Abstract. Supply strategies in a lean environment should support the operations strategy. It is appropriate then to use lean concepts and lean terminology in the creation of supply strategy for lean operations. This paper examines supply strategy development in a lean production environment by utilizing 5S, a key lean concept. The concepts of lean supply and 5S will be introduced followed by a discussion of how the 5S methodology may be used to develop and implement a supply strategy.

Lean Supply. The term “lean supply” implies that the supply chain is appropriate for lean production. Lean production is a concept of waste elimination in processes, which has enjoyed popularity in manufacturing companies. The basic tenets of lean production as outlined by Womack and Jones (1996) include the following.

- Specify value
- Identify the value stream
- Organize the value stream to promote flow
- Communicate demand through pull
- Strive for perfection

It is appropriate for the supply management function in a lean environment to integrate lean concepts and terminology into the development of supply strategy. One of the foundational lean concepts that serves as a basis for all of the tenets given above is 5S.

What is 5S? The 5S’s are lean concepts derived from the Japanese words: seiri (sort), seiton (set in order), seiso (shine or purity), seiketsu (standardize), and shitsuke (sustain) (Hirano, 1996). Companies adopting the lean production philosophy often implement the 5S process to bring order to the workplace and thereby support lean production.

Why Use the 5S Concept as a Model for Lean Supply Strategy? 5S is a proven model for organizing and maintaining a lean production environment. The relationship between purchasing or supply and the general management of operations may be improved through the use of a common vocabulary built around concepts familiar to the organizational head and the heads of other departments. For this reason, 5S is an appealing model for the development of supply strategy in a lean production environment. A model for using 5S to develop supply strategy follows.

Sort: Remove All But the Necessary Materials, Equipment and Supplies. Typically, the first step in a producer’s implementation of 5S will be a tour of the target area marking with red
tags those items that appear out of place or unnecessary. After reviewing each item, the item will either be put in its proper place or removed if it is unnecessary or redundant. The Sort process is essential to developing the organization of the workspace needed for lean production.

Sorting the supply base includes selection of suppliers to add to the system and selecting suppliers to eliminate (supply base consolidation or rationalization). Implementing Sort in the supply base through supplier consolidation achieves the following benefits. It reduces the waste of inefficient work methods by reducing the number of suppliers that must be managed by the procurement staff. Sorting reduces the waste of selecting the wrong suppliers by focusing efforts of selection, evaluation, and improvement on a few select suppliers. This also improves the quality (conformance to specifications and delivery) of the products received from these suppliers by focusing quality assurance, control and improvement activities on a smaller number of suppliers. Sorting reduces processing waste as fewer purchase orders may be necessary and fewer selection audits are needed. Finally, Sorting increases the opportunity for supply chain partnering.

So for the management of supply, the primary implementation of Sort is selection. There are several criteria that may be used to identify candidates for elimination in the sorting process.

First, a performance review (i.e., review of quality, delivery, and price performance) isolates some candidates for elimination. Next, a review of redundant suppliers is conducted. How many suppliers have identical or overlapping capabilities? Finally, a review of the number of part numbers purchased from each supplier will often result in identification of a large number of suppliers providing only one or a few parts.

All of the sorting or consolidation is an effort to approach an optimum number of suppliers. Multiplying suppliers increases variation and overhead. The practice of utilizing multiple suppliers for a single part in order to reduce risk often increases risk, just as increasing the number of components in an assembly usually increases the probability of failure.

**Set in Order: Arrange Product and Equipment So It is Easy to Find and Easy to Use.** Equipment and storage locations are labeled so equipment or tools will be easy to identify and put away when they are no longer in use (e.g., tool cutouts or outlines on a peg board or in a tool chest). The labeling of storage locations with tape on the floor or the work station facilitates visual management. A glance is sufficient to identify missing tools or tools not properly stored.

Arranging suppliers so they are easy to use brings to mind the concept of segmentation. Segmentation provides a “place for everything” and allocates “everything in its place.” The supply base is sorted or segmented by value potential and risk, by strategic value and opportunity for cost improvement, by value potential and criticality, or other such criteria. The proper “place” for a supplier is a location in a segmentation matrix. The value of this exercise comes from clearly identifying how each supplier will be treated based on identifiable criteria. Table 1 is an example segmentation of the supply base by annual expenditures and risk yielding four segments of suppliers with different opportunities for value contribution.
The key suppliers for lean production companies tend to be in the high risk – high value potential or “partnership” category of the supplier segmentation matrix. Partnership suppliers represent a higher risk to the company in terms of design complexity, startup communication, custom tooling, overall higher demand for buyer input, and schedule pressures (e.g., just-in-time support). Risk can also be thought of as the level of opportunity for adverse effects on value (e.g., deterioration in delivery, lead time, price, or quality).

