THE ROLE OF INTERNAL AND EXTERNAL INTEGRATION ON THE MANUFACTURING FIRM REACTION TO SUPPLY RELATED PROBLEMS

Autoria: Marcos André Mendes Primo

Abstract
Lack of functional integration, as well as weak integration with direct suppliers, may result in ineffective processes for a manufacturing firm. Considering supplies of critical parts, internal integration of functional areas such as purchasing and operations unifies the firm position about supply related problems. In addition to that, external integration with direct suppliers delivering these parts, have an important role to mitigate the impact of supply problems on the firm business. Thus, when purchasing and operations, as well as direct suppliers, are in the same page concerning a supply problem, chances are better for a more effective problem-solving process and consequently, for more satisfied customers inside and outside the firm. Based on a multi-case study, we explore conditionings of internal integration between purchasing and operations in situations of potential supply problems in four North-American manufacturing companies. Interview data suggest that internal as well external integration may have a critical role on the manufacturing firm reaction to supply related problems.
Introduction

The integration construct has been studied at two levels of analysis in operations management: internal integration with other functional areas inside the organization; and external integration, especially with direct suppliers and customers (Pagell, 2004). From the internal perspective, studies have called the need for greater integration between operations and purchasing (Narasimhan and Das, 2001), as well as pointed benefits of integrating operations and marketing (Chase, 1996; Karmarkar, 1996).

External integration with suppliers and customers is considered important for the manufacturing firm supply chain strategy (Frohlich and Westbrook, 2001). These authors developed the concept of “arcs of integration” that represents not only the direction of integration in a supply chain (towards suppliers or customers), but also the degree of integration activity. They found that the manufacturing firm integration with its supply chain is strongly related to the firm performance.

Integration studies related to operations management have discussed the integration construct through several components. Wheelwright and Clark (1992) talk about joint responsibility for joint outcomes. Narasiman and Das (2001) claim that integrating functional areas such as purchasing and operations implies in defining strategic roles for these areas and align them with the organization strategic goals. Kahn and Mentzer (1998) define integration as a function of interaction and collaboration between parties working inside an organization, and O’Learry-Keally and Flores (2002) add cooperation and coordination to discussions about integration.

The integration construct has also been discussed in terms of particular operational variables. Wheelwright and Clark (1992) discuss integration through cross-functional teams to solve joint problems. Ganeshan (2002) and Kelly (2002) discuss integration based on information sharing through technology systems. Frohlich and Westbrook (2001) establish several factors representing integration of manufacturing firms with other firms in supply chains: access to planning systems; sharing production plans; joint EDI access; and knowledge of inventory mix/levels and delivery frequencies.

In the context of supply of critical parts, internal integration between functional areas such as purchasing and operations and external integration with suppliers and customers, may be the key for minimizing the impact of part poor quality and delivery problems on the manufacturing firm. Since purchasing and operations are evaluated and awarded differently, these areas may see a supply problem in different ways. In fact, Cooper et al. (1991) found that these two areas have different ratings for evaluating customer service criteria, what impacts their perceptions of supplier performance. These authors suggest that integrating these functional areas may become increasingly critical for the organization profitability.

External integration with suppliers is also seen as a major concern for the manufacturing firm efforts in minimizing the impact of supply problems on its business. The major source of supply problems discussed in the buyer-supplier literature (Krajewskis and Wei, 2001) is the supplier ability in matching the buying firm demands especially in uncertain environments. In this situation, integration between the manufacturing firm and its suppliers takes into consideration issues such as forecast information sharing and supplier capacity to deal with unexpected demands.

Methodology

Due to exploratory nature of this research, we chose a case study approach (Eisenhardt, 1989; Meredith, 1998) to understand integration factors in situations of potential supply problems. In selecting cases, we considered that one variable that may impact
integration factors may be the industry type. Industries traditionally have different levels of integration between manufacturing firms and their direct suppliers. Buyer-supplier relationships look more like partnerships in some industries while in other industries parties have a more adversarial relationship. Likewise, the size of firms (using sales volume and number of employees as proxies) may impact external and internal integration. External integration may be affected by the power a manufacturing firm has in the supply chain that in part is related to the firm size (Fine 1998). Internal integration may be affected by issues such as level of strategic planning and organizational hierarchy that also have been related to the firm size.

