PerspECCtive

Battling the Enemy of Predictable Projects

Gary Fischer, PE Director, Project Production Institute





Exposing the Enemy



Unit rate contractor to drive 20,000 piles on the project in the first six months of construction, planned completion of foundations in two years

An excellent piling contractor was hired and delivered as promised for \$8.9MM on a unit rate contract – big win



Success?



Finished Piling – Waiting for Foundations



Projects are naturally unstable and unpredictable









Variability



- Weather
- Unplanned carry over
- Incidents / accidents
- Labor interruptions
- Discovery
- Rework
- Missing components
- Missing or unclear drawings



"No plan survives contact with the enemy" - Von Moltke





Agile Replanning Required







On average what percentage of craft work planned one day in advance is actually completed?

- A. 80-100
- B. 60-80
- C. 40-60
- D. 20-40
- E. 0-20





Agile Replanning Required





Most variability results from decisions made and human nature to protect ourselves



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STRATEGIC PROJECT SOLUTIONS

Self inflicted variability degrades performance



Execution Complexity

Complex designs

Matrix engineering

Scope differences at contractor interfaces

Different rates of work between trades or contractors

Design changes

Differences in construction methods

Complex contracting strategies

Complex compensation

Carry over

Case Study

High Execution Complexity Seeking Lowest Cost







Module Fabrication

Execution Simplified Lower Variability → Lower Ultimate Cost



Equipment suppliers



Equipment Transport Rail Truck Barge



New Module Fabrication Facility



What are the implications for Energy Transition Projects?



Energy Transition - Two Kinds of Projects

Giga Scale





Distributed Large & Small Scale "Deployment"







Unique Challenges

- Marginal economics
- Startups companies without capabilities to commercialize
- Small "mom and pop" EPC's that don't know how to deliver
- Big players inability to innovate
- Volatile supply chain due to geopolitical issues
- High product demand
- Low owner / contractor capacity and competence
- Competition with other sectors for resources
- Technology gaps what is available today vs what is needed
- Private Equity's seeking high returns

Deployment Projects Are Surprisingly Complex





GIGA SCALE	DEPLOYMENT
One location / jurisdiction	Multiple locations / jurisdictions
Dedicated design firm	Numerous design firms
One permit	Numerous permits
Engineered to Order	Typically, standard product that is localized
Many suppliers feeding to one location	Many suppliers feeding to numerous locations
Single lead contractor	Multiple contractors



Strategies to Manage Variability

- Startups partner with majors to commercialize
- Work with suppliers in a very different way. Align their production systems with program needs
- Standardize designs and customize only for local requirements
- Manage to an optimal level of WIP
- Standardize work sequence and work flows so local contractors can work effectively
- One design team
- Simplify design as much as possible even at apparent increased initial cost
- Strong owner involvement
- Use simple / straightforward contracts
- Manage as a program not individual projects
- Map, model and control the portfolio of similar investments





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Simulate, Analyze & Optimize



Control & Improve



Production System Modelling – A Powerful Tool



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What was the probability that the subassemblies would arrive at the fabrication yard in time for the sequence of integration?

- A. 80-100
- B. 60-80
- C. 40-60
- D. 20-40
- E. 0-20



Production System Modelling – A Powerful Tool

"Even in the case of almost perfectly reliable flows (99% reliable, by the agreed upon lead time), the probability (that subassemblies) arrive to the fabrication yard or assembly points just in time ready for integration is 60% (P=0.99^50 = 0.6), meaning a 40% percent chance of failing due to supply chain complexity, However, we know supply reliability is not near 99% and probably ranges between 50%-70%, which results in 99.99% probability of failure to arrive when needed for integration."



Five Levers Work Together

"No free moves"





Balanced Work Rates

Reduce Variability Manage WIP





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PPI 10th Annual Symposium 09 November, Houston