Steel Plant — Supplier Relationship

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The steel industry relies heavily on critical supplies such as ore, scrap, refractories, sensors and fluxes for the efficient production of steel. These materials represent more than half the cost of producing steel and are processed or manufactured by the steel supplier industry. In recent years, because of the decline in technical resources available within the steel industry itself, steel plants also rely on suppliers for developing new products and technical support in the use of these products.

For example, refractory and flux suppliers are helping to design ladle and tundish slags, which will produce clean steel and prolong refractory life. Suppliers of metallurgical sensors are aiding in the development of processes and control of steelmaking and ladle processes based on the use of their sensors.

The steel industry relies on the supply industry for critical materials, and the supply industry relies on the steel industry for sales of its products. In recent years, the relationship between the suppliers and steel plants has changed significantly. The suppliers can no longer simply buy business by out-bidding competitors or using the “old boys” network. The steel plants not only are interested in price, but also quality, service and delivery. The suppliers rely on steel plants for improving existing products and developing new ones.

Despite the improved relationship between the steel industry and its suppliers, misunderstandings, and occasionally mistrust, still exist. A research project, as part of the Sloan Steel Industry Study, was initiated to better understand the current relationship. The study examined if and where misconceptions exist and explored possible methods to improve the relationship for both groups. In particular, the study examined the role of suppliers in developing new processes or process controls, transferring technology and assisting with technical problems.

RESEARCH METHODOLOGY

The research was based on two extensive questionnaires — one for steel plants and the other for suppliers. In many cases, the questions were similar on both questionnaires in order to make comparisons in the responses from the two groups. The questionnaires were developed by submitting written drafts to two steel plants and two suppliers. These parties reviewed the drafts and made useful suggestions for inclusion of new questions and clarification of others. An expert in questionnaires from the Social and Decision Sciences Department at Carnegie Mellon University, Pittsburgh, PA, Professor Paul Fischbeck, also reviewed the questionnaire. He made useful comments to improve the format and wording of the questions.

The questionnaire responses of the individual plants and suppliers are confidential, and specific responses by a company are not discussed. The individual responses given in this article are anonymous, hence the composite results are discussed.

The questionnaires were sent to 67 plants and 44 suppliers. Twenty-three (34
percent) plants and 21 (48 percent) suppliers responded. This rate is considered good for surveys of this type. The responses were reviewed by the research team, which included metallurgical engineers and social and decision scientists. Their analysis and findings are discussed in this article.

RESULTS AND DISCUSSION

Product and Sales

Supplier and plant respondents have slightly different perceptions of who suppliers interact with in steel plants. As shown in Figure 1, a significant difference exists between plants and suppliers in the perception of where suppliers spend time in plants. Plants and suppliers indicate that suppliers tend to spend more of their time with plant personnel overall. But, plant respondents believe a smaller gap exists in the time spent between purchasing and plant personnel. Suppliers indicate that three-fourths of their time is spent with plant personnel with only one-fourth of the time spent with purchasing personnel. In comparison, plants indicate close to a 50-50 split in the time suppliers spend with plant and purchasing personnel.

Advantages and disadvantages of sole-source suppliers – The provision of one product from a single supplier, or sole-source supply, has benefits and drawbacks for both plants and suppliers. Respondents from both groups express some common views in the practice of using sole-source suppliers. In an open-ended question, they indicate that sole-source supply has two important advantages:

(1) Promoting better prices and service

(2) Fostering good relationships between the plant and supplier

A key disadvantage is reduced competition. Plants also indicate that dependence on a single supplier is risky if problems disrupt the flow of supplies.

As seen in part (a) of Figure 2, about 60 percent of plants and 40 percent of suppliers indicate sole-source supply results in lower costs and better service. Suppliers indicate that the larger volume and reduced accounting requirements from sole-source supply permit them to offer price reductions. In addition to the price break, plant respondents indicate sole-source supply enables them to receive products with consistent quality, eliminate or reduce time spent shopping and simplify the ordering process.

More than one-third of suppliers and plants suggest that sole-source supply enhances plant/supplier relationships because of:

- Long-term investments by both parties
- Improved communication by the same individuals over time (also important for troubleshooting problems)
- Development of more consistent expectations and responses over time

Some suppliers indicate that sole-source supply permits technology improvements by focusing resources, including research and development, on the requirements of a particular plant.