Crossing the two variables mentioned above, creates a 2x2 research design involving industry (aerospace versus electronics) and size (relatively small versus relatively large). Within this design, our selection of firms was partly based on convenience, due to contacts with key informants inside these firms and their location in the south-western U.S. area. By purposefully choosing case studies from more than one industry type and from different firm sizes, we reduce the risk of developing theoretical insights that are bound to a specific industry or company (Eisenhardt, 1989; Miles and Huberman, 1994; Yin, 1994).

In order to maintain anonymity, our firms are referred to as Case 1 (relatively large firm in the electronics industry), Case 2 (relatively small firm in the electronics industry), Case 3 (relatively large firm in the aerospace industry), and Case 4 (relatively small firm in the aerospace industry). The research design grid is shown in Table I.

<table>
<thead>
<tr>
<th>Design factors</th>
<th>Firm size (relatively large)</th>
<th>Firm size (relatively small)</th>
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<tbody>
<tr>
<td><strong>Industry Type</strong></td>
<td><strong>CASE 1</strong></td>
<td><strong>CASE 2</strong></td>
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<td></td>
<td>Number of employees - 85,000</td>
<td>Number of employees - 3,500</td>
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<td></td>
<td>Critical Supplies - Trays and cover tapes – test/transport chips - 2 major suppliers</td>
<td>Critical Supplies - Mother Boards (10% all purchases - a major supplier); electronic components (value added - a major supplier)</td>
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<td>Informants - One Purchasing Manager; Two Buyers (one buyer dealing with commercial issues; other buyer dealing with technical issues); One Production Manager</td>
<td>Informants - One Purchasing Manager; Two Buyers (one for each critical supply); One Production Manager</td>
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<tr>
<td><strong>Industry Type</strong></td>
<td><strong>CASE 3</strong></td>
<td><strong>CASE 4</strong></td>
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<td>Number of employees - 115,000</td>
<td>Number of employees - 4,300</td>
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<td>Critical Supplies - Gear Boxes for APU’s (auxiliary power units – 2 major suppliers)</td>
<td>Critical Supplies - Castings (90% of the material purchases – 2 major suppliers)</td>
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<td></td>
<td>Informants - One Purchasing Manager; One Buyer; One Production Manager</td>
<td>Informants - One Purchasing Manager; One Buyer; One Production Manager</td>
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Table I - Research Design
In each company, we analysed integration factors in supply related problems, for at least one critical part supplied to the firm. Since expectations and perceptions in case of supply problems may be different across the manufacturer’s functional areas (Cooper et al., 1991), we interviewed individuals in different functions inside each firm: the purchasing manager, the production manager, and at least one senior buyer in charge of the critical supplied parts.

Interview data about supply problems, collected from key informants, were reduced into useful information using latent content analysis, in which the meaning and relations among concepts are considered rather than a quantitative analysis of the qualitative data. In this analysis we have analyzed elements of internal and external integration such as collaboration, cooperation, interaction, communication, etc., in situations of supply related problems. Archival information inside the buying firm, such as supplier relationship programs, supplemented information about integration factors.

**CASE 1 – Relatively Large Firm in the Electronics Industry**

The multifunctional structure of the firm purchasing group facilitates integration with the operations group. Engineers in the purchasing group work jointly with manufacturing engineers in technical tasks such as evaluation of product quality. The internal job rotation of engineers between manufacturing and purchasing and the strong firm quality focus disseminate a common technical language, what facilitates functional integration. Cross functional teams help internal, as well as external integration in case of supply related problems, providing the internal focus and communicating a consensual message to suppliers, as explained by the purchasing manager:

“We may have an engineering meeting and a business meeting. Ideally, you pull those both together. We use that form to make sure that the supplier not only hears what our view is, but we may bring in an engineer from a site having(a) specific problem with that supplier to make sure that the supplier fully understands... exactly what our factories are seeing and we tie them together that way.”

