How Wired is the Automotive Supplier Sector?

The Middle View Up and Down the Supply Chain

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Introduction

The automotive industry, one of the largest industries in the world, is dependent upon globally linked supply chains. At the head of these supply chains are Original Equipment Manufacturers (OEMs), who produce the vehicles we drive. Despite their name recognition, however, OEMs actually contribute less than half of the total value added contained in motor vehicle. Most of the value added comes from the supply chain. At the top of the supply chain are “tier 1” companies that sell directly to OEMs. Below this tier are a multitude of large and small companies making everything from complex engineered components to raw material.

In recent years, pressures at OEMs for downsizing, and fewer hours in final vehicle assembly, have led to more complex component manufacture by the first tier. This shift from OEM to first tier has resulted in a need for more coordination between OEMs and their immediate suppliers, and between the tier one group and the rest of the automotive supply chain. More information needs to flow among companies, more companies need to coordinate, and the degree of coordination needs to be tighter. As this demand for coordination has increased, so too has the need for electronic business, (e-business) i.e. the application of computer and networking technology to improve collaboration among companies.

It is obvious from perusal of the trade press and attendance at automotive industry meetings that e-business applications have been developed to meet the growing need for collaboration in the automotive industry. These applications include those for supply chain visibility, demand planning and forecasting, online cataloging, design collaboration, and data integration. We know that applications are being developed, sold, and implemented. What is less known is how these technologies, (and the business processes they enable), are actually distributed and used throughout the automotive supply chain. Altarum’s Center for Automotive Research is engaged in a research program to answer these questions. Last year the first study in this series focused on e-business from the point of view of a small number of first tier suppliers.[1] Data reported on what those companies were doing, and their perceptions and expectations of e-business in their supplier community. This study included a much larger sample, went directly to those lower tier suppliers, and asked them to report on both their customers and their suppliers. It is unique in its approach of surveying mid-tier automotive suppliers about their views on e-commerce as it relates to both their customers and their suppliers. This approach provides a perspective both up and down the supply chain.

[1] http://www.altarum.org/publications/pdfs/e-readiness.pdf

Methodology

This research was conducted using a survey deployed on the World Wide Web. All responses were provided online, with complete anonymity on the part of the respondents.

The survey was designed by CAR, with additional insight provided by Amplitude Research. Topics covered include the prevalence of e-business in the automotive supply chain, the types of activities automotive firms use e-business for, the benefits and cost savings provided by e-business solutions, as well as the hurdles responding firms face in implementing their e-business strategies.

The sample base was comprised primarily of mid-level automotive component supplier firms. Respondents indicated a variety of titles, with a significant portion involved in sales and marketing activities.

The survey was deployed for approximately a three-week period during July 2002. Over 160 complete responses were received. The results were analyzed by the Center for Automotive Research using SPSS software.

Respondent Composition

Respondents were asked to respond either for their entire company or for the division in which they're employed, depending on which entity they felt the most knowledgeable about. Fifty nine percent responded for their company as a whole, while 41 percent responded only for their specific division.

Respondents were polled on the automotive sales of the company or division they were responding for. Fifty point five percent of the companies and 35.5 percent of the divisions polled indicated 2001 automotive sales under $100 million. Although one might initially expect the size of the companies responding to be larger than the divisions, the numbers indicate that the divisions represented belong to larger firms, which accounts for their comparatively higher sales.

Responding firms indicated that a high percentage of their business is tied to the automotive industry. Nearly half indicated that over 90 percent of their firm or division's sales are automotive.

Twelve percent of the respondents report having more than 1,000 suppliers for their automotive business. Over half indicate that they have between 11 and 100 suppliers and about 10 percent report having 10 or fewer automotive suppliers.

Respondents indicate substantial levels of sales to all tiers of the automotive supply chain. Thirty one percent indicate that 81 percent or more of their automotive sales are to OEMs (i.e., they function as Tier 1 suppliers), while 17.6 percent indicate that 81 percent or more of their sales are to Tier 1 firms (i.e., they function as Tier 2 firms), and 9 percent indicate that 81 percent or more of their sales are to firms at Tier 2 and lower (i.e., they function as Tier 3 and lower suppliers).

Findings

<u>State of E-business in Domestic Automotive Supply Chains</u>

A major focus in this project was to characterize the state of e-business in the domestic automotive supply chain. To do so, we asked a series of questions about the prevalence of e-business. We asked about: a) technical capabilities to do e-business and b) e-business processes. For each, we asked: a) the situation vis-à-vis customers and suppliers and b) how the present state of affairs may differ from likely developments in two to three year's time. A parallel set of questions asked about the importance (as opposed to the prevalence) of e-business processes. Table 1 is a schematic overview of the logic employed in these questions. While limitations on respondents' time did not allow parallel questions in all cells represented in Table 1, the table does provide a useful visual overview of what material was covered in this section of the questionnaire.

