Critical Tools in the Systems Engineer's Toolbox

The power of a systems engineer is derived from their formal training, attitude toward conquering challenges, and leadership skills. That power is harnessed to the benefit of individual programs through the systems engineer's ability to couple the right tool to the challenges of a project. These tools fall into categories of Processes, Methodologies, and System Development Lifecycles.

The system engineer uses Process and Methodology tools to formally define the work that needs to be done, describe in detail how the work is to be accomplished, and to set the standards for assessing if work is completed. The wrong choice of tool for addressing project challenges will generate inefficiencies in meeting the user's vision, and thereby increase the risk of costly rework and/or schedule delays.

Process and Methodology tools are used at both an organizational level and at a program level. At the organizational level, the systems engineers' Process and Methodology tools provide the foundation for overall quality and efficiency expected from all projects. These tools also reinforce organizational strategies and industry best practices, and help to sustain the organization's reputation, branding, and culture. At the program level, Process and Methodology tools are adopted to meet specific project objectives while living within organizational tool constraints. A systems engineer strives to optimize the choice of a tool to a project team's experience, and the project challenges that need to be resolved.

For an example of how this plays out: A bicycle company might be known for producing high-quality, custom-made racing bikes that last for decades. Customers pay a premium for the bikes and wait four months from order to delivery. Those characteristics arise from the process and methodology tools used by the company. But, say a customer asks the company to develop a special bicycle – one never built before – and wants a working model of the bike in three weeks. Since the model will eventually be disposed of, it does not need to be of high-quality, or built to last – and it should not contain costly materials.

If the standard Process and Methodology tools are applied for this special request, the company cannot hope to meet the user's schedule, nor to discover the unique characteristics of the user's vision. To help this project succeed, the systems engineer will select a subset of "standard" tools, modify and extend others, and, if required, build new ones.

Another tool of the systems engineer is the System Development Lifecycle, which aids in focusing available time and resources onto the most important aspects of a project. The System Development Lifecycle establishes the structure of the project work plan. It is the systems engineer's ability to choose the best-suited System Development Lifecycle tool to meet the program's objectives – and in the bicycle example, one that creates and tests a disposable model, and then develops a final product under the specified program constraints.

The System Development Lifecycle is essentially a work pattern (design, build, integrate, test, deploy) for the work plan. The work plan, in turn, provides the context for the

systems engineer to choose, tailor, and develop Process and Methodology tools that will meet company and program objectives.

Senior level managers who appreciate and support the tools that systems engineers bring to a project, and to an organization, will find greater efficiencies, better directed resources, and a greater positive impact to the organization overall. Through that support, senior level managers can expect to increase the value of the projects they deliver to end users.