Internal integration is also enhanced by the deployment of formal mechanisms through the firm, such as the accountability of supply failure costs. Standard cost accounting mechanisms lead to similar perception of the supply failure impact among purchasing and operations. Supply failure costs are objectively quantified and charged back to suppliers by the discrimination of what internal processes were affected and what kind of rework had to take place. Even working in cross-functional teams and using common mechanisms through the firm, there are disagreements between operations and purchasing in some quality issues that may create difficulties in the supply process, as attested by the buyer:

“For instance, there are issues where engineers might say - hey this supplier needs to meet all these quality requirements- which I think maybe at times we engineer into products too much in the way of quality standards. We over-engineer products which in the end actually costs us more money.”

The firm needs to do a better job in communicating priorities to suppliers when there are changes in the market. When demand exceeds supply the firm main concerning is getting product out of the door. In this situation, the firm tries to understand suppliers’ capacity constraints, providing them forecasts, and anticipating orders to allow them sufficient time to
fulfill critical part orders. On the other hand, when there is plenty of capacity for supply of parts, the firm focus is more on trimming costs and looking where it can gain more business efficiency. Thus, focusing short term planning may create some supply related issues in the long term, as explained by the manufacturing manager:

“What there needs to be is maybe more communication from our side and more interaction in developing load plans, long-term cost reduction plans. We always ask our suppliers for this, but I think at times, especially in ramp-up modes, everybody is so focused on getting product out the door that they get blind-sided somewhat by the long-term plan.”

External integration is supported by the strategic role of the purchasing group. This group is responsible for selecting suppliers with adequate capacity, for qualifying them to deliver products to the firm, and for developing strategic relationships with these suppliers. Interviewers emphasized the investment in supply quality represented by the firm supplier continuous improvement program. In this program, firm engineers spent full-time periods in supplier sites to improve their systems in order to attend high quality requirements. The supplier evaluation program facilitates integration with suppliers when the firm clearly communicates, in frequent face-to-face meetings, its position in relation to supplier performance, as expressed by the purchasing manager:

“The supplier rating and ranking really clearly lays out the expectations. It shows you (supplier) where your scores are; where you need to be and where you’re falling short. We go over whatever expectations. Any current problems we are having or situations are discussed in those weekly meetings. So, it’s not like they find out at the end of the quarter that they’ve done something wrong. I mean, it’s clear that the communications happening on a weekly basis, where they should understand where things are commercially.”

When a quality problem in the firm assembly lines may be potentially related to supplies, an internal team with people of purchasing, quality and manufacturing is created to analyze the issue. The pre-assessment meeting gathers all the applicable data to make sure it is in fact, a supplier problem. Sometimes the problem cause is not clearly located inside or outside the firm and a good external integration helps the problem solving process, as explained by the purchasing manager:

“The suppliers are able to give us tremendous amounts of data that says what causes that type of reaction. We can take that in our factory and say-here are ten different potential contributors to this effect-t, not saying one of the suppliers’ problem because maybe it is not, but what you can start working thru the specific variables of the process to identify where you could be introducing potential process failures.”

External integration with the firm biggest trays and film supplier shows some problems. First, the supplier organization culture is not used to share a whole lot of information, just what is seen as necessary. Also, despite having lots of resources, this global supplier has not been responsive to the firm demanding quality requests, especially in case of critical supply problems. When purchasing and operations consider a supply problem as being critical, the firm requests a formal corrective action through the supplier corrective action report (SCAR) and stops supplier deliveries until these areas receive a satisfactory answer for this report. Answering the firm SCAR implies that suppliers are able not only to solve the problem but, also to demonstrate through quality data that the problem causes were removed and its effects will not come back. Taking a long time to convincingly answer SCARs,
certainly tarnishes the supplier reputation inside the firm. External integration with big suppliers seems problematic when these suppliers use excessive bureaucratic procedures to address firm calls about supply related problems. In these situations, the firm uses to follow an escalation path starting with the local representative and going to supplier upper management, as explained by the purchasing manager:

“We run into that problem more with companies that are large like us. Companies of the magnitude of Supplier X or major companies that have a lot of different business units, a lot of different PNL’s so you’re dealing with basically one division of a huge company. It becomes a challenge at times to make sure you have the level of visibility you need, not only within that division, but within that company to be able to drive and achieve the initiatives that you want to obtain, especially addressing quality”

When quality problems occur in second tier suppliers’ systems, the firm expects a fast communication from its direct suppliers and relies on traceable systems to contain the problem in the affected lots. If these lots are already outside the manufacturing firm sites there are high costs of recalling potentially defective products downstream the supply chain. Unfortunately, lack of interaction with other suppliers upstream in the supply chain (indirect suppliers), may affect the firm business as explained by the manufacturing manager:

“We’d audited the supplier, but we had never audited the sub-supplier that they buy this from. We can’t manage the world. We manage our suppliers with high expectations that they are doing the exact same with their suppliers. When we hold our supplier 100% responsible for any problems that their suppliers cause them, because it may affect us.”

