Insights on Digital Engineering Impact on Design Cycle Time with the Lyneis Rework Cycle

MOTIVATION

DoD Digital Engineering Strategy

- Modernize design, development, operation and sustainment
- Transform acquisition and implementation
- **Improve Speed** for critical capability delivery to the warfighter
- Connected data in a digital environment

STEVENS INSTITUTE OF TECHNOLOGY

GOALS & OBJECTIVES

Identify an evaluation method for success at reducing cycle time with DE implementations. The method should provide insights in advance of and throughout program execution.

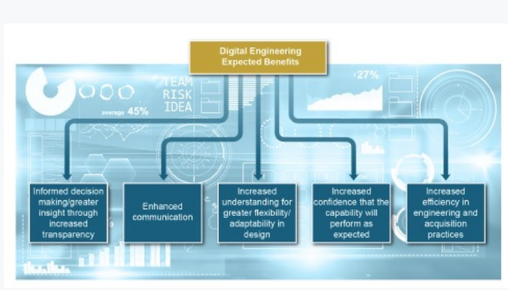
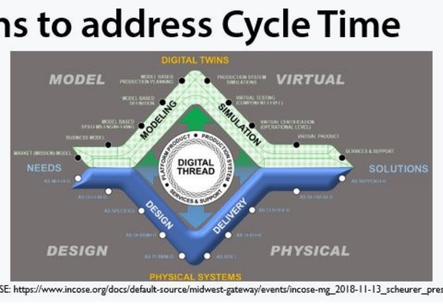


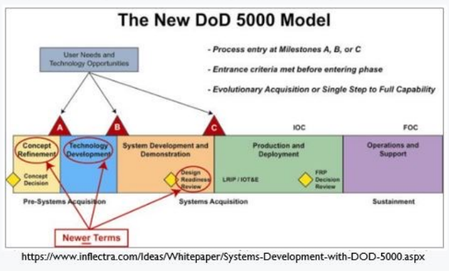
Image credit: DoD Digital Engineering Strategy, June 2018

Digital Engineering Implementations to address Cycle Time

- Integrate tools and data exchange methods to remove gaps
- Automate tasks that do not involve human decision-makers
- Reduce human entry errors



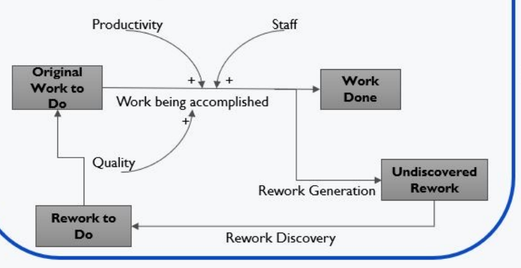
INCOSE: https://www.incose.org/docs/default-source/midwest-gateway/events/incose-mg_2018-11-13_scheurer_presentation.pdf



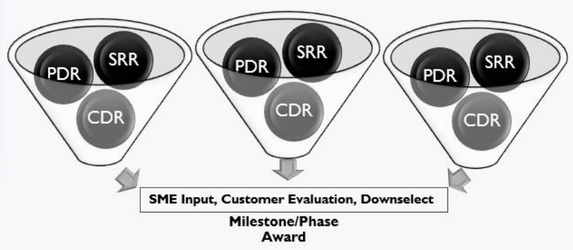
https://www.inflectra.com/Ideas/Whitepaper/Systems-Development-with-DOD-5000.aspx

How Do we Evaluate Success at Reducing Cycle Time?

- Within Design Cycles
  - Automated tasks
  - Reduce human touch time and entry errors
  - Do not replace human decision-making

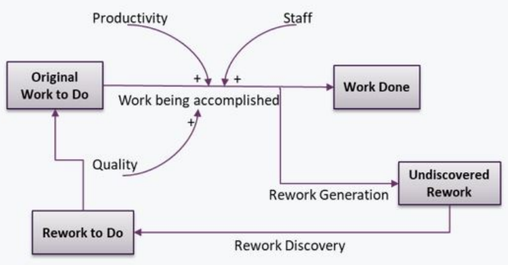


- Decision-Making in Lifecycle Progression
  - Large human decision-making involvement
  - Uses outputs of DE and design cycles for decision-making



