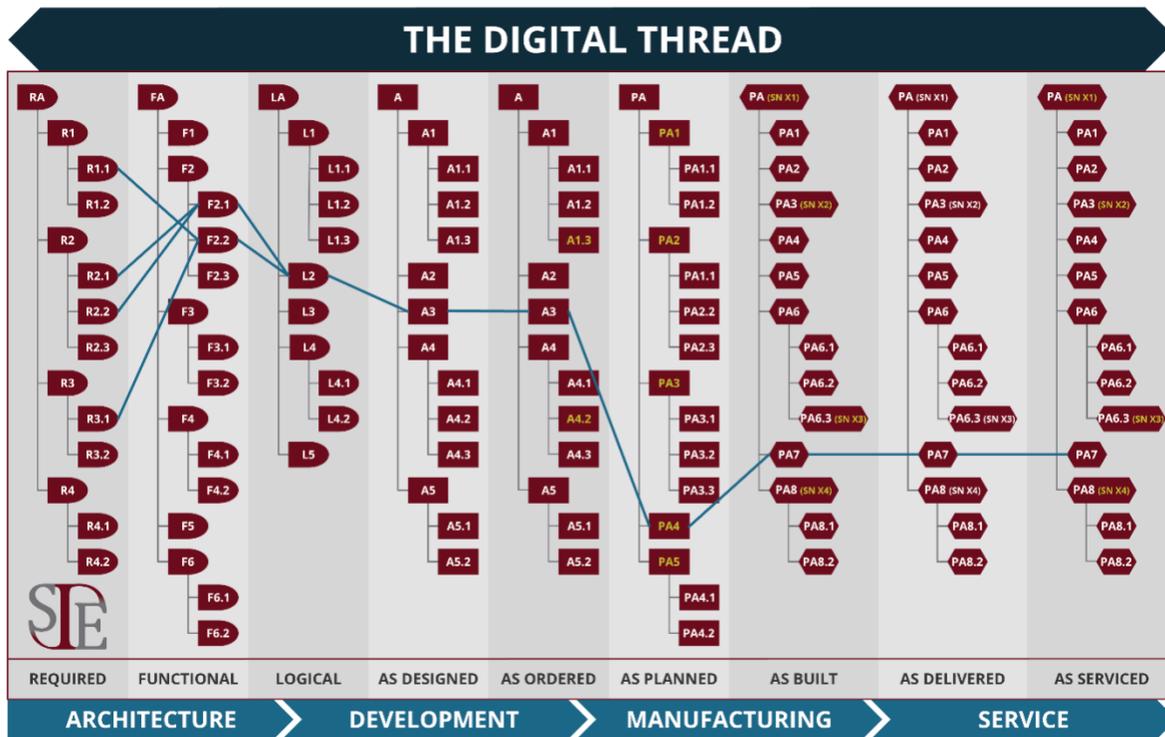


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Systems Engineering, The Digital Thread, and Better Control in Manufacturing



Systems should be designed and architected to enable agility and efficiencies in manufacturing. Instilling concepts of the digital thread in combination with Model Based Systems Engineering (MBSE), as discussed in our last email, will enable better control in manufacturing to assure these desired efficiencies and associated cost savings in manufacturing.

The electronics manufacturing industry has been investing and integrating automation and shop-floor control systems for many years attempting to take advantage of the digital thread from design to manufacturing. Today, the introduction of the Internet of Things (IoT) hardware and software technology along with machine-to-machine communication enables the collection of large amounts of factory floor data to better see what is



happening on the shop floor in real time. The fusion of this data into meaningful information that serves utility is the challenge of newer factory floor equipment.

In addition to manufacturing processes and equipment, there is a critical need to better measure and control materials that we use in the manufacturing of electronic products. In the world of IoT, materials control is one of the forgotten areas based on the complexity of measuring and controlling material systems in a factory setting. Material systems of interest include soldering materials (e.g. solder paste, fluxes, etc.), coating systems and masks, residues from a no-clean process, laminate and insulating systems, and many more. As we tighten processes, move to more agile automation, and integrate smart decision making from big data and machine learning methods, the ability to measure the consistency of materials in manufacturing will be critical.

One of the benefits of MBSE is the ability to not only document system architectures and associated design data but to then use this data (via the digital thread) to improve both design and manufacturing processes. This thread can both shorten setup times in manufacturing and instill better control in manufacturing processes and materials, in many cases, being the forgotten element of control.