CASE 2 – Relatively Small Firm in the Electronics Industry

External integration with suppliers and customers is very important since the firm works as a manufacturing assembly contractor for a broad range of industrial customers (telecommunications, medical instruments, etc) with a high transaction of assemblies (4-6,000 different assemblies a day). Especially when there is a seller market for components (demands exceed supplies), supplier on-time delivery is very critical. Under these conditions, integrating suppliers is synonym of developing relationships. A good supplier relationship is seen as more effective for guaranteeing supply of parts than detailed contracts. External integration is streamlined by incentives and penalties as said by the purchasing manager:

“We told the supply base, if you have the highest on-time delivery, you have an opportunity to get somebody’s business who is less than 98%. So based on that number, there is an eligibility to create new business for you just because you are doing well. So we incentive the supply base to deliver on-time and we penalize the suppliers if they don’t meet the minimum criteria.”

Building a good relationship with its supplier base depends on the firm use of good metrics on supplier performance and providing good data for helping the suppliers job. Due to high uncertainty in the business of assembling electronic products, sharing long-term forecasting information with suppliers has not been considered very effective by interviewers. However, sharing short-term forecasting information with them is considered very helpful for minimizing supply problems. On the flip side, the firm expects their suppliers to be responsive rather than defensive when communicated about supply problems and, ultimately, take ownership of these problems, even the ones they are not entirely responsible for.
External integration with both the external customer and related suppliers is important in assemblies of new products, since it is not uncommon that customer design engineering may create some issues, such as frequent engineering change order (ECO) updates. In these situations, a three-party communication is the key to solve supply problems and lay out responsibilities in the supply chain, as suggested by the purchasing manager:

“...And what you’ve got to do is be able to set up communication between 3 entities so that a supplier can fully understand what the customer’s issues are... Because sometimes a supplier says I’m building to my specifications. This customer ...this is not to what I designed for and... Who pays the extra costs for the parts that are bad? It strains the relationship all the way around.”

From the responsiveness standpoint, integration with overseas suppliers seems not to be a problem since supplier representatives’ reaction time in case of problems is relatively good. Responsiveness of the biggest component supplier that provides parts in-house is a strong factor for external integration. However, due to firm size, the buyer in charge of components believes he may receive lower priority from this supplier than the big manufacturers in the electronic industry, when the overall market demand for these parts exceeds supplier capacity lines.

The purchasing and the manufacturing groups are not always in the same page in relation to supply problems. Every functional area has its own focus indicating lack of a better internal integration. Their perceptions about supply problems and consequently, about the supplier, may be different. They may look for a common language in dollar terms but, even though they may not reach an agreement and bring the issue to a top management decision. For instance, the manufacturing manager expressed that some savings in boards delivered by a cheaper supplier may increase production costs significantly:

“Usually at the introductory stage when the (supply) problem is identified, we may be at completely different stages. This may be a supplier that they use for multiple customers and they don’t have a problem with it. I have a problem because ... it’s jeopardizing my focus. I don’t care... about the other seven customers that they are very successful with... You have one out of a hundred boards with this problem but I can save 25 cents a board on this thing. Their perspectives... one out of a hundred is not near as big an issue.. if the customer sees it and they reject all hundred boards because of that one defect, then I have to expend a lot of labor into this board to re-inspect it and it keeps getting rejected by a customer.”

By the same token, the buyer in charge of circuit boards supported his position in keeping that supplier pointing to favorable transaction costs:

“Our customers start getting really jumpy. And they start wanting to say, -Why don’t we move all of our stuff to this place because they (supplier) can’t do it. Lets take it some place else.- Which tends to cost more in the long run because you got to take it from them and then retool it someplace else. And get them all, and you know, get all the bugs worked out that you’ve done with this supplier for so long.”

