
Common Problems & Collaborative Solutions

OEM-Supplier Relationships and the
Wisconsin Manufacturing Partnership's
Supplier Training Consortium



Common Problems & Collaborative Solutions:

**OEM-Supplier Relationships and the Wisconsin
Manufacturing Partnership's Supplier Training Consortium**

**Jeffrey Rickert
Joel Rogers
Darya Vassina
Josh Whitford
Jonathan Zeitlin**

June 2000

Center on Wisconsin Strategy

University of Wisconsin-Madison, 1180 Observatory Drive, Madison, WI 53706-1393
TEL 608-263-3889 FAX 608-262-9046 INTERNET <http://www.cows.org>

Table of Contents

Executive Summary	i
Policy Recommendations	ii
I. Introduction	1
II. The Growing Importance of Suppliers: A Mixed Blessing	3
III. Supplier Management & Procurement Strategies of	
Wisconsin OEMs	7
Common Goals, Different Paths	7
The Firms	9
John Deere	9
Trane Corporation	10
Harley-Davidson	12
Case Corporation	14
Mercury Marine	15
Ariens Corporation	16
Conclusions: Commonalities and Differences	18
IV. Barriers to Supplier Development	21
Price Reduction Pressures	21
Shifting Costs to Suppliers	23
Abusing Trust	24
Organizational Obstacles to Collaboration: Staff Turnover, Communication Barriers, and Corporate-Plant Disjunction	24
Conclusions: The Limits of Individual Strategies	26
V. The WMEP Supplier Training Consortium: Promise and Performance	27
Mission	27
Origins, Goals, and Structure	28
Participants' Perceptions and Assessment	29
Outcomes: Improvements in Supplier Performance	30
Changing Administrative and Governance Arrangements	31
VI. Conclusions and Recommendations	33
Potential Contributions	33
Policy Recommendations	34
Issues for Further Research	36
References	39

Executive Summary

In 1998 six Wisconsin original equipment manufacturers (OEMs) — John Deere, Trane Corporation, Harley Davidson, Case Corporation, Mercury Marine, and Ariens Corporation — together with the Wisconsin Manufacturing Extension Partnership (WMEP) set up the Supplier Training Consortium (STC). The objective was to improve the performance of Wisconsin small and medium-sized enterprises (SMEs) through problem-oriented training, leading to gains for both the OEMs and their suppliers. This goal derives from the OEMs' pressing need to maximize the effectiveness of a vertically-disintegrated structure, with its advantage of flexibility and simultaneous difficulty of continuous cost and quality controls over suppliers (Section II). At the same time it addresses SMEs' needs for affordable quality training and development, thus aiming to increase productivity and enhance companies' strategic capacities in the long run.

This report examines individual OEMs' supplier management strategies, focusing on commonalities and differences in their approach to broadly similar problems associated with supply-chain rationalization (Section III). While all the OEMs in the study aim at getting their products quicker to the customer by trimming supply chains, establishing closer relationships with suppliers, and assisting them in performance improvement, each OEM follows a different path, depending on its size, corporate structure, products, and markets. These variations in turn shape interactions between OEMs and their suppliers, influencing openness, closeness, trust, and ultimately, performance.

Barriers to improved supplier performance and more effective and mutually beneficial collaborative relationship between OEMs and SMEs arise both from suppliers' difficulties in adopting more advanced production practices and from OEMs' own behavior. Thus, OEMs identify the following problem areas in their relations with suppliers: high cost pressures and suppliers' inability to provide regular price reductions; price reductions as a constraint on suppliers' investments in improvements; difficulty in controlling quality, delivery and time to market; inability of suppliers to achieve improvements independently; and insufficient support for workforce development. However, as the report's findings indicate (Section IV), OEMs can also impose considerable constraints on effective supplier development and collaborative relationships. Some of these serious obstacles are created by OEMs' unrelenting pressures for price reduction; shifting costs to the suppliers; abusing trust, and organizational inconsistencies, such as high staff turnover, communication barriers and absence of strategic fit between corporate and plant-level supply chain policies.

These common problems point to the limits of individual OEM strategies in promoting supplier development. Therefore, as argued in Section V, a multi-firm, public-private partnership such as the WMEP STC can play a positive role in overcoming many of those limitations through collaborative efforts, sharing of costs and benefits, and leveraging of public funds. Since the Consortium is a relatively new initiative, the results of its activity to date are mixed. Such positive outcomes as affordable cost and high quality of training, improved customer service and productivity are frequently undercut by weaknesses in the planning and design of training activities.

Nevertheless, the WMEP STC has considerable potential for serving the needs of OEMs and their suppliers. Recent structural changes in the STC's governance, notably the transfer of its management from John Deere to the WMEP, while raising some concerns, assure an equal standing for all OEMs within the Consortium, increasing their contribution to the planning and implementation of training activities, as well as sharing the responsibility for the outcomes. In addition, the WMEP's leading administrative role enables it to serve as an 'honest broker' discouraging opportunistic behavior by member firms and ensuring that the costs and benefits of consortium activities are shared out fairly among the participants.

The WMEP's Supplier Training Consortium can assist participants in developing collaborative solutions to common problems and strengthening the state's supplier base by performing three interrelated functions: facilitating information flow; sharing out the costs and benefits of widely needed services; and promoting mutual learning.

Policy Recommendations

Further changes in program design and governance may be necessary for the consortium to realize its potential contributions to strengthening the state's supplier base. In particular, to enhance the STC's capacities to facilitate information flow and promote mutual learning among participants we recommend the following measures:

1. More systematic efforts to incorporate supplier voice into the training and development process. These could include:

- development of training needs analysis instruments to assist suppliers in selecting appropriate courses;
- recruitment of supplier representatives onto the STC's governing body and curriculum development committee;
- establishment of a regular OEM-supplier forum within the consortium for exchange of information and views among participating firms, along the lines of the individual supplier advisory councils maintained by several OEMs such as Trane and Harley-Davidson.

2. Greater attention to encouraging cross-firm learning and networking among suppliers through steps such as:

- inclusion of employees from multiple suppliers on training courses wherever possible;
- creation of supplier forums and/or working groups for exchange of experiences and joint problem-solving by SMEs themselves.

3. Increased emphasis on alignment of performance expectations and supplier development practices among OEMs through:

- enhanced efforts to design a common “curriculum of emphasis” for supplier training rather than multiplying courses to fit individual OEM needs;
- exploration of ways to harmonize supplier qualification and certification procedures.

3. Moreover, as a multi-firm public-private partnership, the WMEP’s STC could help individual participants resolve internal organizational dilemmas that hinder their supplier development efforts in a number of ways:

- The STC can continue to provide an external support network for the supplier development function within participating OEMs.
- The STC could encourage participating OEMs to draw up a common code of good supplier relations practice to stimulate the identification and diffusion of good practice among participating OEMs, while also guiding suppliers towards meeting their common performance expectations.
- Implementation of this code of practice within the STC could be assessed by independent third-party monitoring. As proposed in the National Association of Purchasing Managers (NAPM)-National Institute of Standards and Technology (NIST)’s draft White Paper on Supplier Development (NAPM-NIST, 1999), evaluation of OEM-supplier relations could be conducted on an anonymous third-party basis by the Center on Wisconsin Strategy (COWS), while assessment of training project impact could be conducted by the University of Wisconsin-Madison’s Center for Quick Response Manufacturing or a similar not-for-profit organization.
- Participating OEMs found to be in breach of the consortium’s code could be asked to submit plans for correcting the identified problems within a reasonable time period. In cases of persistent uncorrected breaches of the code, consortium members and the MEP could then consider a range of possible sanctions, including loss of access to publicly subsidized supplier training.
- The third-party monitoring process could be harnessed to mutual learning through benchmarking of supplier training practices and related research on OEM-supplier relations, thereby providing a systematic mechanism for generating improvements to the STC’s curricular offerings and code of good practice.
- A larger pilot supplier development initiative could be implemented by OEMs and MEPs across a number of states, including Illinois as well as Wisconsin, and if successful, rapidly extended to a national scale through joint endorsement by NAPM and NIST’s MEP network.

I. Introduction

The story can be told simply enough. Nearly two decades ago, original equipment manufacturers (OEMs) undertook a new strategy that made suppliers more important to their operations. A common problem for OEMs emerged when it became apparent that suppliers were in large part not ready to meet these new demands. Competitive pressures and the structure of their business models made it difficult for OEMs individually to solve the resulting problem. The Wisconsin Manufacturing Extension Partnership's (WMEP) Supplier Training Consortium (STC) emerged as a way to tackle one aspect of that problem and organize a collective solution where OEMs separately could not.

This report has six main objectives:

1. To provide a brief account of the new approach that has increased the importance of suppliers in manufacturing;
2. To describe the individual supplier management strategies of Wisconsin OEMs;
3. To show that certain OEM procurement practices have contributed to suppliers' performance problems and continue to inhibit improvement;
4. To explain how the STC helps to solve this common problem;
5. To propose improvements in the STC's organization and policies aimed at enhancing its ability to fulfill its mission;
6. To identify key issues for further research.

The WMEP's Supplier Training Consortium began in 1998. The goal of the project was to leverage public resources to improve the performance of small- and medium-sized enterprises (SMEs) that supply parts and components to large OEMs in Wisconsin. The logic of the program was that WMEP could create a win-win solution for manufacturers in the state. WMEP could simultaneously make SMEs perform better by providing training in desirable skills, while also responding to the demands of the state's large manufacturers, thereby ensuring that business would flow to the former from the latter. Such a program further promised to improve OEM performance. Large firms could take advantage of a more flexible supplier base, capable of delivering higher-quality products and of finding innovative ways to drive costs out of production. This would in turn serve the larger public mission of keeping Wisconsin's economy vital and growing, producing jobs and raising wages for the state's manufacturing workforce, which could benefit from more profitable companies experiencing increased sales with lower costs.

The reality of this program is of course not so neat. But allowing for the difficulties of overcoming traditional business models, initial experience with the WMEP STC confirms its promise as a program capable of delivering a win-win outcome: a more effective supply base for OEMs, higher productivity and profitability for SMEs, and a well-trained workforce which can contribute to continuous performance improvement and reap the rewards. At the same time, however, as this report will argue, there is also scope for revisions in governance structure and program design which would better enable the WMEP STC to realize these objectives.

II. The Growing Importance of Suppliers: A Mixed Blessing

WMEP focuses on a particular subset of the general pool of manufacturers. STC aims to help those SMEs that sell their products to OEMs. This is a sector of growing importance to the nation's economy. American firms have adopted a model of industrial organization influenced by the example of their Japanese counterparts in which vertical integration is seen as undesirable and close long-term relationships with outside suppliers are preferred. OEMs have instead turned their attention towards developing their "core competencies," while farming out the other parts of their production. In this way, OEMs are better able to respond to increasingly volatile markets and limit their financial risk by reduction of their asset base.

