

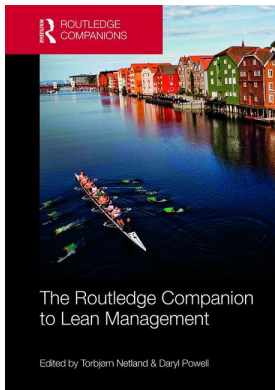
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Torbjørn H. Netland, Daryl J. Powell

### Lean Purchasing

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Tim Torvatn, Ann-Charlott Pedersen, Elsebeth Holmen

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## LEAN PURCHASING

*Tim Torvatn, Ann-Charlott Pedersen, and Elsebeth Holmen*

### Introduction

Lean purchasing is the introduction of lean principles into the purchasing function. It covers two important, but separate, areas of professional practice. One is to use lean principles in the governance of the purchasing department itself. The other involves the purchasing personnel's use of their professional knowledge in handling suppliers to help the company in its efforts to build lean supply chains and networks. The first area is in many ways easier, as the purchasing personnel exercise a fair amount of control over their own procedures and, consequently, can decide to manage their department according to lean principles. Usually, this would happen within the context of an already established lean initiative at the company or division level. The second area is more challenging to handle as it involves other organizations and thus cannot be decided solely by the purchasing personnel or top managers within a company. Instead, a collaborating process must be applied, where the purchasing personnel and managers from a company work with the personnel of one or more suppliers to create the framework for cooperation. This framework for cooperation should implement lean principles at the supplier, supply chain, and supply network levels, thus benefiting all companies involved. This chapter discusses these two different areas of lean purchasing.

### Applying Lean Principles in a Purchasing Department

Many production companies that have started a lean initiative have found the lean principles easier to apply to the actual production processes than to supporting departments, such as sales and marketing, research and development, and purchasing. Nevertheless, the principles remain useful even for these kinds of supporting activities. However, these principles need to be reinterpreted to fit with the different settings of the relevant departments. In this section, we examine a reasonable interpretation of the five main principles that work well for purchasing departments and should be applied as follows (Womack and Jones, 2003):

- 1 Specify value
- 2 Identify the value stream
- 3 Flow
- 4 Pull
- 5 Seek perfection.

### ***Principle 1: Specify Value***

This principle is often challenging for purchasing personnel, who are frequently organized at an operative level and whose usual task is to procure whatever is determined necessary by the production department (Gadde and Håkansson, 1993). This practice is harmful to companies since the purchasing department would clearly benefit from knowing the target customers for a product or service, the customers' criteria for judging quality, and which parts of the product or service are particularly important for them. After all, the economic value of purchased goods and services is frequently 60 percent or higher (Gadde and Håkansson, 1993; van Weele, 1994). Thus, suppliers and their deliverables are clearly important for the quality and cost of the end product/service. The purchasing department and its purchasers are the key to obtaining the maximum value from the suppliers. We also understand from work-life science that the possibility of knowing about end customers and their requirements, thus learning how the work of purchasing personnel fits into a larger whole, is an important motivator for any type of personnel as well as for purchasers (Wilton, 2013).

Therefore, if contact with customers is imperative for purchasing personnel, what can a typical company do to enable its purchasing personnel to meet with customers and understand their needs? One necessary, although insufficient criterion, is to deal with the purchasing department as a strategically important sector within the company. Its top-level managers should occupy high-level positions in the organization, and the strategic decisions about purchasing and supply chain management should be treated at least as crucially as sales and production decisions. This will bring senior purchasing managers into frequent contact with other top-level managers and thus with the customers and their concerns. For lower-level personnel, the use of cross-functional teams (Sethi et al., 2001) linked to a customer order can be a good solution. Such structures allow purchasers to interact with personnel from the production, sales and marketing, and research and development departments, as well as with customer representatives. Purchasers can then bring customer concerns to their department's attention. As an added bonus, the interactions will also provide information about other internal departments' concerns regarding the customer requirements. A more direct way is to arrange for visits to customers where purchasing personnel can observe how their products/services are used at the customer sites and thus discover the relevant customer concerns.