Table 1

Overview of Question Logic to Determine the State of E-business

	Now	2 – 3 Years
Use of e-business		
Technical capability		
Suppliers		
Customers		
E-business process		
Suppliers		
Customers		
Importance of e-business		
E-business process		
Suppliers		
Customers		

<u>Prevalence of E-business</u>

Before investigating specific aspects of the respondents' use of e-business, we begin with a question of whether information used by their firm is available through an automated system. To obtain insight on this matter we looked at the respondents' own companies, and asked about what business information is available via information technology. These findings appear in Tables 2, 3, and 4.

Table 2 **Information About Suppliers Available Through Computer Access**			
	Percent of Respondents Reporting Access to Information		
	Available, Reliable, Easily Accessible	Available, but NOT Reliable or Accessible	Not Available
Shipping schedules	43%*	28%	29%
Availability of critical parts	34%	20%	46%
* All percentages rounded to closest whole value.			

Table 3 **Information About Your Company Available Through Computer Access**			
	Percent of Respondents Reporting Access to Information		
	Available, Reliable, Easily Accessible	Available, but NOT Reliable or Accessible	Not Available
Finished Goods Inventory	84%*	15%	1%
Raw Goods Inventory	78%	17%	5%
Production Capacity	65%	27%	9%
Work in Process	65%	27%	9%
Engineering Data	61%	27%	11%
* All percentages rounded to closest whole value.			

Table 4 **Information About Your Customer Available Through Computer Access**			
	Percent of Respondents Reporting Access to Information		
	Available, Reliable, Easily Accessible	Available, but NOT Reliable or Accessible	Not Available
Ordering requirements	71%*	24%	5%
Engineering change notices	38%	37%	24%
* All percentages rounded to closest whole value.			

Respondents indicate high levels of availability of information within their own companies. As could be expected, respondents do not report as high a level of information availability for their customers and suppliers. The responding firms report the highest levels of availability of information from the customer and supplier systems of which they would be expected to make the greatest use (i.e., ordering requirements from customers and shipping schedules from suppliers).

The data illustrate the imbalance observed in the application of e-commerce in automotive supply chains; the respondents report significantly higher levels of information availability regarding their customers than their suppliers. They report information availability about their suppliers that, for some categories, is even higher than reported for their own firms.

Moving from access to business processes, one set of questions asked respondents to estimate the percentage of their suppliers that have computer automated various business processes. Their answers, with respect to the present and the likely future in two or three years, appear in Table 5.

Table 5

Percent Reporting 51 Percent or More Of Suppliers Have/Will Automate Business Process

	Now	2 – 3 Years
Production Planning	43%*	62%
Logistics / order tracking	40%	65%
Finished goods inventory	38%	64%
Computer to computer communication	37%	61%
Interoperable CAD file exchange	35%	48%
Computer to human communication – automated at respondent's company	32%	48%
Integration between data sent to suppliers and their internal systems	21%	46%
Catalogue pricing	14%	32%

* All percentages rounded to closest whole value.

Respondents indicate that production planning is the process most automated by their suppliers, with 43 percent reporting that 51 percent or more of their suppliers have automated now and 62 percent expecting them to automate within the next two to three years. Logistics and order tracking, with a 40 percent level of automation currently, is expected achieve the highest levels in the next two to three years, with 65 percent of the respondents expecting 51 percent or more of their suppliers to automate.

Catalogue pricing achieves the lowest scores in both time frames, with 14 percent of respondents indicating 51 percent or more of their suppliers achieving automation now and 32 percent expecting automation in two to three years. Respondents also report low levels of automation for processes, which might be expected to be challenging and costly to automate, including integration between data sent to suppliers and their internal systems.

Another set of questions dealt with customers' automation of business processes. (Data here are available only for the present.) These data appear in Table 6.

Table 6 Percent Reporting 51 Percent or More Of Customers Have Automated Business Process	
Production planning	59%*
Computer to comp. Communication with supplier	58%
Logistics / order tracking	55%
Integration between data sent to suppliers and their systems	50%
Computer to human communication - automated on your end	45%
Inventory	49%
CAD systems	29%
Catalogue/pricing	24%
* All percentages rounded to closest whole value.	

Respondents indicate higher levels of automation by their customers than their suppliers. Production planning is the most automated process, with 59 percent of respondents indicating that 51 percent or more of their customers have automated their production planning process and 43 percent indicating that 51 percent or more of their suppliers have. As was the case with suppliers, respondents indicate the lowest levels of automation by their customers in the field of catalogue / pricing. Twenty four percent of the respondents indicate that 51 percent or more of their customers have automated.