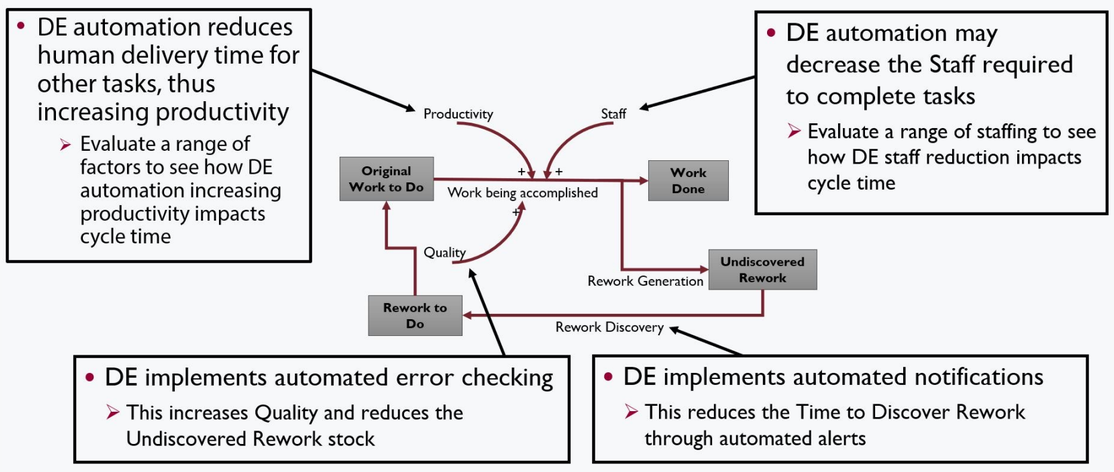
Digital Engineering as the Rework Cycle

- Dr. James M. Lyneis, MIT
  - Systems Dynamics Model for Project Management
  - System Dynamics can translate theories to equations representative of social and physical systems, such as engineering design cycles
    - Descriptions of processes, interactions are converted to stock and flow equations
    - Model can be simulated to identify impacts of change
    - Both direct and indirect impacts can be represented in the model via feedback loops



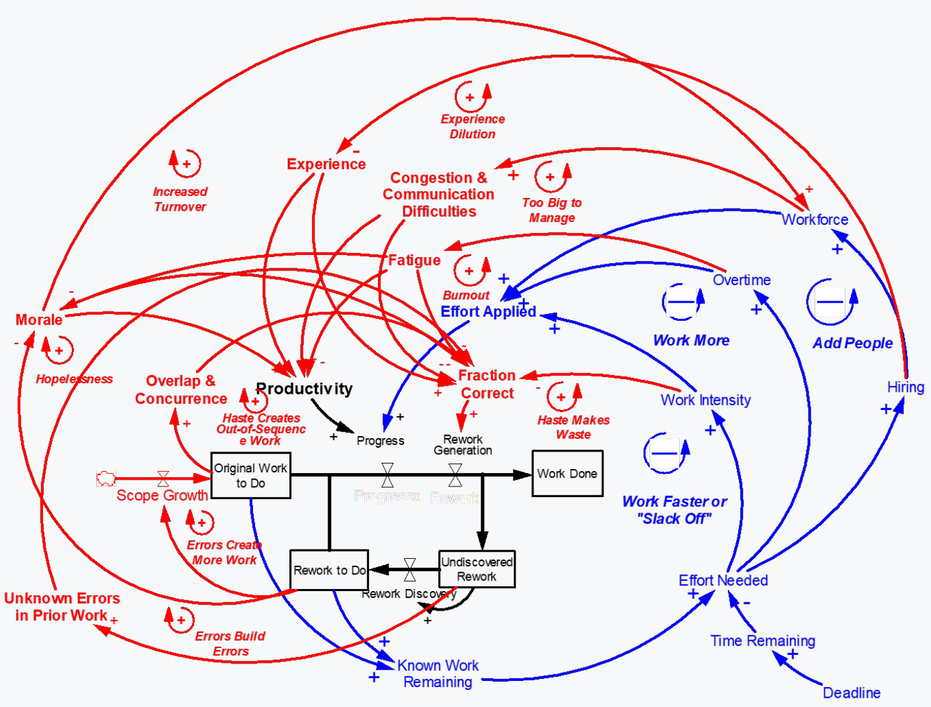
The basic rework cycle

How does DE impact time to complete the rework cycle?



METHODOLOGY

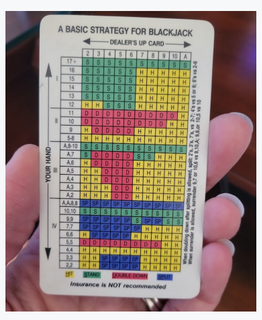
Digital Engineering implementations can have some significant impacts on key stocks and flows in the Rework Cycle. These can be evaluated in a systems dynamics model to look at the impacts of increased adoption and use. The challenge is to see how this impacts feedback loops of the qualitative model, or introduces new feedback loops to be considered:



FUTURE RESEARCH

This work presents the Rework Cycle as a method for gaining insight on Digital Engineering impact on cycle time within a design cycle. Future work needs to look at a method for gaining insight on Digital Engineering impact on human decision-making that drives cycle time.

Future studies will include using Agent Based Modeling (ABM) and a surrogate model to evaluate decision-making behaviors with DE with the intent of informing industry on how to build a basic strategy for decision making using DE.



CONTACTS & REFERENCES

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