How to Leverage Manufacturing Best Practices to Create Competitive Advantage in Distribution Centers

By borrowing process improvement tools and techniques from the manufacturing world, supply chain players can more effectively manage product flow, significantly reduce costs and improve flexibility in their distribution centers.

Executive Summary

Manufacturing has evolved by embracing highly refined processes for planning and execution. This has helped many manufacturers rapidly improve their operational effectiveness and productivity while removing waste from each and every step of their production processes.

Overall, manufacturers have benefited from being the focal point of value creation (materials, labor, etc. required to produce a product), as their role in the process represents the largest percentage of cost within the supply chain. This status has helped manufacturers propel the development and standardization of process improvement tools and techniques, such as Value Stream Mapping, 5S, Andons, collaborative forecasting and planning, Kaizen, just-in-time inventory, and approaches adopted across the entire Toyota Production System. Increasingly, these tools and techniques are being embraced by supply chain players to reduce inventory within their distribution centers (DCs) and to more effectively manage product flow, with an eye toward significantly reducing costs and improving flexibility.

For large DCs, spread across millions of square feet, both planning and execution excellence provide opportunities to leverage manufacturing industry best practices. Focal points include:

− **Planning:** Forecasting resources, including labor and equipment, to more effectively utilize capacity, drive world-class order fill rates and minimize costs by “right-sizing” the labor force to meet demand. DC managers have also begun to leverage planning aspects of JIT (just-in-time) and TOC (theory of constraints) from the manufacturer’s production planning handbook to better manage freight flow and handling across facilities.

− **Execution:** Tools and techniques to manage the production shop floor, including process management approaches (such as Lean) to reduce or eliminate waste and Andon systems for exception management to improve order fill accuracy and throughput. Automation and an emphasis on execution flexibility are two other areas where distribution center operations are adopting best practices from the manufacturing world.
This white paper explores key aspects of how players across the supply chain can leverage best practices pioneered and perfected by manufacturers.

**Production Planning Rigor in the Distribution Center**

Management of the distribution center and its resources, in terms of labor, equipment and space, already borrows heavily from manufacturers’ production planning and control best practices (see Figure 1). This trend will accelerate in the near future and will include some of the following:

- **Capacity planning and utilization:** Sophisticated labor management solutions are increasingly leveraging capacity planning algorithms to determine labor needs in various areas of the DC based on the demand profile. The incoming freight on advance shipment notification (ASNs) determines the inbound resource need, both for labor and space in the DC for storage. Demand placed on the DC determines the outbound labor needs for order filler/loader hours. These are also linked to transportation requirements to help determine capacity for outbound trailers.

- **Sales and operation planning:** Many have begun integrating their planning process with sales and finance to identify and react to demand fluctuations proactively, which reduces cost and improves order cycle times. Previously, DCs conducted their planning in a vacuum, which often resulted in under-utilized resources or excessive overtime, negatively impacting cost and order cycle time. We expect this trend to continue, going forward.

- **Just-in-time:** JIT is a management system defined to remove waste from different operational elements, such as inventory (raw materials, WIP and finished goods). At a high level, JIT means having exactly what is needed in exactly the right quantity at exactly the right time. While we will discuss some of the execution principles of JIT in the next section, from a planning perspective JIT imposes the challenge of accepting and distributing freight with little to no inventory in the warehouse. This has implications on supply chain network design, supplier collaboration, scheduling inbound freight and overall supply chain risk. The goal is to ensure that the right freight keeps moving in the network with little to no storage at a single node. In a world where being responsive to demand will be critical for retailers, mastering this just-in-time capability will be key to success.

- **Leveraging the theory of constraints:** TOC has been utilized to plan around bottlenecks in manufacturing plants. DC managers have started to identify and plan around the bottlenecks in their respective buildings. For some, the bot-

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**If the Practice Fits, Borrow It**

![Figure 1](image-url)
tleneck might be the order-filling operations where an increasing amount of automation is utilized to increase productivity. For some customer fulfillment operations, the bottleneck might lie in the order packing and consolidation area. In such situations, DC management teams are identifying and putting in place processes to alleviate these bottlenecks by managing the workloads at these work stations.