In some cases, particularly for companies situated far upstream in a value chain and mostly producing raw materials and/or standardized components, knowledge about the end users may not be relevant as the products delivered have passed through many intermediate stages before arriving at their final destination. In this regard, top management should carefully designate which intermediate customers are relevant and consider them those whom they should "understand" properly.

Finally, purchasing personnel should also find out about their nearest internal customer, usually the production department, and be knowledgeable about its requirements and how it uses the supplies procured by the purchasing department. Such a "work-unit analysis," where a work unit interviews the counterpart that takes over its deliverables in an attempt to find out the requirements set by the latter, is useful for any kind of department, purchasing included.

### ***Principle 2: Identify the Value Stream***

Similar to all the other departments, the purchasing department needs to work on the description and analysis of its main activities. Central processes, such as ordering (including follow-up, expediting, and invoicing), supplier selection, supplier evaluation, supplier development, strategic decisions (involving setting and measuring key performance indicators), and internal improvement and change (van Weele, 1994) should be broken down into separate activities.

This will allow purchasing managers and personnel to analyze the activities and decide on how they can focus more on value adding and eliminate or reduce activities that do not add value.

Value stream mapping (Rother and Shook, 2003) is a well-developed technique that will also work well for the purchasing department. In addition to evaluating internal activities, a company-wide value stream map will contribute to a shared understanding of the purchasing department's efforts, as well as help the purchasing staff understand and appreciate the value-adding activities in other departments. This work will become easier and more efficient if policies are already implemented to ensure that purchasing personnel are well informed about the preferences of their (end) customers and of the internal work units to which they hand over their deliverables (see Principle 1).

### ***Principle 3: Flow***

Flow means ensuring that the production process is continuous and not hampered by functional or physical borders within the company. Ideally, this should also stretch to suppliers and intermediate customers.

For a support function such as purchasing, one of the central ways of helping with flow is to avoid waste. This can be achieved by doing only value-adding activities as much as possible. This presupposes that the department has performed a value stream mapping or a similar type of activity mapping (see Principle 2). Given that such an analysis has been done, the department can simplify or simply remove activities that do not contribute to customer value.

The purchasing department is also in some sense a logistics provider as all purchased materials and components usually pass through it on their way to production lines. Simplifying this logistics trail, especially reducing the waste of time and resources in storage, is almost as important as minimizing non-value-adding activities. Even when steps have been taken to ensure that the company employs the pull principle (see Principle 4), waste can still occur. This may happen because the purchasing department is unable to coordinate deliveries, storage space, and handoff to the production and/or sales departments to achieve a stream of materials and supplies that enters production as close to just-in-time as possible (Monden, 2011). Cross-docking, coordination of transport to and from the production site, and optimization of incoming transportation routes may also be relevant to eliminate waste. If, for some reason, the company is unable to buy everything based on orders only, the purchasing department must assume the additional task of handling storage space and ensuring that minimal waste occurs there. Most purchasers have been trained in the relevant techniques, such as economic order quantity and optimum storage size and placement (Bailey et al., 1994). The company may also have information technology (IT) systems that can help in obtaining the information necessary to create and compute optimization solutions.

Waste can also result from the necessary documentation and money trail associated with ordering materials and supplies. Here, the purchasing department can make certain that ordering and payment routines are simplified and, where possible, coordinated so that they take a minimum of resources to perform.

Even in the management of the human resources of the purchasing department, actions can be taken to reduce waste. Using value stream mapping, a matrix can be used to show all the skills and competencies necessary to perform these activities. This matrix can then illustrate the competencies that the department needs to possess and at what levels. This information can in turn be fed back to the human resources department to help with recruiting and staffing. It should also be used by managers in the purchasing department to decide what courses their staff should take and what competencies need to be developed. The information should also allow managers to ensure that all existing competencies are used to the maximum.