CASE 3 – Relatively Large Firm in the Aerospace Industry

Due to the high number products and parts managed by a single buyer, purchasing may have few resources to cover technical issues in a broad range of supplies. Consequently, purchasing personnel do not go deep into supply quality issues. The firm has selected two
casting suppliers; a local supplier (supplier X) and a Chicago based supplier (supplier Y). For the local supplier, purchasing establishes delivery plans and milestones but, all technical issues are delegated to operations. This may be the reason why supplier relationships have been fostered by operations as explained by the manufacturing manager:

“We started meeting with them (supplier) weekly and developing that relationship and of course we had the buyer with us. We insisted that they be with us. But it seemed like a foreign concept to them to sit down and meet with the supplier once a week and talk about the issues. ... But once we forged that relationship with Supplier X, we kept it alive within the department.”

The close relationship between supplier X and operations personnel was pointed by the manufacturing manager as responsible for huge improvements in the supplier quality and also, in supplier customer service. Sometimes supplier X has borrowed manufacturing personnel (i.e. welders, black belt engineers) for attending the firm demand in emergency times. Supplier improvements in case of problems are characterized by operations personnel by fast supplier reactions to the firm call and by a better supplier understanding of the manufacturing firm needs.

Surprisingly, supplier X has an unfavorable reputation with purchasing compared to the other supply for the same part. The buyer in charge of castings related that improvements on supplier X have been small and they are not prepared to substantial increases in the firm demand. The purchasing manager, even taking into consideration in his sourcing decisions, the operations group preferences for the supplier close location, described bad stories about this supplier. For instance, while the manufacturing manager said that supplier shows up after a phone or e-mail, the purchasing manager commented:

“Some suppliers wait for our firm to call them. The local supplier (supplier X), he won’t even come twelve miles to see the problem. They don’t believe me. The supplier Y sends somebody from Chicago tomorrow morning to find out what the problem is. So they show a much better attitude, a much more willingness to work to try to fix the problem than the other supplier does.”

Purchasing and operations also disagree about the firm influence on delivery problems of this supplier. While the purchasing manager agreed that changes in the firm order scheduling may affect supplier deliveries, he considered these changes are responsible for a small part of supplier problems. On the other hand, the manufacturing manager claimed that the firm behavior leads to supplier failures:

“The demand we placed on them did not enable them to perform. We have a habit.. it’s much better now, of changing requirements very often. Most of their lead-times are seven, eight, ten weeks. And so if you get three weeks into a schedule and our firm changes the requirements, they can’t react. But then we beat them up because they can’t react.”

In several situations, purchasing arbitrates conflicts between operations and suppliers such as situations in which operations-blames-the-supplier-for-quality-problems-while-the-supplier-accuses-the-firm-of-scrapping-hardware-in-the-shop-floor. In this case, as well as in situations of supplier late delivery, the final call about punishing the supplier is made by the purchasing manager:
“The decision to debit a supplier is my decision. If manufacturing says it’s the supplier’s fault and I don’t agree, I don’t debit them. Sometimes the supplier will say, or the customer will say don’t debit and I do debit. I make the decision based on… I try to weigh all the information that I have in front of me and I make a decision yes or no. If I see that the supplier expedited hardware and absolutely did… tried their best and still didn’t succeed, maybe I debit them, maybe I don’t. If I see a supplier that is not going, not giving me 100%, then I don’t cut them any breaks.”

Despite all differences pointed above, purchasing and operations agree in several points characterizing supplier customer service. According to them, suppliers that provide a good customer service are the ones that build part inventories rather than wait a purchase order to start producing parts, that make engineering technical staff available to provide support for customers in case of emergencies and especially, that provide to the firm early warnings in case of potential delivery problems.

Supplier integration has been expressed through several ideas. Commitment has come up in all interviews. Supplier commitment to customer expectations is seen as the key for a strong integration with suppliers. Also, supplier willingness to help customers and getting involved in a problem, that might not be their problem is seen as a differential in reacting to supply problems, as explained by the purchasing manager:

“Depending on whose fault it is. Depending on that supplier’s level of commitment to our firm. Depending on capacity at that supplier, they react differently to the problem. If I can show that it’s the supplier’s fault, they react more urgently than if it’s a firm problem. If I agree to pay for help, they react differently, so it varies. Some suppliers will keep a safety stock in case an emergency order, just in case, because they want to support us. The other supplier does not.”