Included in this category is the ability of suppliers to provide better technical support for their products. However, plants did not share this viewpoint.

Supplier and plants present some similar views on the disadvantages to sole-source supply, as well as one important difference of opinion. As presented in part (b) of Figure 2, roughly 40 percent of plants and suppliers suggests that a key disadvantage of sole-sourcing is the lack of competition. Within this category of responses, suppliers indicate that sole-source contracts reduce incentives to provide service, and competitors do not have a “fair” chance to compete with sole-source suppliers. Responses from plants include concerns that sole-source supply leads to a lack of price competition.

A key negative aspect of sole-source supply for plants centers on potential disruptions in supply. Prominent comments in this area include a fear of interrupted delivery service if suppliers run out of materials, employees strike or the

Figure 1 Plants and suppliers have different perceptions of the percentage of time suppliers spend with plant and purchasing personnel.

Figure 2 Plants and suppliers were asked to rate sole-source supply agreements under various criteria for their (a) advantages and (b) disadvantages.
sole-source supplier shuts down for other reasons.

About one-fourth of supplier and plant survey respondents indicate that sole-source supply leads to worse plant and supplier relationships. A reason suggested for this deterioration is a tendency for parties to become complacent. The belief exists that suppliers and plants need both parties' involvement to ensure competitive prices and new products.

On a related note, between 10 and 15 percent of plant and supply responses suggest sole-sourcing impedes technical advance by removing the incentive for suppliers to innovate in response to plant needs. Some plant respondents indicate in sole-source situations, suppliers are exposed to fewer sites and, thus, may have less information about current technology garnered from other sites. Finally, a few suppliers indicate sole-sourcing leads to a decrease in product quality. This largely is because the number of options available to customers is limited, since a single supplier cannot offer every product.

**Importance of price, quality, delivery and service** — Plants consider four key factors in choosing a supplier:

1. Price
2. Quality
3. Delivery
4. Service

The survey asked plants about the importance of these factors in their purchasing decisions. Suppliers also were queried about their perceptions of the importance of these factors to customers. Perhaps not surprisingly, suppliers perceive that the price of goods relative to other factors is the most important factor considered by plants. Almost one-half of the suppliers (48 percent) indicate that a plant's purchasing decisions are based only on product price. Slightly more than one-fourth of suppliers suggest that other factors are considered in the purchase decision, but only after selections based on price. The remaining one-fourth of suppliers indicate that quality and service are at least as important in the purchase decision as the product price.

In contrast, the responses of plants reflect a different pattern in decision-making from the perception of suppliers. Plants were asked to indicate how important the just-mentioned four factors are in their decision-making process for refractory, fluxes, gases, scrap, ore/DRI and alloys. The survey also asked suppliers to rank how important the four factors are to their customers for the products they provide.

Parts (a) and (b) of Figure 3 present the results for two products — refractory and fluxes. On a scale of one to 10, with 10 indicating a highly critical factor, suppliers perceive price as the most important factor in the customer's decision-making process. Price ranked 8.5 out of 10 for refractories and 8.1 out of 10 for fluxes.

Suppliers perceive delivery as the next most important factor that plants consider, again for both products. Quality ranks third in importance for fluxes and fourth for refractories. Service ranks fourth and third for fluxes and refractories, respectively.

Plants indicate that service is the most important factor they consider in the purchase of both refractory and fluxes (each scored 8.4 out of 10). Delivery of fluxes ranked first in importance. While quality is the second most important factor considered for refractory purchase (8.3 out of 10), the range in the importance of the four factors is tight, from 7.48 (for delivery) to 8.43 (for service). This indicates the factors each may be important in a plant's purchasing decision.

The range in importance for flux purchasers is wider, from 6.6 to 8.43.

This suggests a greater distinction in the importance of factors in their purchase decision.

A key result presented in parts (a) and (b) of Figure 3 is the significant lack of perception by suppliers of the importance of quality and service to plants. Suppliers appear to believe that price is the major concern in the purchasing decisions of plants, at least for the two product areas of refractories and fluxes. Suppliers significantly underestimate the importance of quality and service to customers as compared with plant personnel.

