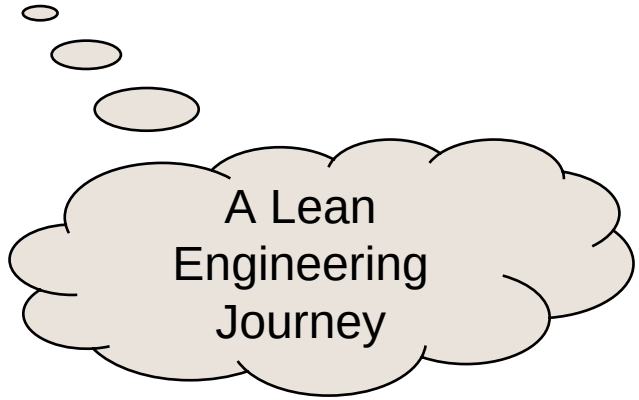
Simplifying & Scaling Engineering Processes: Unifying Business Units and Engineering Disciplines



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A New Order of Things

- And it ought to be remembered that there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things.
- Because the innovator has for enemies all those who have done well under the old conditions, and lukewarm defenders in those who may do well under the new.
- This coolness arises partly from fear of the opponents, who have the laws on their side, and partly from the incredulity of men, who do not readily believe in new things until they have had a long experience of them.
- Thus it happens that whenever those who are hostile have the opportunity to attack they do it like partisans, whilst the others defend lukewarmly…

- Nicolo Machiavelli, written circa 1505, published 1515

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Objectives

- Understand basic & historical evolution of RCI engineering processes
- Understand steps through process transformation
- Explore outcomes from transformation
- Explore expected resulting behavior

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Previous State to 2000

- Rockwell Collins consisted primarily of 3 distinct business units
  - Government Systems
    - Primary customers: military aerospace
    - Process basis: MIL-STD-499, DoD-STD-2167
    - Documented process: Engineering Project Manual – largely hardware development
  - Business & Regional Systems
    - Primary customers: business jets, small regional transports, FAA
    - Process basis: FAA certification (RTCA DO-178)
    - Documented process: Systems Engineering Process – closely aligned with FAA expectations and avionics application
  - Air Transport Systems
    - Primary customers: large transports, passenger & cargo
    - Process basis: Aircraft OEM Processes
    - Documented process: Loose collection of process papers; OEM-driven process

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Reformation

- Enterprise use of SAP
  - New financial and order administration capability
  - How does engineering align with SAP?

- Cross- Business Unit Functional Teams
  - Process & Practioner views of new process
  - Cross-Business Teams Aligned along functional boundaries
    - Systems Engineering
    - Software Engineering
    - Hardware Engineering (Electrical & Mechanical)
    - ASIC Engineering
    - Installation (latecomer)

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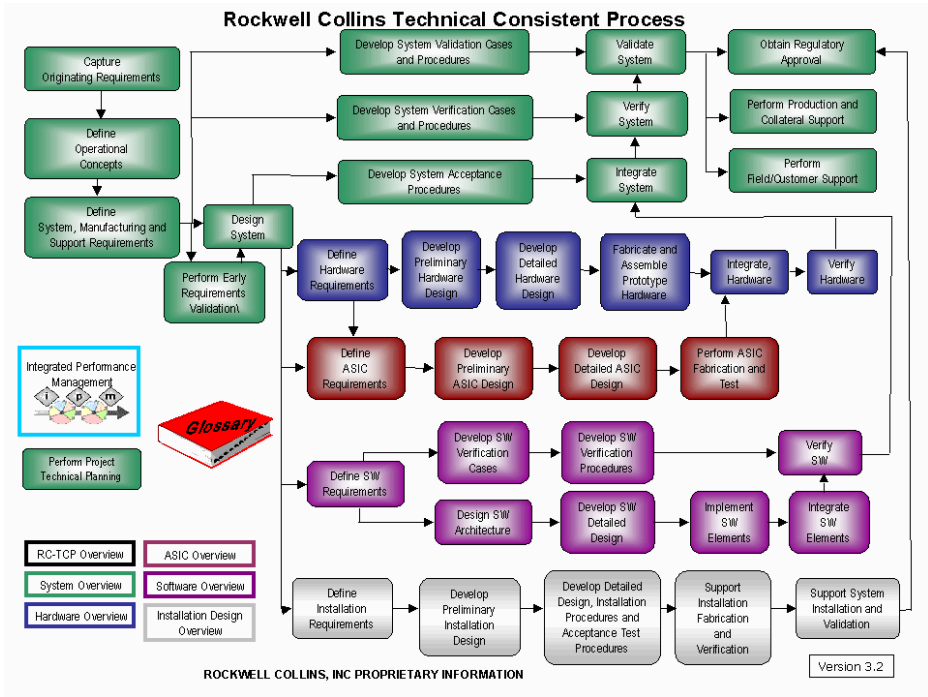
Consistent Process Model: First Steps