These changes in industrial organization have their roots in the shocks of the 1970s that prompted large manufacturers to reassess the way they had conducted business for the previous fifty years. A dramatic increase in market volatility and fragmentation, triggered by the expansion of international competition and fluctuations in exchange rates and raw materials prices, necessitated new manufacturing and supply chain strategies. A more competitive market meant that firms had to commercialize new products at a faster pace, while the products' life cycles became shorter. To compete successfully, companies had to develop a wider range of products to meet the demands of a more diversified marketplace. This increased the complexities of design, planning, production, and all of the other activities associated with the manufacturing enterprise. Firms moved away from the Fordist, vertically-integrated structure which they had used to exploit economies of scale allowed by a stable national market. In its place they had to discover more flexible modes of operation capable of responding more nimbly to a more fragmented and competitive marketplace. Large firms accordingly slimmed down, existing small firms added jobs, and new firms sprang up.¹

Hence the number of small firms and the percentage of workers employed by them is growing. U.S. manufacturing on the whole has shed over a million jobs. Although by the late eighties large firms had lost some 2.5 million jobs, small firms had bulked up by 1.2 million. Whereas small firms in 1967 accounted for 53% of all manufacturing employment, that proportion increased to 65% by 1987. Small firms have thus been steadily becoming more important to the industrial sector of our economy (Luria 1993).

¹ For a concise overview of these developments, see Helper, MacDuffie, and Sabel 1999.

These small suppliers, unfortunately, are less productive, at least in the American context. Smaller U.S. firms produce lower value-added per production worker. These plants tend to employ a lower ratio of managers to production workers, and therefore have fewer professional staff to develop strategic plans or organize work in efficient ways that reduce cycle times and cut costs while improving output. Internally, they have limited incentive to invest in research and design. These enterprises spend less annually on capital upgrades and new equipment, instead adjusting labor costs to regulate production. They are less likely to be unionized, and invest less in their workforce. These features, together with low capital intensity, mean that less is spent annually on training, jobs tend to require fewer skills, and wages on the whole are lower. They also tend to sell their products to a relatively small group of customers: the large firms that incorporate the suppliers' parts into their final products (Luria, 1996a and b).

The implications are many. Smaller U.S. firms endure greater exposure to the market, often finding themselves asked by OEMs to reduce prices or to take on responsibility for additional services without any extra remuneration. Such effective price cuts, moreover, often come out of suppliers' already lower margins rather than being financed through parallel cost reductions or process improvements. This in turn means less capital available for their own strategic plans, R&D, technology development, capital investments and worker training. Since small firms have less capital for all of these activities, they are mired in a vicious cycle which limits their hopes of becoming more productive. With an increasing percentage of employment in small firms, more and more workers thus find themselves in lower-paying, less-skilled jobs, with far-reaching impact on American society as a whole (Luria, 1996a and b; Helper, 1995; Helper, 1998).

OEMs thus find themselves in a bind. They rely on the new model of vertical disintegration to cope with the complications of more volatile and fragmented markets. But that model entails dependence on outside suppliers for important parts of the production process. This dependence is complicated by two tensions. First, the processes outside the OEMs' core competencies are often simpler, less capital-intensive ones which add less value, employ a lower-skilled workforce, and return less profit to the firm. To take advantage of increased flexibility, OEMs must rely on suppliers to meet higher quality and delivery benchmarks, while at the same time pushing them to introduce new technologies and reach new levels of productivity — all of which the latter often lack the capacity to do. Second, decentralized production demands inter-firm coordination and information exchange, which depends in turn on conditions of mutual trust that have not previously existed between OEMs and suppliers.

Caught between the tension of preserving the advantages of a flexible, vertically disintegrated approach for their own firm while maintaining cost and quality controls over parts that go into their products, OEMs are faced with a choice of dealing with their supply base in traditional ways or seeking to develop more efficient ones. A number of Wisconsin OEMs, as the next section documents, have undertaken supplier development initiatives aimed at distributing some of the benefits of collaborative production down the supply chain while realizing increased gains themselves. These initiatives aim not only to correct problems of cost and quality in a sustainable way for OEMs but also to pass on some of the benefits in productivity and work conditions experienced in the large firm to their suppliers. At the same time, however, as section IV illustrates, a variety of internal barriers within the OEMs themselves have often inhibited these individual firm initiatives

from achieving their full potential in terms of improved supplier relations and performance. Under these conditions, as section V argues, a multi-firm, public-private partnership such as the WMEP's STC may have a crucial role to play in developing collaborative solutions to common problems. The remainder of section V describes and assesses the STC's operations during its first year, while section VI goes on to propose improvements in the consortium's organization and policies aimed at enhancing its ability to fulfill this mission.

III. Supplier Management & Procurement Strategies of Wisconsin OEMs

A closer look at Wisconsin OEMs and their suppliers bears out this larger story and confirms the significance of the resulting problems. This study draws on interviews with supplier management and purchasing staff in six OEMs in Wisconsin as well as interviews with ten of their suppliers. Each OEM was asked to nominate two suppliers to take part in the interviews, one supplier which had taken part in the first year of the supplier training consortium and one which had not. Additionally, whenever possible they were asked to nominate firms which also supplied to another OEM in the study. This research design was intended to ensure that suppliers could be candid with their views about OEMs in the study without feeling threatened that their comments would lead to repercussions with the customer that nominated them. The interviews took place on-site at each location. Our goal was to construct a multi-faceted portrait of supplier management strategies that could be used to identify common problems facing OEMs, challenges to suppliers in light of these strategies, and the opportunities for and effectiveness of WMEP's Supplier Training Consortium in Wisconsin's current manufacturing landscape.

Common Goals, Different Paths

As the trend towards mass customization gains pace, more and more markets are demanding products configured to the specific requirements of individual customers' orders. For Case, the number of base products and options in our mix has grown enormously. Our production managers are finding that they must be prepared to provide millions of different product configurations.

Case Supplier Manual, 1999

The above quote from the Case Supplier Manual typifies the situation facing the purchasing departments of all of the OEMs in this study. Manufacturers are trying to produce a wider variety of products more quickly and at a lower cost. Outsourcing and supply chain management has become a key tool in meeting these goals. This puts greater pressure on the procurement function in firms. Interviews with staff at John Deere, Harley-Davidson, Trane Corporation, Case Corporation, Mercury Marine and Ariens Corporation reveal a number of commonalities that echo the manufacturing situation nationally and, increasingly, globally as well.

Motivations of each of the firms are different, but all are pursuing a vertically disintegrated manufacturing strategy. Case, for instance, has moved away from a “make-to-stock” strategy of building towards annual sales forecasts. Instead it now aims to “make-to-order,” responding as much as possible to current customer demand in the agricultural industry. Deere as well aims to concentrate its manufacturing operations as close as possible on their four-month selling season. Harley-Davidson is trying to meet the rising demand for its products, which managers estimate to be growing at an annual rate of more than 30 percent. Mercury Marine faces the challenge of constant product redesign in order to meet increasingly stringent environmental standards. Trane engages in concurrent engineering initiatives in order to “design new high-quality products at lower costs — and in less time than our competitors” (Trane *Supply Line Signal*, 1999). Ariens, unlike its much larger counterparts, is actually bringing some operations back in-house to service the firm’s own large customers more quickly. From this diversity of goals, a number of commonalities emerge. This study identifies six:

1. OEMs are trying to become more flexible in order to respond more rapidly to market conditions and opportunities.
2. They are relying more heavily on their suppliers to perform manufacturing operations formerly done in-house.
3. At the same time they are trying to reduce the number of suppliers in their supply base.
4. As a result, OEMs are growing more concerned with improving the performance of their suppliers in terms of price, quality, delivery, and flexibility, with particular emphasis on reducing lead times.
5. They are forging closer relationships with suppliers to align them with their own companies’ goals.
6. They are initiating efforts to provide training services to suppliers in order to improve the latter’s performance, though not always at a consistent level.

There are also a number of differences, frequently confounding suppliers who sell their products to more than one of these customers. The large size and complex organizational structure of the OEMs generate a wide range of often conflicting messages flowing to the suppliers. Fluctuations in demand patterns mean that each OEM has a different set of requirements which can become more or less urgent depending on when firms need to get their products to market. Each OEM also sells to a somewhat different market with varying requirements, some based on service, others on time and speed. In addition, each OEM has its own manufacturing and procurement philosophy, often based on the ideas of an external academic guru or consultant, and imposes its own supplier qualification and certification procedures. A closer look at the firms thus reveals that despite many commonalities, the differences between them make it difficult for suppliers to satisfy their new demands.

The Firms

John Deere

In the early nineties, Deere began a company-wide order fulfillment program aimed at making the company more responsive to market conditions. Around the same time, Deere realigned its supplier management strategy to reflect the company's new desire to become more flexible. The company's Horicon Works, specializing in lawn mowers and tractors, had long organized its production according to an annual sales forecast. Production was planned according to the forecast, ensuring that it would remain at a constant level year round. The advantage of this was that Deere could foresee demand for inputs at year-long intervals. Two-thirds of the product, however, sold during the four spring months. Horicon decided that it wanted to become more responsive to market conditions, producing more during the peak selling months of successful products and curtailing production for products not selling up to forecast.

Plant managers attempted to build greater flexibility into their production system in order to weight output towards the selling period. They reorganized the plant's own operation to focus on just four core competencies. All other production operations were then outsourced to Deere's supplier base, even as this base was being trimmed from 750 in the early nineties to 250 today. In implementing the new strategy, however, Deere discovered that their suppliers were unable to support this production scheme efficiently. Horicon found that supplier lead times were often much longer than the selling season. With this limitation, managers were unable to achieve the flexibility towards which they had geared their own operation.

Deere had an existing supplier development program, begun in the early 1990s as a way of dealing with suppliers suffering from delivery and quality problems, which was adapted to resolve some of the problems with suppliers that emerged as the new strategy was implemented. The Horicon Works supplier development team discovered that a significant share of supplier production cost could be removed by reducing lead time, allowing Deere to obtain price savings as well as become more responsive to its final customers. The group of managers proposed to upper management the creation of a unit within supplier management that could undertake improvement projects on-site at suppliers' operations. The initial objective was flexibility, but the managers argued convincingly that the project could be self-sustaining, even profitable, because lead time reductions would translate into cost savings for suppliers that would lead in turn to price savings for Deere. Upper management agreed to a five-year pilot project, the Supplier Development Initiative (SDI), authorizing 100 supplier development engineers throughout Deere and Company's four divisions, located in the purchasing departments of each unit.²

² Deere & Company is the parent company of five business units that create products bearing the Deere name. Each unit manufactures products for a different market segment: Agriculture, Construction, Grounds Care, Power Systems, and Parts. They also have a credit division and a financial division. The credit division was recently sold to Sentry Insurance. Executives at Deere & Company fiercely defend its decentralized structure. As a result each division has its own purchasing department, and each supplier development team is unique.