**Service and Technical Assistance**

An important area identified in the purchasing decision of plants is service by suppliers. To understand the relationship between suppliers and customers, the researchers examined the service provided with respect to sales, service and training.

The survey asked suppliers and plants to estimate how many annual visits are
necessary for sales or technical service people to a plant. It also asked how many actual visits are made. The results are summarized for refractories (Figures 4 and 5) and all other products (Figures 6 and 7).

For refractory products, almost 95 percent of suppliers indicate that plants receive the required number of annual sales visits [i.e., actual sales visits equal the estimated number of required sales visits (Figure 4)]. About 60 percent of plants agree. The actual and estimated number of sales visits are the same, with the remaining plants responding that they receive much more actual visits than they estimate are required for refractory products. Most plants (82 percent) and suppliers (92 percent) agree that plants actually receive the required number of refractory service visits.

For all products except refractories, most plants (90 percent) and suppliers (85 percent) suggest that plants receive the estimated number of sales visits per year (Figure 6). The remaining suppliers believe that plants receive fewer sales visits than required, while most of the remaining plants believe plants receive more sales visits than needed.

The majority of plant (98 percent) and supplier (77 percent) responses indicate that actual and estimated visits are equal for technical service (Figure 7). However, 23 percent of suppliers indicate that plants receive fewer service visits than necessary. As with sales visits, few plants and suppliers indicate that too few service visits are provided.

Provision of training for new and existing products — Suppliers and plants were asked about the level of training provided for new and existing products by suppliers. Figure 8 shows that, on a scale of 0 (none) to 3 (extensive), suppliers provide moderate-to-extensive training for new products (average rating 2.2). Moderate training is provided for existing products (average rating 1.9). Plants echo this result for refractory products, in which suppliers provide an average 2.4 training level for new refractories and 1.9 for existing ones.

Plants indicate a similar trend in training for sensors, with an average rating of 2 and 1.3 for new and existing sensor products, respectively. In contrast, plants indicate only minor level of training for all other products, either new (average 0.7) or existing (average 0.6).  

New Products and Innovation

The development and ongoing innovation of products is an important source of competitive advantage for the U.S. steel industry. The questionnaire asked suppliers about the sources of innovation and the role plants play in the innovation process.

For plants and suppliers, the barriers to introducing new products in plants were explored.

Sources of innovation for suppliers — As presented in Figure 9, three

![Figure 4](image1)

**Figure 4** The actual versus estimated refractory sales visits for suppliers and plants are illustrated.

![Figure 5](image2)

**Figure 5** The actual versus estimated refractory service visits for suppliers and plants are depicted.

![Figure 6](image3)

**Figure 6** A vast majority of suppliers and plants agree that the estimated required number of sales visits is being met for nonrefractory products.

![Figure 7](image4)

**Figure 7** The actual versus estimated service visits for nonrefractory products for suppliers and plants can be seen.

![Figure 8](image5)

**Figure 8** Plants and suppliers agree that an average moderate-to-extensive level of training is provided by suppliers to plants for new products.

All other products included gases, ore/DRI, scrap, oxides and alloys. The range of average training reported for these products is from 0.2 to 0.9 for new products and from 0.3 to 0.8 for existing products.
important sources of innovation for new products for suppliers are:

(1) Internal research and development programs
(2) Sales and service visits
(3) Customers

On a scale of 0 (not important) to 4 (very important), these three sources receive an average ranking of between 3.1 to 3.3. In contrast, the average ranking for U.S. and foreign competitors, conferences and consultants is between 1.4 and 1.9, between minor and moderate in importance to innovation for suppliers.

In the development of new products, slightly more than one-half of suppliers report that they partner with plants. Forty percent of suppliers report the involvement of plant personnel to be useful in new product development and one-fourth report their involvement to be critical.

Within the plants, suppliers rely on various personnel, including metallurgists, operators and senior management, in the process of developing new products, but to different extents. Operators are involved more extensively than other personnel, followed by metallurgists. Senior management has only moderate to no involvement.