- Technical Consistent Process (TCP) v1.0 model released in 2000
  - Align business units under one process
  - Align engineering process for use with SAP

- TCP interactive web-site
- TCP tailoring worksheet
- TCP computer-based training



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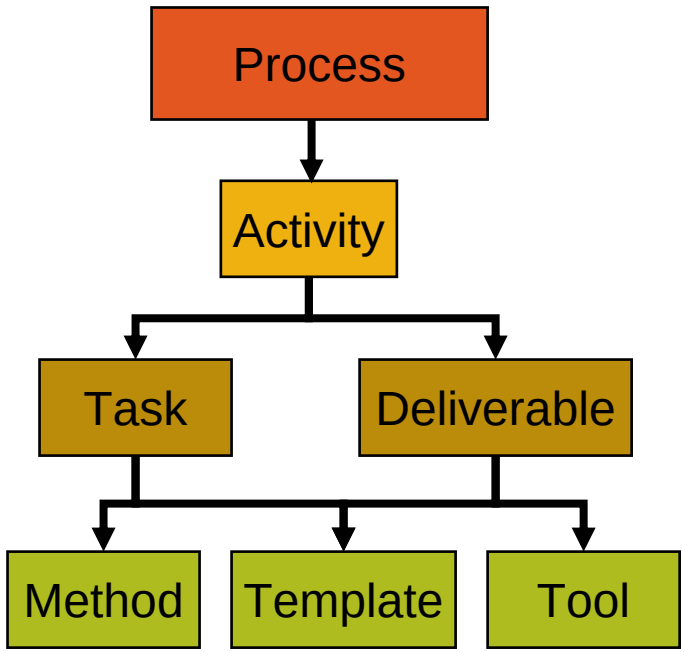
Resulting Behaviors

- Discipline-Centric views of "Engineering"
  - Inconsistencies between disciplines – similar, yet different
  - Depth vs. breadth of process content
  - Activity vs Phase Models
- Disparate Application of Process
  - "Process Tax"
- Evolving Process Library
- Potential Consistent Metrics



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Evolving the TCP: Current Steps

- Design & Development (D&D) Cycle Time Reduction (CTR) Initiative
  - Simplify the engineering process model
    - Eliminate redundancy
    - Remove inconsistencies
  - Improve scalability
  - Improve user friendliness and information understanding
  - Maximize reuse of existing TCP

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Observations

- Scalability
  - Consider TurboTax approach to process tailoring
    - Project & product characteristics drive process needs
  - Allow common process model
    - Shared by business units
    - Shared between disciplines

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Transformation

- Initial
  - Cross- Business Unit Functional Teams
    - Aligned along same discipline-centric approach
    - Allowed functional practitioners voice to express desires to reform TCP
- Synthesize observations into ONE process model
- Subsequent
  - Mixed functional teams
    - Systems, software, hardware, ASIC from different business areas collaborate
    - Attempt to unify a single engineering process model
    - 90+ practitioners and process experts – meet in smaller groups of 10-20 participants