The Supplier Development Initiative has been successful at improving the performance of suppliers, relying heavily on two main qualities in its six-step improvement process. First, and most importantly, the process establishes a relationship of commitment and trust by fostering the information flow necessary for producing improvements. Second, the process helps the suppliers to implement a number of “quick-response manufacturing” experiments, particularly set-up reduction, cellular manufacturing, and small batch production. The process relies heavily on the work of Rajan Suri at the University of Wisconsin-Madison, who emphasizes time as the primary metric for competition in the new manufacturing environment (Suri, 1998). Performance improvements at suppliers participating in SDI include substantial reductions in cycle times, work-in-process, materials handling, inspection, and floor space, leading to significant gains in quality, on-time delivery, costs, and sales (Rickert, 1999).

While many managers at Deere, and especially those in the supplier development division, believe that fostering closeness is the only way to achieve continuous improvement not only on price, but also on quality, delivery and flexibility, there is no consensus at the firm on the value of closeness. It is a hotly debated topic, and managers at Deere & Company, Horicon Works’ corporate parent, see closeness as desirable when the supply chain has reached its optimal level, but think that until then all firms in the supply base should compete to hold their position. However, some procurement managers at Horicon Works, whose performance is judged largely by their ability to deliver reductions in component costs, see hard bargaining backed by exit-based options as the most effective way of extracting price cuts from suppliers who know that the threat that Deere will pull its business is always looming.

As a result, Deere often sends mixed messages to its suppliers. They avoid sole source supplier relationships, but limit the number of suppliers for any part to between two and four, with an aim to both achieve closeness and at the same time retain exit options with suppliers. The firm also requests an annual price reduction from its suppliers, not all of whom receive assistance from Deere. In fact, only twenty-five of Horicon Work’s suppliers do, while the other approximately 225 suppliers must discover their own ways to bring down costs in order to match the price target. If they do not have that capability, which is all too often the case, they must take the price reduction out of their profit margins, severely hampering their ability to improve by restricting the funds to invest in the appropriate training, processes, and technology that make improvement possible.

Trane Corporation

Trane Corporation’s La Crosse Business Unit (LBU) produces water chillers for commercial and municipal customers. Trane divides its supplier function into two parts. Day-to-day ordering of parts and materials is handled by the operations division, while supplier selection, negotiation, development, and problem-solving are handled by a separate materials division. Trane’s literature explains that procurement’s focus is on “today’s business” while the focus of the materials division is on “tomorrow’s business.” Materials division is the strategic component of Trane’s supplier strategy.

Trane LBU has been aggressively trying to reduce its supply base while also giving it more responsibility for the final product. There are only 175 suppliers delivering more

than \$10,000 worth of product, down from 250 in 1997. They have done this principally by redesigning products and consolidating parts formerly manufactured by multiple suppliers into an assembly provided by a single firm. A supplier manager reports that every time a product is designed or redesigned, they aim to engineer at least one supplier out. Additionally, they have begun a concurrent engineering effort aimed at rapid product and technology development, which partly motivates the company's drive for closer relationships with suppliers. By developing close relationships with suppliers, they can be brought in early in the development of new products and can take on some of the research and design functions necessary for a new product launch. Engineering staff at Trane felt that it was essential to change the adversarial supplier relations so that suppliers could deliver input on new designs as well as tool up early to deliver product.

Trane employs a progressive system of supplier management and values stability in sole-source relationships with suppliers. The company attempts to foster open communication in the production process from the earliest stages of design through the life of the product. It provides support to supplier partners who are having problems. Managers work to lay out a long-term strategic plan to help drive improvement and keep suppliers abreast of its strategic goals and initiatives so that suppliers could gear their operations to the production targets. Finally, all suppliers are expected to be able to participate in Trane's Demand-Flow Technology (DFT) system. Designed by former business school professor John Costanza, DFT is essentially an advanced pull system that uses electronic commerce and production management techniques to improve not only inventory but also lead and cycle times at the suppliers.

This supplier management system begins with a process of supplier qualification. Initially, potential suppliers are subjected to a quality assessment to determine if they meet Trane's exacting standards on a number of metrics. Once they qualify, they are asked to create a supplier development plan with Trane managers. Then there is an on-going review process including a three-year supplier audit plan, a material verification plan, and a process control plan.

Qualified suppliers are graded by Trane on various metrics (delivered quality, field reliability, on-time delivery, replenishment cycle and pricing history). An assessment is made of suppliers' ability to hold down defects and to service Trane reliably when problems arise. Late shipments are monitored, as are lead time and lead time reduction efforts. Finally, purchasing managers also track pricing and cost reduction efforts of suppliers in assessing them for qualification. All of this performance data is then communicated to the supplier. They are also given reports on Trane's assessment of their quality performance and efforts for improvement and are immediately notified if there has been a request for corrective action within Trane. In general, Trane is good about informing suppliers of their performance as well as keeping them up to date on goals and objectives. The company holds an annual supplier event where suppliers are invited to Trane to learn about its strategic direction as well as hear from national speakers on supply chain management, and all suppliers receive a monthly newsletter.

Trane also has a supplier improvement initiative. Trane managers conduct quality audits and review supplier financial and operations data to identify areas for improvement and cost reduction, for which all Trane suppliers make their financial data available to the company's purchasing managers. Suppliers are invited to Trane for annual business

reviews to plan improvements. Additionally, Trane makes training and education resources available to suppliers and their employees. Trane has developed a Supplier Development Council composed of materials managers to implement these programs as well as to drive other strategic efforts including R & D, transportation, and logistics.

Purchasing management feels that the system is able to provide continuous improvement. Late shipments are below 1 percent of total shipments. Ninety-nine percent of shipments conform to Trane quality standards. Seventy-three percent of suppliers have lead times of less than 10 days. Sixty percent of Trane's purchases are made via electronic transfer. Eighty-five to ninety percent of purchased parts are delivered using recyclable packaging. Ninety percent of all parts purchased are covered by a blanket purchase order. Suppliers are updated on production forecast for next 26 weeks on a weekly basis, and they are informed weekly about their actual orders. Trane is trying to work aggressively with suppliers to help them remove their costs associated with inventory. Nearly 70 percent of all trucks used to deliver parts to Trane are used to deliver outgoing product from the company to its customers.

Harley-Davidson

Harley-Davidson Motor Company produces one of the most popular motorcycles in the world. It makes motorcycles for global markets from six plants: three in Wisconsin; one in York, Pennsylvania; one in Kansas City, Missouri; and one in Brazil. The plants in York, Kansas City, and Brazil are assembly plants, while the Wisconsin plants comprise its power train division. This division creates two relatively distinct supply bases: one for assembly and one for power train production. Suppliers in one or the other supply chain most often supply to all of the plants in that division. A supplier selling parts to York would also sell parts to the Kansas City plant. A supplier selling parts to the Milwaukee plant would also sell to the Tomahawk, Wisconsin plant. This is true for about 90 percent of suppliers in either base.

Approximately 100 of Harley's 350 suppliers, accounting for 25 percent of purchased parts by dollar volume are based in Wisconsin, mostly in Milwaukee. Harley values geographic closeness in its supply chain. York and Kansas City have similar clusters of suppliers. The average supplier has been supplying to Harley for ten years. All suppliers enjoy sole-source agreements with Harley.

Harley also began trimming its supply chain in the late eighties. Mike Schmitt, purchasing manager at Harley, describes the company's supply chain optimization as a two-phase process. The first phase arose out of necessity. At the end of the eighties, Harley had nearly 1200 suppliers in its supply chain but did not have the business to support this number. "Our business had shrunk and we spread our [supply] business too thin," explained Schmitt, "We did not have much clout with [any one supplier]." He also explained that managing a supply chain of that size was administratively cumbersome. At that time, they sought to trim their supply chain from 1200 to about 350 suppliers, where it stands now.

The second phase of optimization is just beginning and is a result of a changing supply strategy. Harley now wants to purchase more complete systems and assemblies rather than individual parts. Schmitt explains that many tier-one suppliers will become tier-two suppliers. These suppliers will be supplying parts to a single tier-one supplier

which assembles a system that goes to Harley rather than selling the parts directly to the company itself. For instance, instead of purchasing all the parts for its brake systems and then assembling them in-house, Harley would purchase an assembly that it would integrate with other purchased assemblies. Now, entrance into the Harley supply base will increasingly be secured through possession of the technologies and capabilities to build whole systems. Even if a supplier still supplies discrete parts directly to Harley, they will increasingly need to be able to apply new processes to those parts in order to continue doing business with the company, and new suppliers are added yearly as Harley pursues new technological capacities.

Harley is focused on building closer relationships with suppliers. The company does not use contracts but has instead begun to use the master supply agreement (MSA). The MSA is a list of guidelines for the relationship, rules to follow, and resolutions should problems arise, used with 'strategic' suppliers with whom they anticipate having long-term relationships. Harley is just beginning to formalize the process of certifying suppliers as 'strategic' but at the moment, the cycle maker has such relationships with about 250 of its 350 suppliers. These suppliers command special attention from Harley and are invited quarterly for business planning meetings (BP). BPs are thematically organized meetings designed to help supplier understand Harley's strategic issues. They give suppliers an opportunity to provide input and feedback, as well as coordinate on new projects. Strategic suppliers are brought in early to the design phase. They are brought in-house, and many even have desks at Harley's Capitol Drive research and design facility. Their input is solicited at the idea phase so that there do not have to be many revisions during the development process. They are also kept informed of the latest Harley strategies through a company newsletter, *Harley World*.

To facilitate feedback from the supply base, strategic suppliers are invited to become part of Harley's Supplier Advisory Council (SAC), composed of sixteen supplier members and six Harley staff. Membership in the SAC lasts two years, and the council is chaired by one supplier member selected to a one year term. Each supplier representative is asked to correspond at least once every three months with a list of eight to ten suppliers with whom it does not compete directly. When the council convenes, the supplier representatives are able to provide informed feedback to Harley staff who take it back to their production, new product development, engineering and purchasing departments.

While they are seeking closeness, Harley also asks for price reductions every year. As a result, price will become a bigger factor as Harley moves forward. Suppliers in the recent past have not been cut because of their inability to meet price demands, but in the new optimization phase, those in purchasing believe that this will become more prevalent. Still, Harley is making a concerted effort to help its suppliers meet these demands through its continuous improvement team (CIT), a group of manufacturing and process engineers headquartered in Milwaukee but assisting suppliers to all plants in the company. CIT is Harley's version of supplier development. Like those found at Deere, Trane, and Case, and much like Case's program (described in the next section), Harley targets suppliers for assistance based on intensity of need. Most often a supplier is offered CIT assistance after several staff people at Harley have suggested it needs help, though suppliers can also ask for assistance themselves. Projects range from a few months to several years depending on the supplier's needs and strategic significance.

