IMPLEMENTING
Lean Manufacturing **Principles in an A&D Environment**

Lean manufacturing is a management philosophy, enabled and supported by various techniques, to eliminate any form of non-value adding activity. With terms like “lot size of one”, “continuous flow”, and “pull production”, lean manufacturing has primarily been associated with the factory floors of short run, repetitive manufacturers. In an Aerospace and Defense (A&D), government regulations often impose very different business practices than those followed in the commercial sector. Can lean manufacturing principles work in A&D? The answer is “yes”. Implemented via an appropriately architected ERP system, lean manufacturing principles can and *should* play a crucial role in A&D, particularly in reducing knowledge worker and administrative waste, a huge component of cost in A&D environments.

The practice of lean manufacturing got started in Japan in the 1950’s at Toyota Motor Company. Seeking to reduce manufacturing costs, Toyota set up a system in which demand directly drove production. Each sale of finished goods triggered a signal for replenishment. The signal cascaded back through the manufacturing process, at each step “pulling” a replacement for consumed inventory. This highly successful flow manufacturing methodology dramatically drove down lead times, transaction costs, and inventory, both within the factory walls and throughout the supply chain.

Over time, lean has become somewhat of a fuzzy umbrella for process improvements that seek to eliminate waste and duplicate activities in operations. For many lean converts, Enterprise Resource Planning software, typically associated with large batch runs driven by production planning and dedicated to achieving economies of scale, is antithetical to the principles of lean manufacturing. But A&D is a unique environment where the right ERP system not only works within lean’s core concepts, but actually is the only viable method for enabling them in the non-manufacturing areas that are so essential to successful defense contractors.

In Aerospace & Defense, more people and costs are involved in Engineering, Project Management, Contract Negotiations, and Cost Accounting than in actual manufacturing activities on the shop floor. In this environment, progress payments, document control, and an extensive component audit trial (none of which would normally be viewed as adding value to a product) are critical components of the deliverable. This paperwork factory underpins every manufacturer producing goods for the government. The products of this paperwork factory go through processes, down time and often, unfortunately, rework, much as do physical products. Superior performance here is where A&D manufacturers, so tied to these functions via regulatory require-

ments, can significantly pad or pare their margins. If lean manufacturing is about using only what you need to get the job done and eliminating superfluous work and equipment, then implementing vertical-specific ERP is only way to achieve lean in A&D's major expense centers.

Let's take a few examples to illustrate:

Progress Payments

Imagine your company has just been requested to provide government regulators with full backup to support the latest progress payment. Without project-oriented ERP, the workflow for the request will start with the project manager, who will translate the request into report requirements for the IT department: "I need to know exactly what components have been purchased towards the project, how many are in WIP, how many in inventory, and labor to date". IT then builds the "bridge" between what your software provides out of the box and the information that's required for the report. Not infrequently, this will require manual reentry of data and/or the creation of additional databases outside of those native to the software. When all is said and done, the report may be reusable, but each time it's run, it will go to the General Ledger to gather its costing data. It won't be up-to-date, since commercially-oriented software typically sends data to the GL in batch mode. Even worse, it will have exponentially multiplied the number of transactions the ERP system is handling, clogging its arteries and slowing it down for the "real" work the factory needs to produce the goods.

ERP architected for project-oriented businesses completely avoids both the human and information workflows detailed above. Industry-specific modules, including Work Breakdown Structure, Project Control, and Design Engineering enable multi-level cost collection and reporting by job, customer, contract, or project number. Systems designed from the bottom up for project control avoid both the creation of additional databases and the need to tap into the GL to extract WBS data, by sending only costed journal entries to the GL and the Actual Cost of Work Performed from Receiving, Labor, WIP, etc., directly to the appropriate Work Breakdown Structure. Information for progress payments (or Earned Value) roll up in real time without unduly burdening other departments within the organization, or the system itself.

Inventory Integrity

Many A&D manufacturers produce products requiring project specific inventory items and, frequently, a full audit trail. Some face an even more complicated situation by needing a mix of project specific and stock items commingled for a single end product. In both situations, many functional areas within the organization, including Purchasing, Receiving and Kitting will be forced to somehow artificially tag items to specific projects (and, perhaps, specific warehouses). Accounting and Finance also will need to design creative ways to track cost components.

In a lean A&D environment supported by appropriate ERP capabilities, inventory can be accepted into specific warehouses, projects, and/or work breakdown structures, or users can elect to plan certain items without regard to projects, so that production or purchasing efficiencies can be maintained. All these capabilities are available without manual workarounds or a force fit, creative misuse of the native capabilities of commercial software.

Throughout the paperwork factory in A&D plants, including order reporting, engineering change control, and document control, ERP

systems fundamentally architected for project control can avoid or reduce:

- Management time dedicated to determine reporting requirements – project-oriented software was built to automatically configure to the report requirements of an A&D environment
- IT customization set-up time to develop "work-arounds"
- Manual pulling and entry of data into secondary data sources for standard government reporting requirements
- Initial customization costs, time, manpower, and/or dollar outlay required to build the "bridge" or manually collect information
- Database proliferation
- The number of transactions within the ERP system (streamlined ERP functioning increases the system's overall speed and efficiency)

A&D manufacturers are typically working under multiple-year contracts, tight security, classified products, and exacting cost, inventory, and finished goods auditability requirements. The myriad reporting tasks imposed by such requirements seem to preclude the implementation of many lean manufacturing initiatives. Yet successful companies in the A&D industry are reducing costs in key functional areas through the implementation of an ERP system whose architecture is native to A&D reporting requirements.

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