However, some of the most promising possibilities for reducing waste are not related to internal procedures but to how the company interacts with its suppliers. How this can help reduce waste is further discussed in the second part of this chapter.

Another important way for the purchasing department to ensure flow is to stay constantly updated on production plans and schedules, including sales orders and forecasts. Such internal information should always be open across departments so that purchasers can anticipate the demand for certain raw materials and components, instead of waiting until the production department has sent official requests for materials.

#### ***Principle 4: Pull***

Pull systems are lean because they only produce as a result of consumption. Production is thus a function of knowing that the actual product will be consumed by an end user. If the company is lucky, this can be a result of a direct customer order. Otherwise, the company must either be very good at knowing where and how much the consumers will buy or have short production and distribution cycles and be quick to respond to consumer demands.

Purchasing departments usually work based on derived demand (van Weele, 1994), whether it comes directly from a customer order or from internal “customers” (usually the production department, but sometimes the sales department when goods bought by the purchasing department are sold directly to customers without going through internal production stages). Thus, if the company itself buys on order, then so will the purchasing department in most cases. Two central processes are used in purchasing to produce for derived demand. One is soliciting competitive bids to procure the necessary products/services. The other is to base the buying company’s purchases on agreements (usually frame agreements) or long-term purchases from strategic partners.

The purchasing department is a gateway to external suppliers and can in some cases experience a mismatch between the internal order time and external delivery cycles. In other words, a supplier may need more time producing a component to sell to the buying company than the buying company’s available time before the customer wants his or her finished product/service delivered. In such cases, the purchasing department needs to take action. The best situation is where the purchasing department can bring the two cycle times in congruence by eliminating or improving internal activities (for example, by eliminating non-value-adding internal activities). If this is not possible or wanted, purchasing personnel can attempt negotiations with suppliers to help them make changes to reduce their cycle time and thus enable better congruence. If none of these options is workable, purchasing personnel should discuss with key suppliers that encounter these challenges to seek other solutions that may reduce the problem. Modularization of purchased items can be a possible solution, as can better coordination and information systems between companies. A supply chain management (Lamming, 1993; Wincel, 2004) and/or supply networks (Gadde and Håkansson, 2001) perspective is useful here, where the larger needs of the supply chain are in focus, and individual challenges and problems can be discussed and possibly solved.

In the end, if none of these alternatives can arrive at solutions, some form of scheduling and prognosis-based purchasing must be implemented. However, this should be a last resort, and thus implemented only after every other possibility has been exploited.

#### ***Principle 5: Seek Perfection***

In the context of this discussion, perfection means that systems and people in the purchasing department need to constantly improve their own competencies, as well as the systems and routines in how they work.

Central to working with continuous improvement is a system where the measures of important value-adding activities are developed and used to keep track of existing procedures and practices (Netland et al., 2015). The value-adding activities are uncovered with value stream mapping or similar activities (see Principle 2). The measures to keep track of the performance of these activities are necessary to help with improvement. Typical measures that may be useful can be divided into the following categories:

- 1 activities and process measurements (for example, how many orders an employee can handle within a specific time period),
- 2 price measurements (for example, the price of a particular commodity tracked over time),
- 3 quality measurements (for example, how many errors occur in a product in a particular period or how often a late delivery from a supplier occurs), and
- 4 cycle time measurements (for example, how long it takes from the order to the arrival of purchased goods, or how long a typical material stays in raw material storage).

The purchasing department needs to employ several such measurements and track them over time. A relatively small number of measurements should be tracked at any given time; when one measurement shows promising development, it should be replaced by another. Measurements need to be displayed openly so that all employees in the department can check their status and improvement at any given time. Measurements should also be coordinated with the production department (and perhaps other departments as well) so that the two departments do not pick measurements that counteract each other. Moreover, it is important to choose measurements related to the activities that the employees can actually affect. “Bad” measurements in terms of improvement constitute any measurement relying on and/or derived from external factors, such as raw material global prices.