Case Corporation

Case Corporation produces agricultural and construction equipment for global markets. It is split into three business units. Agricultural equipment is responsible for 49 percent of its total business, construction for 32 percent, and production of after-market goods for 19 percent. Case is the world's largest manufacturer of light-to-medium construction equipment and the second-largest producer of agricultural equipment. It has 25 plants and joint ventures scattered around the world. Case has recently agreed to a merger with New Holland NV, a leading international producer of agricultural and construction equipment controlled by the Fiat group. The merger was due to be completed in October 1999. Case employees anticipate that things will stay very much the same once the merger is complete, because the CEO, CFO, and the COO will continue to hold those roles in the new company.

At Case, where purchased parts account for between 60 and 80 percent of the cost of final products, supplier management is centralized. Corporate purchasing is responsible for 85 percent of supplier selection. The only supplier selection decisions made at the local level are for parts used only at that plant. All parts for use at multiple plants are to be purchased from suppliers certified by corporate supplier management.

The firm's supply-chain strategy is customer focused and aligned towards flexibility because of the company's move away from a "make-to-stock" strategy of building to annual sales forecasts. It now aims to "make-to-order," responding as much as possible to current customer demand. Case also emphasizes customer service in the form of a wide range of custom products, made quickly to meet the customers' demands.

Case admits that this has put significant stress on their supplier base. They have however aimed to alleviate this by conducting extensive needs assessments as well as supplier development assistance. To assess needs and identify qualified suppliers Case employs a Strategic Sourcing (SS) program created by the consulting firm Booz-Allen Hamilton. The purpose of SS is two-fold. First, SS aims at lowering Case's overall parts acquisition costs, focusing on long-term partnerships. The product is segmented and each part is sourced to a specific supplier. The suppliers are selected using twenty different criteria; price is among them but not, in theory, the most important. The average length of contract is five years, but some are as long as seven years. SS is used to select new suppliers, but all suppliers currently in the supply base also need to participate in the certification process. A Case manager distinguished the company's philosophy, as derived from the strategic sourcing method, by pointing out that most firms organize their supply chains according to product, whereas Case does so by commodity. He reported that there were three to four suppliers for each commodity. Once a supplier breaks into a niche they are given a contract for a particular version of the commodity part. For instance, there may be four different bolt manufacturers, but each one would be given a particular type of bolt to produce.

Once certified, suppliers are involved in new product development from day one. Suppliers become deeply involved. They must sign confidentiality agreements and send a member from their staff to sit on the product development team which consists of engineering staff, one commodity manager, and the supplier. The top hundred suppliers by dollar volume are also invited to an annual supplier day where they are brought up-to-speed on Case initiatives. Case managers report communicating regularly with suppliers

via e-mail. Additionally, each supplier has access to the Case Supplier Communication Network (CSCN), an extranet where suppliers can access such information as accounts payable, cost savings plans, drawings and specs, a supplier bulletin board, and a shut down schedule among other things.

Case does not have a formal supplier development initiative but they do have an Intensive Corrective Action Process (ICA). If a supplier is having problems they will send a multi-functional team to help the supplier address problem areas. This occurs less than fifteen times per year. ICAs can last from 6 months to many years depending on the strategic importance of the part. If the supplier is in a niche with many competitors, it is given a six-month window to improve with Case's help, or the work is re-sourced. If they are a sole-source supplier Case will commit the team no matter how long the project requires.

Mercury Marine

Mercury Marine is headquartered in Fond du Lac, WI. It produces outboard motors for consumer and racing boats. Mercury Marine, like other firms in this study, is trying to achieve flexibility to meet market demand, but it also needs to accelerate its time to market for new products. Constant redesign and new product development is required in order to meet new environmental standards governing their engines.

In the early nineties, Mercury Marine began an effort to trim its supply chain, as did many other large OEMs, reducing the number of suppliers from around 1100 to between 250 and 300. Recently, the firm's supplier base has been growing again, because it has begun to produce a number of new products as a result of increased environmental regulation, involving tighter emission restrictions on outboard motors and requiring new engine designs. As a result, the supplier management division is gearing up to trim the supply base again. Managers reported that they have been asked to take up the process again, but they did not specify the reduction target. Managers also reported that most of the supply base was outside of Wisconsin, and the firm was not at all wedded to in-state suppliers. Many of the remaining Wisconsin suppliers were relics of a time before global supply strategies were possible.

Managers indicated, however, that closeness was increasing between Mercury Marine and its suppliers. Buyers in particular talked regularly to suppliers with whom they placed daily orders or had electronic data interchange (EDI) systems in place. An additional sort of supplier interaction came in the form of AIM and DRIVE initiatives, targeted improvement projects for cost reduction. Managers often have suppliers in for a regular "sit-down." For key suppliers this occurred six times per year, for suppliers of moderate importance two to four times per year, but at least once a year for all suppliers. The majority of suppliers came in at least twice a year. The firm also has begun to utilize suppliers in the design phase of new products at a limited but increasing level, though purchasing staff report that they are often too tied up in expediting to facilitate this effectively. They did not have the time to engage in tactical purchasing strategies that would support this effort, but the new product purchasing director was hoping to fill the next purchasing manager position with a staffer dedicated to tactical supplier management.

Mercury Marine uses its own certification system as the main tool for managing and trimming its supply chain. The firm employs what it calls supplier progress review (SPR). In SPR, suppliers are judged on four metrics: Quality, Cost and Management Activities, Delivery, and Service (which includes a variety of value-added services the firm might offer, such as returnable packages, EDI, progress towards Y2K compliance). Performance on the SPR is reported to suppliers in their regular meetings with Mercury Marine managers.

The company does not have a formal supplier development team, though they do employ supplier quality engineers who evaluate supplier quality process, without getting into manufacturing or design processes. The engineering department will very occasionally set continuous improvement goals, but those are rare and usually limited to delivery systems. They also do have a cost management activity where purchasing managers and suppliers will participate in joint two-day workshops to discuss cutting costs out of the supply chain. The training is inspired by the work of Ankle Saria, a management theorist from San Diego State University. The firm's system attacks current costing practices, and shows suppliers how to conduct a more accurate costing system.

Because Mercury Marine has no earmarked resources for supplier development, purchasing managers must rely on outside resources to strengthen their suppliers. Managers in the purchasing department believe that Mercury Marine should go down the supplier development path and are upset that top management is not interested. Instead, they are forced to rely on programs like WMEP's STC to improve their suppliers' capabilities. They also look actively for suppliers working with customers who have supplier development initiatives in order to "piggy back" on support those firms may have received from their customers. The danger is that Mercury Marine becomes a second fiddle to those other customers, unable to command the kind of special consideration that a Deere or a Harley might receive.

Ariens Corporation

Ariens Company makes lawn mowers and snow-throws in Northern Wisconsin. It began as a family owned business at the turn of the century and is the only privately held firm in this study. Ariens differs in a number of respects from the other OEMs surveyed in this report. The firm is much smaller than its other counterparts. Ariens has only about 700 employees in total, in contrast to companies like Deere or Harley, which employ a similar number at each of their plants. It is also the most geographically concentrated of the OEMs examined in the study. All of the firm's production operations are located in Brillion, apart from an after-market operation in Indiana. It should be noted that Ariens also functions as a supplier to other firms studied in this report. Finally, unlike the other companies participating in the STC, Ariens is "insourcing" a number of its production operations in order to increase the firm's capacities as it takes on new business and seeks to attract new customers.

Ariens has succeeded in winning new orders. The firm began its business as a lawn and garden equipment maker, but in order to deal with the seasonality of production associated with this product it diversified into snow-throws. In this way, Ariens does not have to level its production in order to operate year-round, relying instead on the two seasonal spikes to anchor the production schedule. Its customer base has also begun to change, as the firm has taken on new and larger clients, in addition to increasing the

number of products it sells under its own name. In the past year Ariens has added several major contracts with national customers.

Ariens' transformation, which is still in progress, reveals a supplier management strategy that is just emerging. Its size, geographic concentration, and position relative to other OEMs means that the firm is not as developed or formalized but is quickly becoming so in some areas while remaining in an experimentation phase in others. The growth in Ariens' business and the increasing diversity of its products and customers have created the demand for evolution as well as the capacity to effect that change.

Ariens' supply base is similar in size to a number of the OEMs in the report, but it also varies in interesting ways. The firm has between six and seven hundred suppliers, seventy percent of which are located within 250 miles of its three plants in Brillion, Wisconsin. Ariens has been looking to increase its foreign sourcing. Purchasing managers have been traveling to China, Taiwan, and Mexico to look for foreign sourcing options. The director of purchasing reports that this effort has been proceeding very slowly. Not surprisingly, the first purchase from Mexico netted a 40 percent savings per part even after carrying costs but forced them to purchase in large batches.

For the most part, however, the Director of Purchasing says that Ariens values geographic closeness in their suppliers because it operates according to the *Theory of Constraints*, a popular management philosophy created by Eliyahu Goldratt. This operates essentially as a kind of lean manufacturing strategy with the goal of flexibility, not unlike that of the other OEMs in this study. Ariens has begun to implement a computer software program called *Resonance*, marketed by Throughput and designed to institutionalize Goldratt's theory. The firm's goal is to be able to build to order according to demand without need for forecasts. Following from this, Ariens purchasing strategy is to reduce lead times, fight off internal minimum order thresholds, and get away from large batch orders from suppliers.

In order to reorient the supplier base to its production needs, Ariens began a supplier certification process in the spring of this year. The firm requires all suppliers from whom it will buy to be "qualified," but some suppliers achieve "certified" status, acquiring preferential treatment from the OEM. A supplier becomes eligible for certified status when it has achieved a 99 percent quality performance ratio for three consecutive quarters. The supplier is then subjected to a visit from the Ariens purchasing staff who evaluate it on a number of other metrics. While certified suppliers are expected to come up with cost-savings ideas, they enjoy partnership style relationships with Ariens, particularly in engineering. In bidding, if they can come within five percent of the lowest bid, they get the order. Currently, only ten suppliers are designated "certified," but Ariens hopes over the next two years to certify its sixty core suppliers.

Sole-source agreements are common because so much of what Ariens produces is custom made. Contracts with suppliers are long-term (the purchasing director defines long-term as one to three years where long-term tends to be thought of as three to five in manufacturing more generally), with weekly buys. Eighty percent of suppliers are on EDI or AutoFAX. Ariens aims to average a one percent price reduction annually, and regularly issues across-the-board price reduction requests. Within the supplier base, however, there is a great deal of variation, ranging from a twenty percent reduction to a five percent increase. The firm also allows for fluctuations in price resulting from changing materials costs.

As mentioned, Ariens supplier strategy is still developing. The firm is capturing more and more business while operating on larger geographical scale. Its supplier management strategy is now being transformed to meet the changes in their business as the firm continues to grow. Decisions to look abroad for suppliers reflect on the one hand a desire to secure lower prices for purchased materials, but also a new capacity to seek out foreign suppliers and integrate them into its business. But while Ariens begins to head down paths that go against emergent collaborative models of supplier management, its size and the organization of its existing supplier base produce close relationships that give the firm some advantages over other more formalized supplier management strategies, as we will see in the next section.