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Lean Engineering: Simplify & Eliminate

- Unified disciplines under one process model
  - Eliminate inconsistencies between disciplines
  - Remove redundancy
  - Simplified process model
    -

TCP	Original	New	% Total Reduction
Activities	39	18	54%
Tasks	344	129	63%

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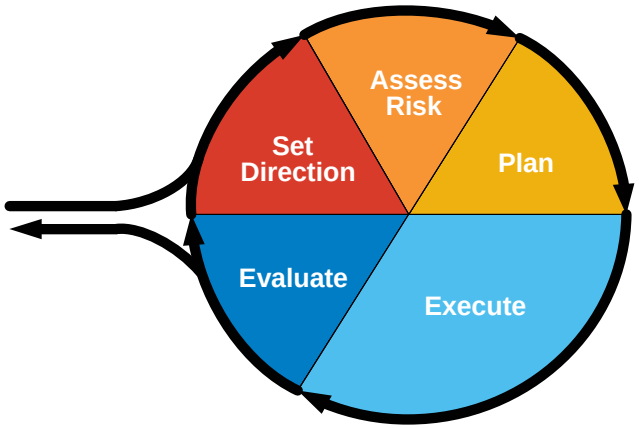
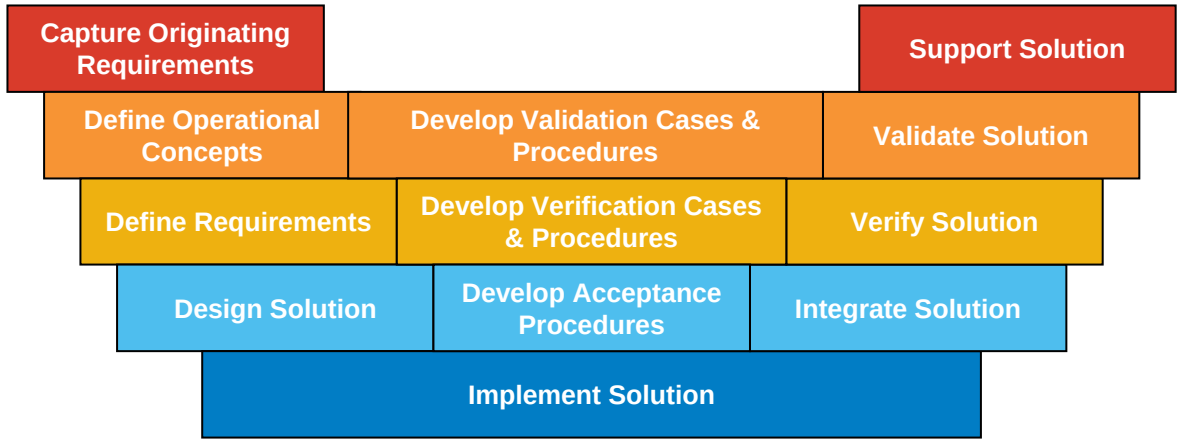
Technical Consistent Process v4.0

Technical Management Activities (TMA)



Technical Development Activities (TDA)



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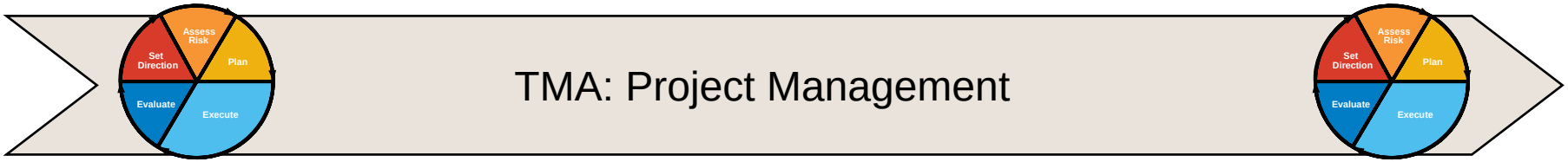
Instantiable Process Model



Capture Originating Requirements

Support Solution

Define Operational Concepts

Develop Validation Cases & Procedures

Validate Solution

Define Requirements

Develop Verification Cases & Procedures

Design Solution

Develop Acceptance Procedures

Implement Solution

Use same process for:
- Primary end-system
- System components
- Enabling systems used to develop, build, support, test, etc across the primary system's life-cycle.