**Plant Involvement in Innovation**

Figure 10 presents the extent to which plants are involved in product development for various products. On a scale from 0 (no involvement) to 3 (extensive involvement), plants report only minor involvement in product development on average (1.2 out of 3). Refractories are the one product in which plants report moderate involvement in their development. However, in general, plants indicate little or no involvement in the development of gases, scrap and alloys, and minor involvement in the development of sensors, ore/DRI and fluxes.

**Barriers to new technology** — The survey asked plants and suppliers to reflect on the major barriers to the process of introducing new products into a plant's existing product line. The responses tend to cluster into three distinct areas:

1. The risk of new technology
2. An overall resistance to change
3. Uncertainty about prices

As shown in Figure 11, suppliers perceive plants as fearful of new technology (76 percent of responses) and resistant to change (81 percent). Almost one-third of the plants concur that the risk of new technology is a significant barrier to trying new products. For example, a loss or slowdown in production is feared. However, plant respondents did not perceive themselves as resistant to change (13 percent). About one-fourth of plants and one-tenth of suppliers indicate that the potential for increased prices is a barrier to using new products.

**Improving Relationships**

Suppliers and plants rely on each other, sometimes in an uneasy alliance. The survey asked each about what could be done to improve the association. In an open-ended question, suppliers and plants were asked to describe the role of the supplier in making a steel plant customer more competitive. Figure 12 presents a summary of the responses.

About two-thirds of suppliers and plants indicate that a key role of suppliers is to make plants more competitive through continuous cost improvements. In addition, two-thirds of suppliers and

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**Figure 9** The importance to suppliers of sources of innovation in the development of new products is shown.

**Figure 10** Plants report minor involvement in most product development, with the exception of refractories.

**Figure 11** Suppliers believe plants fear new technology and resist change.

**Figure 12** More than two-thirds of both plant and supplier respondents believe suppliers help make steel plant customers more competitive through cost and technological improvements.
plants also agree that the supplier’s role in making plants competitive is through the provision of, and improvements to, technology.

This category includes the supplier's role in the innovation of new technology, the search for new applications for products and continuous improvements to product quality. About one-fifth of suppliers and one-half of plants indicate that service-related factors provided by suppliers are important. Responses in this category include the need for suppliers who understand the global steel business and products.

In another open-ended question, respondents were asked about the focus of the current plant/supplier relationship. The most frequent category of response centered on cost and price reductions (Figure 13).

About two-thirds of suppliers and plants indicate that they focus their relationships on cost reductions, coupled with improvements in product quality. Customer service factors are the focus of the relationship for about one-half of suppliers and one-third of plants. This includes maintaining product service and quality, and partnerships to assure mutual success. Customer relations, which include understanding customer goals and needs, is the focus for about one-fourth of suppliers and one-sixth of plants.

**GENERAL OBSERVATIONS AND CONCLUSIONS**

Survey results show that steel industry suppliers and plants agree on some key areas that are important for establishing and maintaining good relationships. Suppliers and plants agree that suppliers play an important role in making plants competitive. Yet, while both agree that suppliers have responsibility for continuous cost and quality improvements, plants find suppliers potentially falling short in the provision of services that enable them to be globally competitive.

Another area of agreement is in the sole-source supply of products. Suppliers and plants agree this may contribute to better pricing and service, and to better overall supplier/plant relationships. However, plants also fear a sole-source agreement leads to price increases and supply disruptions, revealing a general mistrust of supplier motivations.

Suppliers and plants are at odds about the importance of price as a factor in plant purchasing decisions. Suppliers suggest that plants only take price into consideration and, further, they underestimate (or undervalue) the costs of improving product quality. In contrast, plants maintain that quality and service are important, even critical, components in their decision to select a supplier for certain products.

A surprising disjunction exists in the perception of the innovation process in the steel industry. Both suppliers and plants indicate improvement to new and existing technology is an important role for suppliers to fill. Yet, suppliers suggest major barriers exist to introducing new products into plants, including a resistance to change and the risk of new technology. Further, while suppliers rank plants as an important source of innovation, plants feel largely disconnected from the process in all products with the exception of refractories. Further exploration of the suppliers’ perspective may be beneficial to understand why and how plants contribute to the innovation process and how to involve them more fully.

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