Supplier reaction in case of supply problems may harm its relationship with the manufacturing firm. Most suppliers will not admit that they were wrong until they get a little bit further into the process. To exemplify, once purchasing called a supplier for manufacturing a part out of the wrong material. The supplier denied the fact until the firm physically got a part, did a chemical and metallurgical review, and shipped all 200 parts back, making the purchasing manager really mad, as expressed in the following quotation:

“You wanna kill somebody. That person, that person is not the kind of supplier that we want to have doing work for our firm. I wasn’t laying blame. All I wanted to do was get more parts running and they were looking to make someone else responsible for the parts. They were saying that the blueprint wasn’t accurate. Excuses after excuses. And I wasn’t looking for excuses or reasons or anything like that. All I wanted to do was get more parts in here tomorrow and they would not cooperate. So that supplier is still on the wanted list.”

Case 4 – Relatively Small Firm in the Aerospace Segment

The purchasing group does not have enough technical resources to deal with supply quality problems. Buyers deal with commercial issues and the purchasing manager is the only one inside the group to be involved with quality issues. In these situations, he involves the firm quality representative and the manufacturing group. Purchasing is also involved in negotiations with suppliers about quality problems related to part specifications, such as unclear points coming from interpretation of the part drawings. In case of significant quality
problems, supplier is communicated in a formal way through the corrective action report (CAR) and expected to respond convincingly, as expressed by the manufacturing manager:

“They (supplier) are receptive to that because they want to make good parts and the business we are in is low margin ... They don’t want to get these (scrap) back. And so it’s in their best interest to review the CAR and implement the changes that we’ve suggested or at least come up with their own ideas on what to have to correct that problem that we’ve identified.”

The good integration between purchasing and operations appears to be related not only to the firm size (purchasing and manufacturing groups work physically close), but also related to the job rotation inside the firm. For instance, the manufacturing manager had already taken a position in purchasing as well a position as a material manager. In case of supply delivery problems, a good functional communication allows better production schedule adjustments. In few cases the manufacturing manager is surprised by lack of materials in the production floor. When the supplier provides early communication of its internal production problems, good recovery plans can be put in place to allow mitigation of the supply problem impact through the supply chain, as suggested by the buyer’s comment:

“I just think that it (early communication) provides a better level of customer service to my internal customer and then he can communicate it to Customer X. Then Customer X can go to their customer and explain. I’ve just found in my experience that if I know things (problems) upfront, I can better deal with it. I can come up with a plan B, a recovery plan as to how we are going to proceed from this point on.”

The manufacturing firm expects supplier cooperation and collaboration in some emergency situations by shortening order lead-times and making additional part deliveries. First, the difficulty in forecasting spare blades related to airline companies’ demands creates situations in which the firm runs out of parts for manufacturing these blades. Also, due to the complex blade manufacturing process, it is not uncommon that supplies (castings) may be scrapped in the buying firm production lines and the firm needs to order additional deliveries. Emergency delivers disrupts the material flow and increase supply chain costs. Thus, supplier commitment in addressing problems in these types of deliveries is considered a differential between a good and a bad supplier, as suggested by the following buyer’s comment:

“So, I called the supplier, can you get these pulled in? We need to get these parts as soon as possible... So they got some of those parts shipped, as well as hurried up the process. I think they may have even put in some weekend overtime to actually get out 3,000 pieces by that next week. And we had another situation ...and I had called them (another supplier) and said is there any way that we can bring these parts in, and... I just got the run-around. I mean I was leaving voice mails and emails for a week. No one would call me back. I would go to that person’s supervisor, same run-around; no one would get back to me.”