Conclusions: Commonalities and Differences

Wisconsin OEMs have gravitated in a similar direction in many respects. All of the firms are struggling to meet the ever-changing demands of forces external to their operations. Whether in relation to the product market, their competitors, or government regulations, OEMs have embarked on strategies aimed at rationalizing their supply operations to achieve increased flexibility and efficiency.

All of the firms are focused on getting products to customers quicker. Firms like Harley are trying to fill a steady demand before customers find substitutes or become frustrated, while Deere, Case, and Ariens must get products to the market when their customers want to buy them. In order to achieve this flexibility, firms must simultaneously depend on their suppliers to produce an increasing portion of their product and make the supply base more manageable.

All of the OEMs are pursuing closer relationships with suppliers. Firms like Harley have first trimmed their supply chains to lower the administrative costs and then winnowed them again to make sure that they include only the most capable suppliers. Case, Trane and Harley have tried to limit their supply chains to firms able to assist them in product and process innovation. Deere has pursued a more segmented approach that will give it greater agility. Ariens has constructed a base of suppliers that are close geographically and can interact with their company on a number of levels. Mercury Marine is trying to shift its own organizational structure to accommodate greater closeness, starting first with its commitment to consistent communication, and moving towards a more strategic positioning.

All the firms in the study are concerned with improving suppliers' performance, as their membership in the Supplier Training Consortium suggests, but most are being more proactive than that. Deere, Trane, Harley, and Case all have supplier development programs aimed at helping suppliers to improve along the metrics they consider most important. Mercury Marine and Ariens, while not having formal supplier development programs, are actively trying to find ways to formalize the development activities they need to compete in a vertically disintegrated competitive environment.

Nevertheless, supply chain strategies reflect differences between companies in terms of size, corporate structure, the nature of their products, and the characteristics of their markets. This complex of forces impacts on the way in which OEMs interact with their suppliers, influencing openness, closeness, trust, and ultimately, performance. Five of the six firms in this study are publicly traded. Ariens' presence in the study illuminates a

number of the differences between the firms. Ariens is the only privately-held firm and is also the smallest and most geographically concentrated; it also has the smallest purchasing department which services all of its plants. The firm's suppliers comment that its small size is one of the advantages of working with it. Suppliers can call company engineering to get feedback about materials, and engineering also calls them for advice about materials in new products. In addition, the supplier can go to the plant and visit the shop floor to talk with operators about how their parts are working in production. Most importantly, they can call the director of purchasing directly.

In the other OEMs, purchasing is centralized at corporate headquarters, but most often plants have their own purchasing staffs as well. Their large size necessitates this kind of dual structure. But amongst the OEMs the distribution of power across corporate and plant-level purchasing departments varies significantly. This cleavage also means that each production unit runs the risk of making demands and sending messages that run contrary to other production units or even corporate purchasing itself. Trane is able to emulate Ariens' closeness with suppliers because members of the plants' purchasing departments serve as the corporate management group for world-wide production. Their message is consistent across all plants and the action of plant-level managers is consistent with corporate policies. Other firms, however, may negotiate contracts or orders at corporate level, but plant purchasing agents have the power to select suppliers and renegotiate prices. In this way OEMs are able to use local knowledge to achieve efficiencies at each production site. But often suppliers receive conflicting messages from these multiple entities. This is one of the key problems OEMs face in trying to build trust with their suppliers.

The geographic concentration of Ariens' supply base also facilitates closeness. Supplier proximity allows for both purchasing staff and supplier staff to visit each other's operations regularly. The other OEMs in the study negotiate this issue in different ways. Harley-Davidson, for instance, sets up clusters of suppliers around each of its plants so that most of its suppliers are no more than a day away. Deere has nearly half of its suppliers for its Horicon plant in Wisconsin, using distant suppliers most often only when they can not find the part built locally. For instance, engines of the size used in their lawn tractors and commercial mowers are not produced in the United States, so they purchase them from a Japanese supplier. Case, Trane, and Mercury Marine now see business as a global affair and do not try to achieve geographic closeness. Trane's La Crosse business unit has only about a dozen suppliers in Wisconsin, but the firm's consistent and coherent procurement system leads its in-state suppliers to report close collaborative relationships with business units as far away as Pueblo, Colorado.

Ariens' size, however, also places it at a disadvantage because it is typically unable to command enough of a supplier's business to receive preferential treatment. Deere and Case, its direct competitors in the lawn mower market, often control more than 20 percent of any one supplier's business. As a result, suppliers are much more worried about satisfying their demands for fear of losing that volume of business. Ariens' small size and purchasing department also restricts the firm's ability to create its own supplier development program. Mercury Marine, too, has a relatively small purchasing staff and has not been able to develop its own supplier development program. Purchasing managers will often select suppliers who they know are receiving development assistance from other OEMs, but then feel the effects when they can not secure the preferential treatment

accorded to those customers. Harley and Case have largely pursued reactive supplier development strategies, while Deere and Trane have been able to be more proactive and reap the benefits of closeness not only in performance, but also in preferential price reductions.

Gaining preference with suppliers is an important factor in making flexibility work. Harley nominated suppliers into the STC as a way to provide a service to them where the firm didn't have the critical mass of business to command preference when it needs special treatment. Deere uses its supplier development initiative to foster close relationships which will make suppliers eager to perform favors when the company needs rush orders or small jobs. OEMs call on these favors often. Most of the products produced by the OEMs in this study are seasonal. Deere, Case, Mercury Marine, Ariens, and to a lesser extent Harley, all make products which sell mainly in the spring and early summer months. They each call on their suppliers at the same time to meet the demands of current sales conditions, and whichever customer the supplier needs most gets the latter's special effort to catch the market.

This complex of differences creates a number of inconsistencies with which suppliers must cope in order to compete in a vertically disintegrated environment. A number of problems emerge as a result, which ultimately hurt the performance of the OEMs themselves and hamper the wider economy. Thus OEMs are finding that:

1. Cost pressures are high and suppliers are not able to provide regular price reductions.
2. Price reductions secured often cut into suppliers' profit margins, constraining their ability to invest in improvements.
3. They do not have the same control over the final product in terms of quality, delivery, and time to market because they do not have the same control they once had over the making of parts that go into the final product.
4. The supplier base is not able to produce these results independently or they do not have the process technologies in-house to partner effectively.
5. Suppliers do not support the skilled workforce that can solve problems and drive improvements.

For flexible manufacturing to work successfully, both suppliers and OEMs must employ high-performance practices. But the actions of OEMs and the condition of suppliers constrain the ability of manufacturing as a sector to reach this level. In order to understand the obstacles better, we now turn to the perspective of the suppliers themselves.

IV. Barriers to Supplier Development

Controlling for the stage of development of their supplier management strategies and differences in size, product, and market, one would think that OEMs are being very active in addressing the weaknesses of their now important supply base. The problem it would seem, is that OEMs had simply inherited a weak population of suppliers, which had trouble making improvements and progressing to new levels of advanced manufacturing. But such a reading would miss the important role played by OEMs themselves in creating and perpetuating this situation. In fact, much of suppliers' initial weakness and the continuing inability of many to develop advanced manufacturing capabilities can be traced back to the constraints imposed by OEMs' own behavior, particularly in deviating from their official procurement strategies and/or exploiting vulnerabilities arising from new collaborative relationships. OEM practices that negatively affect supplier performance include:

1. Unrelenting pressures for price reductions;
2. Shifting costs to the supplier;
3. Abusing trust;
4. Organizational obstacles to collaborative relationships, including high staff turnover, communication barriers, and inconsistent implementation of supply chain management strategies at the corporate and plant levels.

Price Reduction Pressures

Despite attempts at partnering from some sections of OEM purchasing departments, competitive price pressures are still prevalent in customer-supplier relationships. Suppliers interviewed for this study describe a number of ways that OEMs still use as hardball negotiation tactics to achieve "brutal" price reductions.

One supplier explained that a major customer had recently begun to bid out parts that his firm was producing for it. The supplier said this practice is becoming more prevalent as "target pricing" diffuses from the auto industry. Increasingly, customers survey the market, choose the lowest price, and then pressure the supplier to meet it, often without offering concomitant assistance in cost reduction. Most frequently, the supplier has "to answer negatively," especially where the quote comes from foreign competitors willing to bid 30% percent below his current price. In only a few cases has he been able to retain the business after returning a 'no' answer. Often, however, the parts will come back. For instance, four months previously, the supplier had lost a contract for an automotive

manifold cover to a Korean firm. He then suddenly received a call from the auto company asking if his firm would be able to resume production on the part, without explanation. Based on discussions with contacts inside the customer firm, the supplier speculated that quality and delivery problems at the new source were responsible for the returning order.

Often, however, price pressure does not come in such a hard-nosed form. One set of practices mentioned by suppliers revolved around the customers' use of cost-reduction techniques to achieve price cuts. Several suppliers emphasized that cost reductions achieved rarely match price reductions demanded. By claiming that they have figured out ways to drive costs out of the production process, OEMs convince suppliers to deliver price cuts before the savings are secured. Suppliers are skeptical of cost reduction claims but nonetheless feel compelled to deliver price cuts in order to maintain business from their customer. OEMs still move business around often enough that the threat is very real, and often experienced as such by the supplier. In these cases, the price cuts are ultimately financed out of the supplier's profit margin.

An example from one supplier interviewed illustrates this process. The customer informed this firm that they were going to start redesigning their products to engineer costs out, and requested a 6.5 percent cost reduction in anticipation of the resulting savings. The customer offered that if the supplier could meet the target price they would not bid out the product to other competitors. The customer did not include the supplier in the redesign process, and did not provide blueprints before the price reduction request. The supplier was upset, and told the buyer on the engineering team that he was uncomfortable agreeing to produce a part he had never seen, since he was unsure that he could produce it in such a way as to achieve the projected savings. The buyer claimed that no other supplier had objected to this procedure, but accepted an alternative agreement whereby the supplier agreed to meet the target subject to review of the plans. The supplier met the requested price on the first product redesign, but the customer did not deliver a part with 6.5 percent cost savings. The supplier points to the lack of communication between engineering and purchasing as the root problem. The supplier reported that the buyer told him that engineering was still throwing prints over the wall to them. The different functions within the customer firm were not communicating in a way that allowed the supplier to provide information about how they could produce the part nor did it allow purchasing to mediate effectively between engineering needs and supplier capabilities.

OEMs also dream up other inventive ways of promising cost reductions to secure price cuts. The same supplier relayed a story where the customer recommended that the supplier reduce costs by using the larger firm's own steel suppliers, with whom it had negotiated preferential prices. The customer estimated that if the supplier bought steel from one of these sources, it would save two to three percent, and expected that this cost reduction would translate directly into a two to three percent price cut, with none of the savings going to the supplier itself. The OEM's rationale was that the supplier would now be saving money on steel and could increase their margin by not adjusting prices for other customers. The supplier was uncomfortable with this proposal, feeling that the customer had "skipped over the trust building" process, but nonetheless provided data on current steel costs. A month went by without any word, until the customer called inquiring about the requested price reduction. The supplier responded he had turned in the material cost data but had not heard anything about alternative suppliers. The supplier then requested to be allowed to quote the target price himself to a variety of steel suppliers, including those

outside the customer's preferred list. With the customer's agreement, the supplier managed to negotiate a contract at a price three percent below the previous rate, but with a non-certified supplier. He gave the customer a two percent price reduction and kept the rest, and then gave all the firm's other customers a two percent price reduction as well.