Replace "Solution" with:
- Platform
- System
- Subsystem
- Component
- Software
- Hardware
- ASIC
- Installation
- Test Equipment
- Integration Lab (bench, SIL, etc)
- Simulator
- Manufacturing system
- Human Process
- Or whatever else "X" being designed and developed

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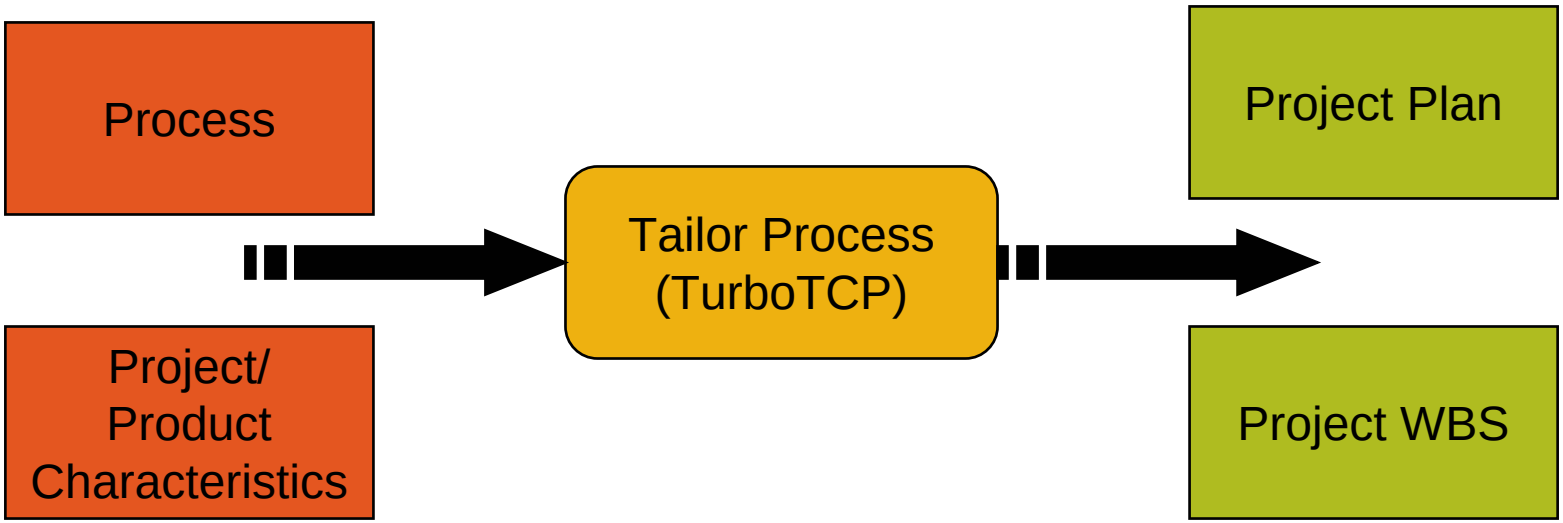
Expected Behaviors

- Process forms the basis of project planning



- Consistent metrics
- Consistent application

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Conclusion

- Understand basic & historical evolution of RCI engineering processes
  - Business unit & discipline centric processes evolving to unified, tailorable engineering process model
- Understand steps through process transformation
  - Collaborative teams – practitioners and process experts
- Explore outcomes from transformation
  - Scalable process framework
- Explore expected resulting behavior
  - Process provides basis for planning & execution

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