**Execution Principles from the Manufacturing World**

Industrial engineering principles and various productivity improvement methodologies such as TPS (Toyota Production System), Lean manufacturing and Six Sigma have evolved over the past several decades in the manufacturing domain. Increasingly, some of these principles have been applied to DC management, as well. The following are key principles adopted by supply chain execution leaders for designing processes to enhance the overall productivity of their distribution centers. (See Figure 1 for additional insights.)

- **Power to the people (Andon):** Some of the main principles advocated for effective shop floor control center around associates and the team on the ground. Lean and JIT principles provide workers and teams with the authority to supervise themselves and stop production when an issue is found. This authority and the ability to highlight issues as early as possible prevent defects from emerging later in the production process and causing rework.

  Similarly, in a distribution center, each and every associate must be encouraged to identify issues and, enabled with mechanisms, raise alerts to supervisors to correct them as soon as possible. Examples include damages, stock-outs, inventory errors, order-filling errors, etc.

  We are already seeing a trend in which industry leaders are building sophisticated alerting mechanisms into their execution systems, such as WMS (warehouse management systems) or YMS (yard management systems). These alerts will let supervisors know of situations like inventory issues and aging trailers that in the DC world directly impact production and shipment to customers.

  Cutting-edge DCs are also using Andons to maintain flow throughout the DC. Examples include installing Andons on workstations and shipping doors to signal flow/congestion issues. DCs can dramatically improve KPIs (e.g., productivity, quality, customer experience and cost) by empowering all front-line employees to identify and escalate issues instead of viewing operational challenges as belonging exclusively to DC management. This extends responsibility to employees in receiving, hauling, replenishment, order filling and shipping.

- **Poka-yoke:** This term — introduced in Lean manufacturing to denote “mistake-proofing” — emphasizes designing processes in a manner that reduces the chance of the process producing a defect. The intent is to keep the defect from moving downstream and causing huge amounts of rework or lost productivity.

  In DCs, we see several instances of processes designed to catch issues as soon as they occur, including defining thresholds for order quantities to prevent inventory discrepancies; providing visual aids to workers to encourage adherence to SOPs; implementing RFID to ensure the correct merchandise is processed through the DC, from receipt to customer shipment; and installing scales and exception handling processes to verify shipment integrity prior to goods leaving the warehouse. Since customers have enormous choice of which retailers they purchase from, order fulfillment accuracy can be a key differentiator. We believe DCs will continue to focus on “poka-yoke” in the future.

- **Process improvement:** Leveraging Lean tools such as value-stream mapping, Kaizen and 5S, many DCs are conducting rigorous and frequent process design reviews. Value-stream mapping is designed to map a process end-to-end, with the goal of eliminating or streamlining all non-value-added activities and removing process waste. DCs are also increasing their adoption of 5S principles, or “sort, shine, set-to-order, standardize and sustain.”

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to fully automate camera production at its Japanese plant. Higher productivity and better quality were cited as the main drivers of this achievement. Similar levels of process maturity will be achieved in DCs over the next few years as a result of greater automation. While automated storage and retrieval systems (ASRS) have been around for some time, automating other tasks such as picking will increasingly gain momentum. Two trends—an increased focus on customer service within the retail industry and demographic forces that are increasing the cost of labor—are pushing most DCs to explore automation as an alternative to manual operations.

Recent process advancements have involved some sort of human intervention, such as last-stage packing or an automated guided vehicle (AGV), where associates actually pick and deliver the goods to the packing area. As these technologies mature, become more reliable and gain acceptance—and as purchase/implementation costs decline—we will see a similar shift toward reduced human involvement, as is currently the case in the manufacturing industry.

- **Flexibility**: Manufacturers have invested significant effort and dollars to drive flexibility through smaller batch sizes by decreasing setup times, modifying network design to move vendors/suppliers closer to the point of consumption, and utilizing postponement and common components across product platforms. This emphasis on “flexible manufacturing” is manifesting itself in the shape of “flexible fulfillment” for DCs. Many are being forced by changing customer expectations and competitive pressures to reshape their operations to support both customer and store fulfillment in an increasingly complex “omni-channel” environment.

As a result, DCs are processing a wider array of goods, which undercuts their ability to contain SKU proliferation and reduce operating costs. This impacts freight flow across and within the DC, labor productivity and facility layout, which must be fine-tuned to deliver on the omni-channel fulfillment promise.

As the move toward “fulfill from anywhere” continues, we expect DCs to continue leveraging what they learn from the manufacturing sector to support this paradigm shift.

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