According to the suppliers interviewed for this study, price is almost always used to determine sourcing decisions. OEMs are still in a supply-chain trimming mode, and price is the primary metric for determining who is in or out and for moving business away from a supplier. While a supplier who has poor delivery performance or quality problems might get support from the OEM, price pressures, in the form of rebidding, are still the main grounds on which suppliers lose business.

Shifting Costs to Suppliers

One of the key features of the emergent manufacturing model is outsourcing, not only of production functions and parts but also of costs that had previously been assumed by the OEM. This can take many different forms. Most often suppliers are asked to take on inventory functions in order to satisfy just-in-time demands. Customers inventory turns have gone up, but they have been relying on suppliers to shoulder the resulting burden. Many of the suppliers interviewed reported that they had responded to customers' demands for more frequent deliveries by holding more inventory than in the past rather than by introducing quick response manufacturing techniques such as batch-size and machine set-up time reduction or cellular production. Some of these firms had not been offered development assistance from their customers in meeting these new requirements, while others — rightly or wrongly — considered such techniques to be inappropriate for their operations and product mix. One supplier saw this shift to just-in-time logistics as highly beneficial to his business. When asked about his firm's competitive advantage as a distributor in an economy where cutting out the middleman seemed to be the order of the day, the supplier emphasized his willingness to hold materials stock. OEMs, he felt, were able to operate in a just-in-time fashion because the supplier provided this service.

A second example illustrates the subtle ways in which OEMs profit from pushing costs to their suppliers. The customer in this case wanted its suppliers to move towards using recyclable packaging. The supplier already did this. The customer, however, insisted that the supplier use company-specified wood pallets. These pallets, it turned out, could only be purchased from the customer, who made them at its headquarters. To add insult to injury, suppliers had to pay the costs of shipping the pallets back once the parts were delivered.

Another supplier complained that a particular OEM relied on it to do preparation work for experimental product redesigns that would previously have been done in-house. The customer would commit significant resources to this effort only to have the project cancelled before it went into production. The supplier estimated that this occurred with 80 percent of the projects proposed by this customer, leading the firm to avoid any further preparatory investments on the latter's behalf, unlike with other more trustworthy clients.

Abusing Trust

As the previous example indicates, a major obstacle to the development of collaborative supplier relations comes from opportunistic behavior on the part of OEMs. Another supplier, for instance, reported that the same OEM had encouraged his firm to invest in additional production facilities to handle growing orders for a particular process, only to see new managers pull back the most profitable jobs in-house, leaving the supplier with only the “nuisance work”. While the customer was again proposing to outsource work that would require expanded facilities, the supplier bitterly observed that he would insist on a written agreement this time round.

Most damaging, however, to closeness and the information flow that supports joint improvement efforts are abuses of suppliers’ trust by customers to whom they open up their operations. Thus one supplier reported that he does not supply cost information to any of its customers after his dealings with one customer not included in the survey. This customer requested costing information with its latest round of bidding but then decided not to pursue the business. In the process, the customer took information provided about tooling costs to a common vendor of this equipment and demanded a price reduction to match that reported by the supplier. The vendor was of course displeased and complained to the supplier. “If I never have business with [this customer] again, I’ll be fine with that,” commented the supplier.

Another common violation of trust arose from customers’ turning over suppliers’ cost reduction ideas to their competitors. One supplier reported, for example, that they had submitted a detailed proposal for cutting out a step in the production of a particular component at the request of the customer, who then passed on the suggestion to another firm which subsequently outbid them for that part. Another supplier dealing with the same OEM refused to participate in a process mapping exercise because they did not trust the customer not to share proprietary innovations with competitors that might be bidding for the same business.

Organizational Obstacles to Collaboration: Staff Turnover, Communication Barriers, and Corporate-Plant Disjunction

Many of the opportunistic procurement practices reported by suppliers appeared to be less a product of deliberately exploitative strategies on OEMs’ part than of internal organizational obstacles to the development of more collaborative relationships. Since process and performance improvement rely so heavily on open communication and information flow, it is not surprising that suppliers interviewed found their inability to develop stable relationships with their customers frustrating. In addition to cross-functional conflicts such as those between purchasing and engineering discussed above, suppliers consistently complain that the large size, cumbersome organization, and high staff turnover of OEMs hinder the emergence of closer partnerships and more effective communication with their customers.

This can hurt both the customer and the supplier. One supplier explained that a few years previously a customer had informed him that their order levels were going to come down. This was due to the fact that the customer was going to replace the supplier’s product with a higher-quality version based on processes that the latter did not have.

Though the supplier was not happy about the order reduction, he was pleased that the customer had warned him of the impending reduction in time to bring in new business to replace the loss. But the supplier found that this was not true for all local firms servicing this customer. Another supplier informed him that the same customer had started to reduce his orders, but without any prior warning. Realizing what was going on, this supplier went to the customer and informed them that their price was going up by 35 percent immediately. With nowhere else to go for the moment, the customer reluctantly agreed to pay the price increase, which might have been avoided through timely information sharing.

Another supplier reported that the larger the OEM, the worse the communication. He believes this is because they have so many things going on. At Ariens, the supplier knew people personally in all of the relevant departments, including engineering, sales, and even shopfloor operators. During the design phase, engineers from Ariens call to find out what kind of metals they have in stock, and the supplier can even help to facilitate communication with the mill to identify which materials are available, appropriate, and most cost effective for the project. Operators from Ariens also report on how the materials are working, so if they find one kind of parts hard to deal with the supplier can suggest alternatives. But at larger customers, with higher turnover, he complained, "How do you learn who you are supposed to talk to?" The average length of tenure at the supplier firm was in the high teens, which gave them the ability to foster continuing relationships, but that was impossible if the customer did not have similar stability. A second supplier concurred. He observed that "short-termism" led to constant turnover in his contacts at the customers, because they are promoted out of the positions higher up or into new companies. A third supplier characterized communicating with his large customers as a virtual nightmare because of the constant turnover of buyers in the OEM. This was compounded by the fact that they dealt with both corporate and plant-level buyers. They can deal with up to four buyers for each company. These change so often that it is hard to build relationships with them. The new buyers often have very little knowledge about their product and make extraordinary demands. The move to joint engineering and purchasing teams has only complicated the matter by multiplying contacts. This supplier tries to contact each buyer once a month but turnover and sheer number of contacts make this schedule increasingly difficult to fulfill. The supplier saw this as part of a general trend in which face-face contact is disappearing. Between staff turnover and growing use of EDI systems, face-to-face contact was becoming less frequent and this was hurting both sides because the supplier needs continuing relationships in order to negotiate with and effectively service their customers.

Another major supplier complaint was that plant-level purchasing agents often defect on commitments made at the corporate level. Suppliers in many cases have to be certified by corporate purchasing departments but then actually sell parts to plant-level buyers. Since all buyers are judged primarily on the price reductions achieved, they often try to renegotiate the blanket order prices agreed at higher levels. Unless the supplier agrees to cut prices, the plant-level buyer implicitly threatens to transfer work to another firm on the certified supplier list. Thus, for example, the single biggest complaint of one supplier with a large customer was the latter's lack of effective commitment to the stated goals of its supplier management strategy. He thought that commitment was very strong at the corporate level but that that commitment did not translate to the plant level. The

supplier reported that his firm still met with plant-level resistance to open communication and joint problem-solving. He believed that the emphasis on cost reduction had gone by the wayside when dealing with the plant-level purchasing people, who looked strictly at how to get price reductions. The supplier did not see a commonality at all in purchasing philosophy from plant-to-plant. He said in one case they could not even get feedback from a plant on its losing quotes to see why they were outbid despite scoring well in the certification process.

Conclusions: The Limits of Individual Strategies

All of the OEMs surveyed in this study have made serious efforts to develop closer and more collaborative relationships with suppliers, to whom they have increasingly devolved a wider range of responsibilities for production, quality control, just-in-time logistics, and design. Yet the supplier interviews are rife with examples of opportunistic behavior and abuse of trust by OEMs, leading to missed opportunities for effective cooperation in product and process improvement on both sides. There are clear differences in suppliers' perceptions of the OEMs studied, with those large firms which have devoted greatest energy and resources to supplier development, two-way communication, and ensuring a consistent message across their operations generally receiving the best ratings. But even OEMs with formal supplier development programs and company-wide commitments to open, collaborative supplier relations appear to suffer from persistent gaps between their ostensible objectives and actual practice due to internal organizational problems such as cross-functional conflicts, high staff turnover, tangled lines of communication, and disjunction between corporate and plant-level policies. Under these circumstances, as we shall see in the next section, a multi-firm, public-private partnership such as the WMEP's STC may have a vital part to play in overcoming the limitations of OEM's individual supplier management strategies and developing collaborative solutions to common problems.

V. The WMEP Supplier Training Consortium: Promise & Performance

Mission

The Original Equipment Manufacturers making up the Wisconsin Manufacturing Extension Partnership Supplier Training Consortium provide a collaborative mechanism to facilitate the building of a well integrated and results oriented supplier training framework in order to gain competitive advantage for small and medium sized Wisconsin manufacturers. The Consortium provides guidance to WMEP in curriculum selection and development, as well as overall program administration

STC Mission Vision, May 8, 1999

Three important findings emerge from the research reported in this study:

1. OEMs are becoming more dependent on their suppliers.
2. Many companies within the supply base are unable to meet the new and increasing demands of OEMs.
3. Suppliers fail to meet those demands not only because of their own limitations, but also because competitive pressures and inconsistent implementation of OEM procurement strategies constrain their ability to improve performance.

These findings point to three central objectives for the WMEP's Supplier Training Consortium, which are implicit in its mission statement:

1. To bring OEMs together in a collaborative effort to solve common problems whose costs and benefits are shared out fairly among the participants;
2. To deploy that coalition to leverage public funds in order to create a pool of resources aimed at ameliorating the effects of competitive pressures and opportunistic procurement practices on suppliers;
3. To use those funds to create a relevant and effective training program to improve supplier performance.

Even in its early stages the WMEP STC has shown positive results in achieving these objectives. Further progress can be expected as changes in this year's program are geared to promote advancement towards each of these goals. At the same time, however, as this report will argue, there is scope for further revisions in governance arrangements and

program design to enhance the STC's ability to fulfill its broader mission of strengthening the state's supplier base.

