.

3 RESEARCH FINDINGS: STATISTICALLY DESCRIBABLE VARIATION

The variation in processing durations of unstable processes can be reduced by identifying ‘special’ causes of variation and implementing countermeasures. Stable processes have statistically predictable variation resulting from the nature of the process; i.e., from so-called ‘common’ causes. By definition, the variation in stable processes can only be reduced by redesigning the process.



Oil field development can be understood as a multi-project production system, in which each well is a project. In the Aera Energy case, three types of changes were made to reduce variation: 1) Reduction of batch sizes, 2) Right sizing equipment, and 3) Improving estimates of process durations. Once stabilized, the system was restructured. Changes

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were made to the organizational structure, a production control system was introduced, and both inventory and capacity buffers were built into the oil development process.

Together, these changes reduced capacity cost throughout the oil field development process of 25% and reduced cycle time by 36%.

4 RESEARCH FINDINGS: LOW PROBABILITY/HIGH IMPACT EVENTS

Flexibility can be increased in plans and in teams. Flexibility in plans is increased through a combination of hedging and postponement.

Postponement refers to decisions to be postponed to/and updated when new (and relevant) information becomes available, and when it is also feasible to update the decisions.

Examples:

- *Structuring the work to increase knowledge about stakeholders in the project definition process to better inform decisions*
- *Keep the solution space open and plan in greater detail as the work being planned approaches nearer in time*
- *Apply the decouple point concept, to develop 'two-stage planning processes'. Activities that can be executed with optimized workflow, with the information available, are assigned to the first stage. Customization activities are assigned to the second stage, after learning more about the future.*

Hedging refers to developing or buying 'insurance' to offset potential losses or gains.

Examples are:

- *In set-based design, developing a fallback alternative in case it is needed to meet the Last Responsible Moment*
- *Consolidating negatively correlated activities; e.g. uncertainty about the equipment type and location on the ship's deck, with different levels of deck sheeting strength required, could be managed by strengthening deck sheeting in potential locations to the maximum needed.*

Team flexibility exists when team members recognize, adapt to and absorb variations and disturbances, especially those that are not anticipated. Vitaliy and Sacks (2013, 2015) found that projects on which Last Planner was used strengthened their social network. A possible explanation is that teams and team members become habituated and skilled in developing plans to achieve objectives in uncertain and variable circumstances. Further research is needed to better understand how Last Planner helps people proactively cope with disturbance under pressure.