The manufacturing firm role in the supply chain also appears to affect external integration with suppliers. Since big companies in the aerospace industry outsource to this firm a portion of their blade manufacturing process, the firm integration with suppliers is mediated by these customers. Since these big companies are responsible for qualifying and choosing these suppliers, the manufacturing firm may get a legacy of troubles for some of them. For this reason, this firm expects customer help in expediting supplier deliveries, as suggested by the purchasing manager:
“Hey, you (external customer) chose that supplier. You qualified them, you said it was o.k. to buy from them. They’re not delivering on time and I need for you to contact them and to put some heat on them, change their priorities.”

Since profit margins for manufacturing parts to the aerospace industry (around 12%) are considered lower than the ones in other industries such as the electronic industry, supply of castings have a key role in trimming supply chain costs. However, the purchasing group claims that quality problems and expediting/shipping costs resulting of late deliveries make the firm total cost of ownership higher when using one of the suppliers defined by the external customer. For this particular supplier, requests at the order placement stage and the resulting upper-level discussions in order to get things truly expedited, makes external integration harder. A frustrated purchasing manager expressed this conflict:

“It is frustrating and it is time consuming. It’s ridiculous, but in order to get out of them what we need, we have to provide these things and ... we can’t go to another supplier. This is the supplier that Customer A has picked out for us and we have to go with them. So, we’re kind of like in between a rock and a hard place and you just have to kind of, go with their requests as ridiculous as they are and just try to make the best of it.”

Communication problems with suppliers, especially related to amendments in purchasing orders, have been addressed by an internet based system that allows fast and secure order communication. However, purchasing recognizes the need of better metrics, such as effective report cards, to provide a better communication of the firm expectations to suppliers. Despite some quality problems, interaction with global suppliers seems to be good and not so different from interaction with the national suppliers. In general, interviews show that the firm personnel tries to team up with suppliers for investigating supply problem causes and even using personal relationships with supplier and customer personnel to solve these problems. Since big suppliers have more resources to deal with supply problems, integration with them has being perceived better than integration with the small ones.

Conclusions

As pointed in the literature, functional areas emphasize different aspects of the supply process (Cooper et al., 1991). While purchasing emphasizes more delivery issues, operations put a big emphasis on quality issues. Except with the large firm in the electronics industry, purchasing groups generally do not have technical resources to go deep into quality issues for all supplied parts. Also, there is some decoupling between these two areas (especially for the relatively large firm in the aerospace industry) in which expectations/ positions about suppliers are not always effectively communicated back and forth.

Supply related costs are a concern around all the functional areas, especially in situations where there is a buyer market for parts (supplies exceed demand), profit margins are lower (aerospace industry), and the manufacturing firm has more options for supply of parts (electronic industry). However, this common language has not solved internal integration problems, especially due to the lack of good systems for accounting supply failure costs (exception only for the large firm in the electronics industry). The strategic role of the purchasing group is critical for internal integration, as well as for external integration with suppliers. Rather than just managing contracts and expediting late deliveries, a strategic purchasing group may be able to lead teamwork internally and make sure that supplier improve their performance and provide a positive contribution to the manufacturing firm.
business. This may be one reason for better external and internal integration in the large firm in the aerospace industry.

In all cases, interviews show that integration with suppliers is critical in case of supply problems. A good integration with suppliers facilitates early warnings of delivery problems, as well as prompt responses to the firm formal corrective requests. A committed supplier not only solves the current issue, but also improves its system to not allow the problem to come back. Supplier willingness in helping the manufacturing firm to solve problems that are not necessarily their fault is a big reinforcement on this integration. By the same token, manufacturing firms may help the external integration with suppliers by providing better forecasts and avoiding, as much as possible, frequent order schedule changes.

Integration with customers is very important when supply problems may be related to product specifications that are built by the manufacturing firm customers. In this case (firms in the aerospace industry) engineering change orders and frequent specification up-dates can create lots of problems. Also, when the firm works as a manufacturing contractor for industrial customers, its sourcing options are already pre-established. Thus, in case of supply problems the firm must jointly integrate customer and supplier.

Surprisingly, there is no external integration beyond direct suppliers and customers in case of supply related problems. Despite studies in the supply chain literature point that a wider integration in the supply chain improves performance of manufacturing firms (Frohlich and Westbrook, 2001), we could not verify this claim in case of supply related problems. It may be an avenue for future studies, to analyze the occurrence of more effective supply problem solving processes in more integrated supply chains.

References