Origins, Goals, and Structure

STC began as a joint effort between WMEP and John Deere. A Deere supplier development manager, Paul Ericksen, was then serving as the president of WMEP's board of directors. The nature of his role at Deere led Ericksen to see both the increasing importance of suppliers to Deere's own manufacturing enterprise, and the growing impact of OEM/supplier relations on Wisconsin's economy. Ericksen took this idea to WMEP's executive director, Mike Klonsinski and together they recruited representatives from the five other firms in this study. Trane Corporation, Mercury Marine, Harley-Davidson Motor Company, Case Corporation, and Ariens Corporation joined John Deere as the inaugural partners in summer 1998.

In addition, the Consortium partners drew support from the state technical college system with which WMEP already had a close relationship. Based on the strength of the public and private partners and prior experience with similar experiments in other states, such as Illinois, the state of Wisconsin provided a \$500,000 allocation from its budget to support the project. The funds went to subsidize the classes so that SME participants could get high-quality training at a fraction of the usual cost, about 50 percent per class. WMEP had raised most of the funds and contributed from its own budget to facilitate the implementation of the project, while Deere provided the administrative services as well as delivering a large portion of the training.

STC's mission statement promises that the program will provide:

both basic employee training to improve current work performance and training to increase employee skills to make them a more valuable resource. The curriculum will also provide for continued supplier viability through improved competitiveness. Consortium members will generate a "curriculum of emphasis" based on their consolidated performance expectations. Suppliers will be assisted by the OEM in training selection based on an assessment of needs.

STC Mission Vision, May 8, 1999

Primarily problem-centered and instrumental in its conception and design, the program aims to deliver on five main objectives: to reduce lead and cycle times, improve delivery, improve quality, and reduce costs. But it also aims to achieve developmental goals such as to improve supplier viability, enhance supplier/OEM business relationships, increase supplier understanding of OEM performance expectations, and increase supplier ability to gain additional customers.

The six partners began by determining a long roster of classes. The consortium members selected courses from a list provided by Wisconsin's Technical College System and John Deere's own training department. Deere handled the administration of this process, pulling together the list and distributing it to the partners. Once representatives from each OEM had reviewed the list of proposed courses and identified the firm's

preferences, they came back together to vote on the final list. The courses were selected to reflect OEMs' individual needs. In order to get the most out of a vertically disintegrated manufacturing enterprise, OEMs need their suppliers to have certain capacities to meet delivery and quality benchmarks, as well as continuously to improve on that performance and find ways to drive costs out of their own production operations. The classes selected also reflected the particular supply chain management strategies espoused by each OEM. Deere had the most influence over the curriculum in the first year since the initial list of courses was drawn from its training department's course offerings. The courses Deere ultimately nominated largely supported its cycle-time reduction focus, such as Cycle Time Reduction, Cell Manufacturing Implementation, and Preventative Maintenance for Cycle Time Reduction.

Once the curriculum had been designed, the OEM partners nominated suppliers for participation in the program. The selection process differed from company to company but in all cases the firms had to be considered SMEs by the National Institute of Standards and Technology's (NIST) definition (firms employing less than 500 employees). Most often the nominees were either longstanding key parts suppliers to the OEM or, conversely, firms with which the OEM was interested in developing closer business relations.

After supplier firms had been chosen for participation, the partners selected training providers. In the first year, the Deere training department taught 52 of the 58 courses offered. Wisconsin Technical Colleges taught the remaining six. In the second year, the ratio shifted, with the technical colleges offering 36 of the 58 classes, leaving Deere with the remaining 22. The kick-off event took place on November 1, 1998 at Harley-Davidson's Milwaukee training facility. The take-up rate of classes offered was nearly 50 percent, with 72 of 148 nominated suppliers taking advantage of the courses.

Participants' Perceptions and Assessment

Only one year into the program the participants' perceptions of initial results were understandably mixed. Overall, both OEMs and suppliers expressed enthusiasm for the project. The main positive aspects stressed by the participating suppliers were the affordable cost and high quality of the training, together with the creation of new incentives for management to take a closer look at training and development practice in the company, and to draw on external sources of expertise in improving customer service. Thus one of the suppliers reported that the unexpectedly low cost of training enabled the firm to send twenty employees, instead of the expected eight. Another supplier reported that after being nominated, the management team created a full training plan and curriculum shaped around the STC course offerings. The established curricula were drawn from the needs of each department and went so far as to identify specific workers to receive the training.

Less positive comments related to the range of course offerings. The STC representatives were limited to the final list supplied by Deere. One representative acknowledged that this was a less than optimal situation, though still acceptable. Although his OEM could find a course it needed, the Deere list did not include the full range of offerings the firm would ideally have liked to see. There have also been complaints among SMEs regarding the curriculum. These mostly related to the vagueness of course descriptions (a concern echoed in a focus group convened by WMEP), resulting in some cases in employees being sent to classes at a lower than expected level, and a consequent mismatch with their particular needs.

Some participants also expressed dissatisfaction with the course locations and organization. One participating supplier reported that many courses offered in his area were eventually cancelled. If he wanted to take advantage of the opportunity he would have to send his employees to other cities, pay for travel, and then put them up in a hotel, thereby diminishing the value of the subsidy. A number of participants further complained that one of the under-exploited potential benefits of the training program was networking opportunities with other SMEs. "Half the value of the training is to meet and interact with other people from industry," one participating supplier commented, but all too frequently classes were entirely composed of employees from a single firm.

These critical observations indicate certain weaknesses in the planning and design of training activities within the consortium. The first is insufficient attention to the identification of training needs. As detailed above, this relates to both OEMs and suppliers. The disadvantages of starting with a list of courses and later trying to match the perceived needs of OEMs and individual suppliers are evident: following this approach, the right 'fit' is difficult to achieve. As Wisconsin Area Technical Colleges are scheduled to play a larger role in training provision under the revised consortium governance arrangements (see below), they will bring their own expertise to this process. But as became apparent at last October's WMEP STC kick-off meeting in Milwaukee, identification of training needs is still a serious problem for many SMEs. More work and thought within the STC should be given to developing instruments that might help suppliers and OEMs with this difficult task. At the same time, moreover, the issue of training needs analysis is closely related to communication between suppliers and OEMs, since both have a stake in the quality of training outcomes. Poor identification of needs and mismatches in perceptions of these needs among the different interested parties (OEMs, SMEs, training providers, and trainees) may result in a sense of waste and frustration, thereby undermining the positive drive behind this initiative. Finally, training courses should be designed wherever possible to facilitate cross-firm learning and experience exchange by including employees from multiple suppliers.

Outcomes: Improvements in Supplier Performance

The success of the STC, as perceived by consortium members, can be assessed along two main yardsticks. First, OEMs have to demonstrate their ability to attract suppliers' interest in taking up the program. Despite some initial glitches in the planning and design of training activities reported above, this goal has largely been achieved during the consortium's first year. Second, as a result of the training received, suppliers must produce tangible improvements in performance. Already at the end of the first year, suppliers are reporting some positive results from the program in meeting current performance goals, according to a separate survey conducted by the WMEP (WMEP 1999). One supplier claims to have increased inventory turns from 5.01 to 6.04 just a month after their first training session. The same supplier credited his employees' participation for work-in-process reduction from around \$400,000 to just \$294,000. Cash on-hand has increased by 89 percent. Another supplier reports inventory reduction of 25 to 30 percent. One SME attributes achievement of "world-class" effectiveness in overall equipment utilization to participation in the program. Still another claims a 40 percent gain in productivity due to improved math and technical skills amongst her employees.

In terms of longer-term supplier development, the outcomes can be associated with positive changes in products and services, as well as adjustments to the business environment. Some suppliers report improving business relationships associated with “more up-front engineering.” Another felt better able to openly discuss costs with their own suppliers to “proceed onto joint efforts to control such costs for mutual benefit.” Employee involvement and initiative also appear to have been developing in a number of participating companies. Some suppliers report improvements in the functioning of teams. “Shop floor involvement is on an up-ward swing,” reports an assembly manufacturer, for example. Another supplier reports soliciting the input of employees in relocating machinery on the floor. More intangible qualitative benefits may also accrue as a result of the learning process initiated by the supplier training program. While it is still too early to assess their impact, such learning effects often prove crucial in enhancing companies’ strategic capacities in the long run.

Unlike the longer-standing Deere supplier development program examined in an earlier study (Rickert, 1999), the STC initiative has only been in existence for a short time. Available data on suppliers’ performance remains limited and does not allow us to assess the full potential effects of the STC initiative on participating suppliers and their individual employees. But even this limited data provides some evidence that the STC can help facilitate significant performance improvements in ways that allow suppliers both to meet the specific demands of their customers and develop their overall capabilities.

Changing Administrative and Governance Arrangements

As STC moves into its second year, it is undergoing structural changes in administrative and governance arrangements. John Deere has handed over the management of the consortium to WMEP. This means that all training and administrative support is now handled by WMEP whereas under the initial arrangement Deere provided the administrative services as well as delivering a large portion of the training. These changes represent both a challenge and an opportunity for the STC and its various stakeholders.

Thus, the reduction of Deere’s leadership role is a cause of some concern to both the company and to the participating suppliers, who have been largely satisfied with the Deere-run program. In particular the participating suppliers had come to value the leadership provided by a single OEM and its experienced staff. Nor is Deere entirely comfortable with losing control over a project in which it had made a substantial investment and from which the company received a significant return in the form of external revenue for its in-house training department. While Deere had facilitated this and other state partnerships in order to help leverage public funds to address OEMs’ common problems, the shift in management threatens to diminish their input into the program’s content.

At the same time, however, these changes in administrative and governance arrangements create a number of positive opportunities for the STC. Most importantly, they structurally alter the relationship of the other partner OEMs to the initiative. Though in the past, the representatives to the STC have acted as formal partners, the shift of administrative responsibility from Deere provides assurance that all OEMs will have an equal standing within the consortium as staff and representatives rotate. For instance, this year a representative from Mercury Marine will serve as consortium chair, rather than the

Deere representative who has held that office from its inception. This is an important symbolic move reinforcing a long-term commitment to shared governance since the outgoing chair was also the founder and convener of the consortium.

In addition, each OEM partner will have greater ability to contribute to the training curriculum, thus improving the planning and implementation process. As one OEM representative explains “with opportunity comes obligation”: representatives will have more say about what gets on the course list, but if something they want is not there, they will be responsible for drafting the syllabus and identifying a training provider.

As an independent public agency, WMEP will be able to serve as an “honest broker”, ensuring that the costs and benefits of consortium activities are shared out fairly among the participants and discouraging opportunistic behavior by firms which often compete both for customers and suppliers. This “honest broker” role of public agencies has elsewhere been found to facilitate the success of collaborative partnerships among competitors in related areas of common interest such as joint research and development (Tripsas et al., 1995).

