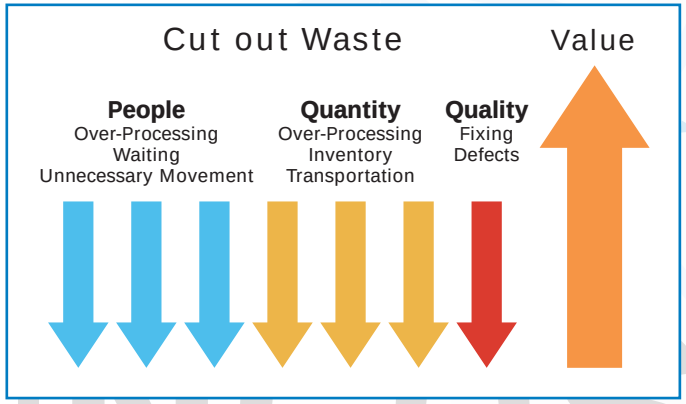
Lean Enablers for Systems Engineering

In 2009, the Lean SE Working Group released a major online product named Lean Enablers for Systems Engineering (LEfSE) (see the LSE WG webpage). It is a list of 194 practices and recommendations formulated as “dos” and “don’ts” of SE based on Lean Thinking. They have been collected from most successful industrial practices and from the wisdom and experience of the 14 Lean and SE experts working on the project, with support from the Lean SE Working Group of INCOSE. The practices cover a large spectrum of SE and other relevant enterprise management practices. Every practice will improve program value and stakeholder satisfaction, and reduce waste, delays, cost overruns and frustrations.

LSE does not mean less SE. It means **better** Systems Engineering with higher responsibility, authority, and accountability, leading to better, waste-free workflow with increased mission assurance. Under the LSE philosophy, mission assurance is non-negotiable, and any task which is legitimately required for success must be included; but it should be well-planned, prepared and coordinated, and executed with minimal waste.

Continued on page [3]...



Fundamentals of Lean Thinking:

1. Value

Value is a measure of worth of a specific product or service by a customer, and potentially other stakeholders and is a function of (1) the product's usefulness in satisfying a customer need, (2) the relative importance of the need being satisfied, (3) the availability of the product relative to when it is needed, and (4) the cost of ownership to the customer.

In LSE, Value is defined as mission assurance (the delivery of a flawless complex system, with flawless technical performance, during the product or mission development life cycle), satisfying the customer and all other stakeholders, which implies completion with minimal waste, minimal cost, and the shortest possible schedule. In early lifecycle phases, value is created by reducing uncertainty, building a stakeholder consensus, and providing clear evidence to support good and timely decisions.

2. Waste

Waste is the work element that adds no value to the product or service in the eyes of the customer. Waste only adds cost and time. Waste is classified into seven categories.
The following are examples of waste in common Systems Engineering practice, in the order of decreasing occurrence in programs:

1. Waiting: Waiting for supply or processing of material or information:
> Late delivery of material or information
> Excessively serial tasking; not enough concurrency
> Waiting for approvals

2. Over-Processing: Processing more than necessary to produce the desired output:
> Too many hands on the “stuff”
> Excessive/custom formatting or reformatting
> Excessive refinement, beyond what is needed for Value

3. Transportation: Moving material or information:
> Unnecessary hand-offs between people
> Communication failures

4. Inventory: Maintaining more material or information than needed:
> Too much “stuff” stockpiled on desks or in storage
> Complicated retrieval of needed “stuff”
> Outdated, obsolete information

5. Defects: Errors, mistakes and lack of communication causing work to be redone to correct the problem:
> Item delivered different from the item needed
> Incorrect information

6. Over-Production: Creating too much material or information:
> Creating unnecessary data and information
> Information over-dissemination (e.g. emails)

7. Unnecessary Movement: People moving to access or process material or information:
> Lack of direct access
> Time spent finding what you need
> Manual intervention

3. The Six Lean Principles -

creating value without waste:

1. The customer defines value. The value proposition must be captured with crystal clarity early in the program (applies to both external and internal customers)

2. Map the value stream. Prepare for and plan all end-to-end linked activities necessary to realise value, streamlined, after eliminating waste, using the best decision-making processes

3. Make value flow continuously along the value stream. This should happen without stopping, rework, or backflow (legitimate optimised iterations are okay)

4. Let customers pull value. The customer’s pull/need defines all tasks and their timing (internal or external)

5. Pursue perfection. Constantly improve your processes, and make all imperfections visible in order to motivate continuous improvement

6. Respect for people. Create a system of mutually respectful, trusting, honest, cooperating and synergistic relationships of key stakeholders, motivating staff to exhibit top capabilities.