The other supplier segments have different needs. The low risk – high value potential segment may include commodity items where price dominates other considerations. If the risk may be reduced for high risk – high value potential items, significant savings may be realized by some form of competitive bidding.

The high risk – low value potential suppliers affect value by the nature of the factors that make them high risk. Risk factors could include demanding delivery requirements, advanced technology, etc. Temporary situations, such as cash flow problems or capacity limitations, could be the major risk factors. Segmentation helps prevent the supply manager from overlooking these potential problem suppliers.

Finally, the low risk – low value potential suppliers typically have relatively high transaction costs as compared with the value of the product. The opportunity for adding value comes by consolidating these purchases and reducing transaction costs.

Several different segmentations may be conducted in order to properly categorize the suppliers. The segmentation of suppliers may also include an evaluation of quality (e.g., certified, conditional, approved status). Performance measures may be helpful in segmenting the remaining supply base. Hau Lee (2002) suggests the use of an uncertainty framework as a means of segmenting the supply base for demand and supply uncertainty.

The location aspect of Set in Order may be addressed by identifying the location value of each supplier on a large map. This may identify further opportunities for consolidation by grouping suppliers locally or in targeted areas or along trucking routes so more than one supplier may be visited on a single trip. Other considerations for

Shine: Keep Everything Swept and Clean. Cleaning implies system maintenance and inspection. As a work area is cleaned, problems such as oil leaks or other maintenance issues, become more apparent before they have a chance to affect performance.
The inspection of suppliers implies surveys or audits. The objective of auditing suppliers is to obtain objective evidence that supports the Sort and Segmentation decisions or evidence that supports action of a different sort, such as risk reduction and continuous improvement. These audits may include: site surveys, supplier self-assessments, remote surveys, third party certification type surveys (e.g., ISO 9000 or QS 9000), or third party quality awards such as the Baldrige Award (or state award using the Baldrige criteria). Major changes in supplier personnel and the workplace environment may not be detected by 3rd party audits such as ISO certification audits. First person audits should be structured in such a way as to detect performance or personnel changes.

For key suppliers (identified in the Set in Order or Segmentation stage), on-site visits should be scheduled with a frequency appropriate to the relationship. For example, high risk-high value potential suppliers usually receive the highest frequency of visits followed by high risk – low value potential, and low risk - high value potential suppliers respectively. Low risk – low value potential suppliers are generally not surveyed except for mail surveys of regulatory compliance issues.

**Standardize: Integrating the First Three S’s.** Standardize ensures that your implementation of the Sort, Set in Order, and Shine doesn’t deteriorate over time. It formalizes the procedures, schedules and practices that sustain the system and drive future improvements. Problems avoided by Standardize include:

- The number of suppliers grows unchecked,
- The segmentation deteriorates and the classification of the suppliers becomes unknown,
- Suppliers are not visited on a regular basis,
- Surveys are conducted informally or with renegade processes.

How can you standardize? Assign 3S duties. Ensure that the personal plans or objectives of the supply management personnel cover the sort (supplier consolidation), set in order (segmentation), and shine (audit) issues necessary.

Strategic buyers, commodity managers, or the purchasing manager are charged with the responsibility of surveying the charts in each buyer’s area to ensure they are kept current. The results of these surveys may be displayed on checklist charts demonstrating the level of implementation.

Often the motivation for adding suppliers comes from outside of the purchasing function. Do these functions understand why consolidation is valuable? One advantage of the 5S approach is that a common language will be used between purchasing and manufacturing. This should facilitate the communication between these groups, but what about interactions between design engineering and purchasing? This is a critical interface for two reasons. First, engineering is the source of many requests for new suppliers. Second, engineering, particularly design engineering, may have a creative environment that feels constrained by programs that promote rigid discipline. Engineers have complained that they see no reason to limit their supplier selections just so the buyers can play more solitaire on the computer. The 5S program provides reasoning behind the consolidation efforts.
Survey schedules are maintained using software that reminds the process owner and the appropriate managers. In some organizations, the quality assurance department can serve a role as a third party to the process with supplier delivery performance being considered with quality performance for preferred supplier status. Supplier surveys or audits should be part of the personal evaluation process for the owners of this process (e.g., buyers, supplier quality engineers, commodity managers).

**Sustain: Discipline Starts With the Leadership.** Do you care enough to be consistent with your message and vision? Are you communicating the strategy, including the reasons for your actions, outside of the procurement function? Are you training new employees properly? Does the proper structure exist to support this strategy? These are issues for leadership. No 5S process for supply management will be effective without vigilant leadership. Lean producers have used this process effectively, but consistent leadership over time is necessary to prevent system deterioration.

**Summary.** Each element of the 5S technique corresponds to an element of supply strategy for a lean supply chain. 5S is a powerful tool in manufacturing, in part, because of its simplicity. Simplicity makes 5S a powerful supply management tool as well.

**REFERENCES:**