All employees should also be constantly challenged to improve their performance and to test whether their improvements actually work. It is important that employees are continuously involved in improvement activities so that they acquire the habit of constantly thinking about improvements.

### **Lean Supply Chains and Networks**

The purchasing department has gained increased attention in recent years. One reason for this is that companies are increasingly outsourcing, downsizing, and focusing on their core competencies. Consequently, they often spend 60–75 percent of total revenues on purchasing materials, components, and services from suppliers (Lamming, 1993; Cusumano, 1994; Dyer, 2000; Gadde and Håkansson, 2001). With a larger purchasing bill, companies have become increasingly reliant on their suppliers to improve both their quality and delivery performance, as well as to develop new products and technologies (Cusumano, 1994; Gadde and Håkansson, 2001; Liker and Choi, 2004). Therefore, competitive advantages and disadvantages of an individual firm are often perceived as linked to the supply chains and networks in which the firm is embedded (Håkansson and Snehota, 1995; Dyer, 2000).

Following this line of thought, enterprises such as Toyota and Honda have developed lean practices aimed at managing internal matters, diffusing lean production through the supply chain, and creating lean suppliers (Lamming, 1993; MacDuffie and Helper, 1997; Cusumano and Nobeoka, 1998). Furthermore, striving for an extended lean enterprise, Toyota and Honda have each developed a set of practices for creating high-performance, knowledge-sharing supplier networks and *Kyoryoku Kai* (Supplier Association) (see Hines, 1994; Dyer and Nobeoka, 2000).

These supply network practices include initiating and developing partnerships with individual suppliers, as well as developing joint learning and continuous improvement among the suppliers involved in the networks to utilize the strength of specialist players in the company environment (Dyer, 2000).

One way to organize and develop lean thinking among key suppliers is the stepwise process of involving and educating them. Several authors have discussed how to manage complex business networks (see, e.g., Möller and Halinen, 1999; Ritter et al., 2004). In the following, we use the four-level model introduced by Ritter et al. (2004) to discuss lean supply in relation to the suppliers:

- 1 manage dyads or single business relationships,
- 2 manage a portfolio of relationships,
- 3 manage connected relationships, and
- 4 manage in business networks.

The first step is to manage dyads or single business relationships viewed in isolation. This implies focusing on how to interact in supplier relationships, how to build trust and mutual orientation, how the two parties involved can engage in adaptations, what types of dependencies and interdependencies are created, and so on (Gadde and Håkansson, 2001). To develop lean suppliers, the firm must start by focusing on lean supply base management, i.e. evaluating the supplier base. According to Dyer (2000), building deep supplier relationships often requires supply base reduction and consolidation. Thus, the buying firm needs to assess its key suppliers with regard to price, total cost, quality, delivery performance, and so on, as well as to take into account the suppliers' experience with lean management (Harris and Streeter, 2010). After the supplier base has been reduced, the buying firm may need to develop the remaining key suppliers through some sort of lean supplier relationship development program. According to Sako (2004), who has studied supplier development at Honda, Nissan, and Toyota over several decades, the development of lean suppliers requires that the buying firm's internal lean practices be transferred to and replicated by the suppliers. The goal of this supplier development process is to develop the suppliers into partners and to create mutually beneficial relationships that provide efficient and consistent values to end customers (Harris and Streeter, 2010).

The second step is to examine the portfolio of relationships; that is, to perform portfolio management of a set of relationships seen together. According to Ritter et al. (2004), focusing on the simultaneous management of several relationships and handling the interconnection among these relationships have often been neglected in management literature. The literature on supply chain management pays attention to different types of purchasing and supplier portfolio models, classifying either the purchased goods or different suppliers into 2x2 matrixes (see Kraljic, 1983; Bensaou, 1999). This approach to the portfolio of relationships has also been explained with regard to lean suppliers. Drake et al. (2013) discuss lean suppliers in relation to agile suppliers in a portfolio model. Nonetheless, very few of these models handle or consider the interdependencies among the different supplier relationships.