VI. Conclusions & Recommendations

Potential Contributions

A multi-firm, public-private partnership such as the WMEP's Supplier Training Consortium can assist participants in developing collaborative solutions to common problems and strengthening the state's supplier base by performing three interrelated functions:

1. Facilitating Information Flow

The partnership structure of the STC allows the WMEP to aggregate the common needs of OEMs and transmit these to suppliers and training providers. The main vehicle for this is the curriculum development and review process by OEM representatives on the STC. Properly conducted, this should create greater transparency for suppliers about current and potential customers' quality and service needs, thereby assisting them to adjust their operations to meet the latter's expectations. In addition, this process should allow OEMs to speak with a single voice to training providers, enhancing their collective influence and ensuring a better fit between course offerings and firms' training requirements. At the same time, conversely, there is an evident need for systematic feedback from suppliers themselves to the consortium about the adequacy and appropriateness of the training offered in meeting their own perceived requirements.

2. Sharing Out the Costs and Benefits of Widely-Needed Services

Many suppliers, as this study has shown, work for a plurality of competing OEMs. The consortial organization of the STC allows OEMs to contribute technical expertise and support to upgrading their suppliers' capabilities without fear that the benefits will be appropriated by competitors and without incurring the high fixed costs of in-house training operations. Public subsidies reduce the cost of training to hard-pressed SMEs, while OEM nominations provide an additional incentive for supplier participation. WMEP can thus devote less of its time and resources on marketing to potential clients and focus more on the provision of core services (NAPM-NIST White Paper 1999), while also ensuring that training activities reach a minimum efficient scale. By assisting suppliers in meeting their customers' demands more effectively, STC enables SMEs to become more productive and more versatile, leading to increased profitability and sales. Since much of the training is focused on the suppliers' workforce, some of this increased productivity and profitability should translate into improved wages and career opportunities for employees.

3. Promoting Mutual Learning

By facilitating the flow of information among OEMs, suppliers, and training providers, while sharing out the costs and benefits of widely-needed services, the STC is in a strong position to promote mutual learning among the participants above and beyond the specific content of the training courses themselves. Yet this is perhaps the area where the STC so far appears to have accomplished least. Curriculum development remains largely aggregative, with OEMs suggesting additional courses to meet their individual needs rather than seeking to align performance expectations or to harmonize supplier qualification and certification procedures. Similarly, no systematic framework has been created for allowing suppliers to learn from one another nor for incorporating their responses to training courses and OEM procurement practices into the work of the consortium.

Policy Recommendations

The WMEP's STC has already demonstrated an impressive ability to mobilize suppliers' participation in training activities and contribute to tangible improvements in their performance. Recent shifts in administrative and governance arrangements should also go a long way towards enabling the STC to correct the flaws in the planning and design of supplier training activities reported during the initial year of operations. At the same time, however, the findings of this report suggest that further changes in program design and governance may also be necessary if the consortium is to realize its potential contributions to strengthening the state's supplier base. In particular, the STC should seek to enhance its capacities to facilitate information flow and promote mutual learning among participants through the following measures:

1. More systematic efforts to incorporate supplier voice into the training and development process. These could include:

- development of training needs analysis instruments to assist suppliers in selecting appropriate courses;
- recruitment of supplier representatives onto the STC's governing body and curriculum development committee;
- establishment of a regular OEM-supplier forum within the consortium for exchange of information and views among participating firms, along the lines of the individual supplier advisory councils maintained by several OEMs such as Trane and Harley-Davidson.

2. Greater attention to encouraging cross-firm learning and networking among suppliers through steps such as:

- inclusion of employees from multiple suppliers on training courses wherever possible;
- creation of supplier forums and/or working groups for exchange of experiences and joint problem-solving by SMEs themselves.

3. Increased emphasis on alignment of performance expectations and supplier development practices among OEMs through steps such as:

- enhanced efforts to design a common “curriculum of emphasis ”for supplier training rather than multiplying courses to fit individual OEM needs;
- exploration of ways to harmonize supplier qualification and certification procedures.

Such measures, if implemented, should significantly increase the WMEP consortium’s ability to carry out its broader public mission of strengthening the state’s supplier base, while at the same time yielding tangible benefits to participating OEMs in terms of improved information flow and mutual learning. Yet a deeper problem would still remain. For as the findings of this report suggest, while the OEMs surveyed talk the talk of open and collaborative supplier relations, they don’t always walk the walk, largely because of internal organizational barriers such as cross-functional conflicts, high staff turnover, tangled lines of communication, and disjunction between corporate and plant-level policies. As a multi-firm public-private partnership, the WMEP’s STC could help to resolve these characteristic dilemmas of large bureaucratic organizations in a number of possible ways:

- The STC can serve as an external support network for the supplier development function within participating OEMs, a role it has already begun to play.
- The STC could encourage participating OEMs to draw up a common code of good supplier relations practice, based on member firms’ official procurement policies. The compilation of such a code could stimulate the identification and diffusion of good practice among participating OEMs, while also guiding suppliers towards meeting their common performance expectations.
- Implementation of this code of practice within the STC, together with the tangible impact of training provided on supplier performance, could be assessed by independent third-party monitoring. As proposed in the National Association of Purchasing Managers (NAPM) - National Institute of Standards and Technology (NIST) draft Supplier Development Initiative White Paper (NAPM-NIST 1999), evaluation of OEM-supplier relations could be conducted on an anonymous third-party basis by the Center on Wisconsin Strategy (COWS), while assessment of training project impact could be conducted by the University of Wisconsin-Madison’s Center for Quick Response Manufacturing or a similar not-for-profit organization.
- Participating OEMs found to be in breach of the consortium’s code of good supplier relations practice could be asked to submit plans for correcting the problems identified by the external monitors within a reasonable time period. In cases of persistent uncorrected breaches of the code, consortium members and the MEP could then consider a range of possible sanctions, including loss of access to publicly subsidized supplier training.
- The third-party monitoring process could itself be harnessed to mutual learning through benchmarking of supplier training practices and related research on OEM-supplier relations, thereby providing a systematic mechanism for generating improvements to the STC’s curricular offerings and code of good practice.

- A larger supplier development initiative along these lines, as proposed in the NAPM-NIST draft White Paper, could be implemented on a pilot basis by OEMs and MEPs across a number of states, including Illinois as well as Wisconsin, and if successful rapidly extended to a national scale through joint endorsement by NAPM and NIST's MEP network (NAPM-NIST, 1999).

Issues for Further Research

The interviews conducted for this report have shed considerable light on emerging patterns of OEM-supplier relations in Wisconsin, together with the resulting challenges and opportunities facing the WMEP's Supplier Training Consortium. At the same time, however, our study has also identified a number of key areas where further research appears vital:

1. Why are some suppliers successful in implementing advanced manufacturing practices, while others resist their adoption or abandon apparently promising departures following an initial experiment? How far can such variations in supplier behavior and performance be explained by firm characteristics such as size, sector, ownership, or product strategy, and how far by differences in their customers' procurement and supplier management practices? These questions could be tackled through a combination of quantitative and qualitative methods by benchmarking participating suppliers against the national database of small manufacturing firms developed by Daniel Luria at Michigan's Institute for Industrial Technology (Luria, 1996), and by building up systematic comparisons among suppliers serving different OEMs within and beyond the STC.
2. Most of the OEMs studied in this report have developed tiered systems of suppliers as a result of their continuing efforts to streamline the supplier base. How far can similar patterns of supplier relations be identified among second and third-tier firms? What problems and challenges does this tiering system create for OEMs, first-tier suppliers, the WMEP, and the STC? At least one first-tier supplier interviewed, for example, observed that it often had to serve as a facilitator in solving problems between the customer and lower-tier suppliers in order to avoid unnecessary costs and quality defects. It would thus be well worthwhile to extend the interviews conducted for this study to lower-tier suppliers in order to build up a more complete picture of OEM supply chains and their problems.
3. Given the STC's broader public mission, it would also be desirable to study the effects of changing OEM procurement and development practices on suppliers' overall performance and prospects, rather than just their relationship with the customer providing the training. For example, insofar as OEMs encourage suppliers to synchronize production more closely to their own seasonal sales patterns by reducing lead times and creating customer-dedicated cells, how far do these capabilities enable the latter to generate new business to fill the resulting demand troughs? How far do the potentially positive effects of supplier training and development translate in practice into tangible improvements in workforce skills, wages, and career prospects? The answers to these pressing questions would require additional in-depth research on individual suppliers as well as systematic comparisons among firms participating in the STC's programs.

4. Finally, there is evident scope for comparisons and benchmarking of the WMEP's Supplier Training Consortium with other similar organizations elsewhere, both in other US states such as Illinois and in other advanced economies abroad. Thus leading Italian OEMs such as Fiat Auto, Iveco, New Holland, and Zanussi have established a successful training consortium aimed at resolving cost and quality problems among their second-tier suppliers, which the first-tier suppliers could not overcome on their own (Follis, 1999). This initiative might repay closer study, especially in light of the recent merger between Case and New Holland.

References

Follis, Massimo, 1999: "Training Actions to Improve Performances at the Second Tier of the Supply Chain for Automotive Components", unpublished paper, Department of Social Sciences, University of Turin.

Helper, Susan, 1995: "Supplier Relations and Adoption of New Technology: Results of Survey Research in the U.S. Auto Industry," *National Bureau of Economic Research Working Paper #5278*, September.

Helper, Susan, 1998: "Complementarity and Cost Reduction: Evidence from the Auto Supply Industry," *National Bureau of Economic Research Working Paper #6033* (revised), 1998, Cambridge, MA.

Helper, Susan, John Paul MacDuffie, and Charles F. Sabel, 1999: "Pragmatic Collaborations: Advancing Knowledge while Controlling Opportunism", unpublished paper, available on line at <http://www.law.Columbia.edu/sable/papers/boundaries.htm/>.

Luria, Daniel, 1996a: "Why Markets Tolerate Mediocre Manufacturing," *Challenge*, July-August: 11-16.

Luria, Daniel, 1996b: "Toward Lean or Rich? What Performance Benchmarking Tells Us About SME Performance, and Some Implications for Extension Center Services and Mission," paper prepared for the conference, *Manufacturing Modernization: Learning From Evaluation Practices and Results*, Atlanta, September.

Luria, Daniel, 1993: "A High Road Policy for U.S. Manufacturing," in C. Howes and A. Singh, eds., *U.S. Industry, International Competitiveness, and Industrial Policy*, University of Michigan Press.

National Association for Purchasing Managers (NAPM)-National Institute of Standards and Technology (NIST), 1999: "Supplier Development Initiative White Paper", draft, John Deere Inc.

Rickert, Jeffrey, 1999: "Supplier Development at John Deere-Horicon Works", unpublished masters' thesis, Department of Sociology, University of Wisconsin-Madison.

Suri, Rajan, 1998: *Quick Response Manufacturing: A Company-wide Approach to Reducing Lead Times*, Portland: Productivity Press.

Tripsas, Mary, Stephan Schrader, and Maurizio Sobrero, 1995: "Discouraging Opportunistic Behavior in Collaborative R&D: A New Role for Government", *Research Policy* 24: 367-89.

Wisconsin Manufacturing Extension Partnership, 1999: Survey of Participants in the Supplier Training Consortium.