

Foundation Concepts for Agility in the Future of Systems Engineering – v201125

Concept Title	Problem	Need	Barriers	Intent	Value	Metrics
	General problem addressed by the concept	General need to solve the problem	General impediments to achieving the concept	General strategies to address the need	General value to be delivered by strategy	General metrics for measuring effectiveness of strategies
1. System of Innovation	Insufficient learning activity and knowledge management; barriers to knowledge application.	Situational awareness and learning embedded in lifecycle processes; timely/affordable learning-application enabled; knowledge management.	Unclear <i>what to do or where to do it</i> beyond learning ceremonies and contract obligation satisfaction.	Explore the application of three core principles: sense, respond, and evolve.	Less rework (cost/time); higher customer/user satisfaction; competency growth.	Relevance of knowledge; impact of applied learning.
2. Technical Oversight for Agile Projects	Traditional technical oversight methods counterproductive in agile programs.	An interactive approach that reveals relevant knowledge for guidance and decision making.	Oversight traditions; standard contract wording; disrespect for oversight.	Synergy between oversight methods and agile approaches.	Relevant and appreciated guidance, streamlined forward progress.	Feedback effectiveness and timeliness; economics of oversight ROI.
3. Engaging Stakeholders	Timeliness and depth of stakeholder collaborative engagement.	Discovery of true requirements and integration conflicts.	Time involved; travel cost; inconvenient scheduling; lack of motivation.	Enable and facilitate compelling collaboration, cooperation, and teaming among all relevant stakeholders.	Less rework (cost/time); higher customer and user satisfaction.	Breadth and depth of stakeholder engagement; time and cost of rework. Lead time, cycle time, defect density.
4. Agility Across Organizational Boundaries	Multiple handoffs across organizational boundaries lead to slower lower quality product.	Common language; less handoffs; product based teams; common metrics	Functional organizational silos.	Enable customer centric product based delivery with low complexity and higher speed.	Adaptable, increased quality, speed, lower cost, reduced risk.	Lead time, cycle time, defect density.
5. Orchestrating Agility with Long Lead Components	Components and external dependencies with long lead times complicate schedule coordination and disrupt technical performance.	Scheduling and acquisition techniques that better align with agile-SE principles.	[False] justification that long-lead items prohibit the use of agile-SE.	Clarify how agile-SE can accommodate long-lead time acquisition.	Reduce long-term cost and risk; quicker time to market.	Non-productive wait time, integration effort, and rework.

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6. Continual Integration	Late discovery of integration and requirements issues.	Minimize risk and rework; maximize stakeholder engagement.	Development effort and expense. Technologies for integrating/testing software prior to HW being ready.	A Live-Virtual-Constructive platform for early and continual integrated testing and work-in-progress demonstrations.	Less rework (cost/time); effective stakeholder engagement.	Rework reduction; stakeholder value statements.
7. Orchestrating Agile Operations	Disparate solutions operate independently.	Tightly coupled coordinated dynamic operations in real-time.	Ability to encode self-learning, adaptive logic as decision-support to people and for autonomous decision making.	Elaborate orchestration as command and control for a system; and advance thinking on command.	Fast adaptable system operation.	Increase in autonomous system defense. Less people in-the-loop.
8. Quantifying Agility for Agile Operations	Lack of autonomy in orchestration; dependency on people in-the-loop.	Continual dynamic adaptation within cyber-relevant time.	Complicatedness of encoding autonomous governance and adjudication logic and rules; situational awareness that provides necessary inputs.	A foundation of technology and mathematical disciplines to quantify agility.	Contribute to realization of continual dynamic adaptation in operations.	Orchestration performance metrics.
9. Harmonizing Risk in Agile Operations	Operational risk predominantly focuses on potential loss.	Expand awareness and operational realization of both the negative side of risk (loss) and the positive side of risk (opportunity, seek gain, optimize).	Silo-thinking and predominance of looking at risk only in terms of loss.	Establish agility's role in sustaining system viability and relevance including proactive contingency planning, continual optimization, and seeking gain.	Holistic approach to risk; dynamic adaptation in explore / exploit.	Mean Time Between Failure (MTBF), Mean Time Between Repair (MTBR); up-time, value-delivery quantity and quality (time, accuracy, efficiency); consistency (dependability).