The third step is to manage connected relationships where the buying firm is not directly involved in all the relationships; for example, with suppliers' suppliers and customers' customers in a supply chain. According to Ritter et al. (2004, p. 179), "the management problem here involves dealing with the indirect effects of management action in one relationship on other relationships . . . including responding to opportunities and problems arising from action taking place in connected relationships." This is also relevant when we discuss lean supply chain management. Moyano-Fuentes and Sacristán-Díaz (2012) claim that it is important to extend

the lean principles to the value/supply chain by eliminating waste, improving quality, reducing costs, and increasing flexibility at all stages in the chain. To accomplish this, the buying firm must not only work with its direct suppliers but also encourage them to start their own lean supplier development processes to educate and develop their sub-suppliers while also ensuring that these changes are creating value for the end customer.

The fourth and last step involves managing in business networks or managing part of a business network; for example, a strategic net or a supply network. In the supply management literature, the creation, development, and management of supply networks have constituted an important topic (see, e.g., Holmen et al., 2003; Harland et al., 2004). Furthermore, some articles have discussed how suppliers can react to a buying firm that is trying to orchestrate a supply network (Johnsen and Ford, 2005; Holmen and Pedersen, 2010). Relating this to lean supply, Dyer and Nobeoka (2000) introduced a method for creating high-performance, knowledge-sharing supplier networks. Such supply network practices include initiating and developing partnerships with individual suppliers, as well as developing joint learning and continuous improvement among the suppliers involved in the supplier networks to utilize the strength of specialist players in the company environment (Dyer, 2000). According to Liker and Choi (2004), the involved suppliers were often eager to become part of the supply network since it gave them the opportunity to be taught and to learn the philosophy and practices of world-class lean companies. The suppliers often gained benefits from the collaboration, which could be transferred to their other customer relationships.

### **The Future of Lean Purchasing**

As discussed, we suggest two quite different ways in which purchasing managers can adopt lean thinking in their main function. One approach is directed (more) toward issues that are internal to the function and to the company; the other concerns working with the external environment, particularly with suppliers. We believe that companies that truly want to become lean should plan for and work with both options. This is not a question of mutual exclusivity or of one way being better than the other.

However, we stress that the possibilities for introducing the approaches are not necessarily equal. Establishing lean practices together with suppliers may be considerably more difficult and require more resources than setting up lean practices internally. Furthermore, the two routes require different competencies from purchasing managers and personnel.

Establishing lean practices with suppliers may require the company to have established lean practices internally, for several reasons. First, to inspire, guide, and support the suppliers' journey toward lean practices, the company should have amassed experiences and built up lean competencies. Second, the company's development of lean experiences and competencies may be a prerequisite for gaining the suppliers' respect for and trust in it as a capable company from which the suppliers will accept directions on their lean journey.

Consequently, we suggest that purchasing managers facing a company in its early stages of lean practices can benefit from introducing lean principles internally, especially if the company is operating in an industry dominated by arms-length relationships with suppliers. Working with suppliers also requires that the top management be committed to taking a long-term perspective on them. Additionally, to ensure continuity in the efforts to develop lean suppliers, it will be beneficial if the purchasing department is suitably positioned to influence the company's strategy. It will be advantageous as well if the purchasing managers are used to working in a cross-functional manner since this will assist the efforts to link the production and product development functions in their own company with similar functions within their suppliers.



Finally, competence development, in terms of understanding the main business processes, key steps, and challenges in the company's production processes, is necessary to enable purchasing managers and personnel to participate in lean development, both inside and outside the organizational boundaries.

### Case Study: Lean Purchasing at NAMMO AS

In 2011, the Norwegian University of Science and Technology launched a large research project called Lean Operations. As part of this project, research partners have cooperated with seven companies to implement and develop their lean initiatives. One of the companies participating in this development work was NAMMO, which (among other initiatives) chose to start applying lean principles in its purchasing work. The authors of this case were involved in this development work and are thus in a position to report on the efforts made and their effects. The readers should be aware that the initiative is still ongoing; as such, several themes have not been covered yet. However, we think it is interesting to show how a company can become lean, rather than adding more stories about successful examples of lean companies.

NAMMO is a medium-sized Norwegian company in the defense sector, producing ammunition for professional use. The production division at Raufoss has worked with lean principles for a long time. Lean processes were originally introduced to the company as a requirement of one of its customers but had mainly been applied in the production departments. NAMMO wanted to spread the implementation of lean processes to other internal departments, and the newly appointed supply chain manager decided on this as a way of developing better routines and procedures within the purchasing department. The researchers contributed to this development by suggesting models, tools, and the relevant literature to support the steps that the manager wanted to take. In this way, the process involved fruitful interactions between the researchers and the business managers.

The first step taken was to commission a master's thesis where students examined how purchasing work was performed in the company. They ended this work with a status report suggesting six areas of improvement. The manager chose to start with one of these suggestions and mapped the purchasing processes, describing each major purchasing activity and the different roles connected to it. This project represented an early form of value stream mapping and helped the company in assigning roles to the purchasing personnel and others to clarify their respective responsibilities and to avoid overlaps between activities and areas of responsibility. Now this project helps the company fulfill two of the five lean principles—to identify the value stream throughout the company and to avoid waste.

The next main activity was to create a map of the competencies needed in the purchasing department. The map also included useful books and articles, and courses that could be taken to improve the individual purchasers' core competencies. More general competencies, such as IT skills and business economics, are also included in the map but without a similar list of books, articles, and courses. This competence map allows the manager and the purchasing employees to gain a better understanding of how individual competencies match the mentioned roles and fit together to create a competence profile for the entire department. This again is a useful tool for discussing and prioritizing competence development within the department and is also valuable for recruitment. Job offers can provide more precise information about the required competencies, and the applicants' competencies can be compared directly with those that are existing or lacking in the department. This helps the company fit its competence profile better to the tasks and activities that need to be

performed, thus improving the value stream. It also reduces the waste by tailoring competencies more clearly to roles and activities.

The third improvement project aimed to evaluate how cross-functional teams could work in the NAMMO context. The production and development teams were already linked to the different product groups. Therefore the improvement project concentrated on how the purchasers could become regular members of these teams and what roles they could play in such teams. The results from this project are still unfolding. Nonetheless, a successful implementation is expected to make improvements along all five lean principles since early involvement in cross-functional teams increases the possibility for the purchasers to know the customers and their requirements. Moreover, better coordination with the production department allows concentration on value-adding activities, avoiding waste, and producing based on the actual orders.

In the spring of 2015, the researchers also contributed to an external evaluation of possible supplier relationship management (SRM) software. The company wanted to determine whether such a system could help it improve its relation to its suppliers. This is the most recent project, and the results have not yet been revealed, but the information is expected to help the company find an SRM system that can further support the focus on value-creating activities. Additionally, the system can tie into existing production management systems to give more accurate information about who can supply the parts needed in production, thus improving the chance for production to always be strongly related to actual orders rather than relying on prognosis.

Finally, the whole process of the improvement projects described in this case can be considered an application of the fifth lean principle of perfection. The supply chain manager at NAMMO has persisted in improving how the purchasing department works through the implementation of the results of these projects. In this way, the department is currently much closer to operating on lean principles than it was when the process started in January 2012.

The next step for the company is to “export” the solutions to other purchasing departments within the larger company group (the division where we worked is only one of four divisions, each having multiple production sites with separate purchasing departments). Furthermore, the purchasing department will start developing lean supply chains. This last part is the focus of another research project being conducted from 2015 to 2017 to continue the productive interactions between the researchers and the company personnel.

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