Importance of E-business

Respondent's views on the importance of e-business were elicited by three sets of questions. The first dealt with high-level business processes – demand planning, engineering, and procurement. The second shifted from process to business objectives for revenue (e.g., inventory), and strategy (e.g., agility). The third narrowed the focus still further, and dealt solely with the cost reduction consequences of various e-business activities. These results are summarized in Tables 7, 8, and 9.

Table 7

Impact of E-business on High-level Business Processes*

	Supplier		Customer	
	Now	2 – 3 Years	Now	2 – 3 Years
Demand planning and management	2.3	1.9	1.8	1.6
Engineering / design	2.6	2.2	2.1	1.9
Procurement	2.5	2.0	2.1	1.9

* This is a scaled question. 1 = required for success, 2 = an important contributor to success, 3= a moderate contributor to success, 4 = of no, or minimal value.

Table 8

How Might E-business Affect Specific Business Objectives?*

Increase revenues through better customer service	2.4
Cost reduction via inventory	2.4
Strategic beliefs that the company will be better able to respond to changes in the business environment	2.5
Increase revenues through higher quality	2.5
Strategic beliefs about needing to take a competitive leadership position in the industry	2.6
Increase revenues through collaborative engineering	2.6
Cost reduction via engineering / design	2.5
Strategic beliefs about adapting to industry best practice	2.7
Cost reduction via purchasing expenses	2.7
Cost reduction via material parts prices (e.g., volume discounts)	2.7
Increase revenues through collaborative marketing	3.0

* Scaled question. 1 = required for success, 2 = an important contributor to success, 3= a moderate contributor to success, 4 = of no, or minimal value.

Table 9

Percent Reporting Cost Reduction of 11 Percent or More From E-business*

	Time Frame	
	Now	When Fully Implemented
Engineering / Product Design	42	61
Procurement	56	75
Quality Assurance	54	68

* All percentages rounded to closest whole value.

Respondents indicate that demand planning and management has had the biggest impact on their high level business processes, with a scaled score of 2.3 relative to suppliers and 1.8 relative to customers. It is expected to be of highest importance in two to three years, with a scaled score of 1.9 relative to suppliers and 1.6 relative to customers. The high responses in this field are not surprising, as it is an area in which suppliers can automate without as significant a financial commitment as that required in the areas of engineering / design and procurement. Demand planning and management is also an area where benefits can be seen fairly quickly, in the form of reduced inventory, decreased overtime, and other benefits that can be expected of a more efficient supply chain.

In addition to ratings of e-business impact on individual business objectives (Table 8), we were also able to explore relationships among ratings. For instance, if a respondent believed that e-business is important for reducing inventory cost, is he more or less likely to see e-business has having a salutary affect on other aspects of revenue?[2] It may not be surprising, but it is noteworthy that two broad categories emerged – dollar considerations and strategic beliefs. People who saw revenue implications tended to see them for all revenue related questions, regardless of whether they believed that e-business would help with strategic objectives. (Similarly, high strategic ratings tended to clump together.)[3]

System View or Trading Partner View?

Although writing about e-business often uses the term "supply chain", in most cases the "chain" referred to includes only a company's immediate trading partners, i.e. its direct suppliers and its immediate customers. This has certainly been the case in the findings reported above. To get a more holistic view of the automotive supply chain, we also asked a series of questions about trends in the implementation of e-business with "suppliers once removed". These findings appear in Table 10.

Table 10

Importance of the "Supplier's Supplier"

	Percent Reporting "Yes"	
	Today	In 2 – 3 Years
Do you select any production parts suppliers on basis of their ability to do e-business with *their* suppliers?	12%*	68%
Do your automotive suppliers *care* about your ability to do e-business with your suppliers?	29%	37%
Do your automotive suppliers *select suppliers* based on a candidate's ability to do e-business with its suppliers?	34%	77%

* All percentages rounded to closest whole value.

Respondents indicate that while it is not as important today, they expect the e-business capability of the firms from which their suppliers source their products to become increasingly important. Respondents expect to their suppliers to care about the ability to do e-commerce in two to three years and they also expect to choose suppliers based on the ability to do e-business with their suppliers.

[2]For technical statistical reasons having to do with question categories and scaling, this type of analysis could not be performed on the other "e-business impact" questions.
[3]The technique used was "principle components analysis" with a verimax rotation. Two factors accounted for 64 percent of the variance.

Business Pressures

Decisions about whether, and how, to implement e-business are being made within the context of a long-term effort by companies to reduce the number of their suppliers. This movement showed up clearly and dramatically last year in our first study in this series, and it continues to manifest itself today.

This year's respondents were asked if their automotive customers plan to reduce suppliers in the next 12 – 24 months, *and* whether they themselves plan such reductions. Eighty one percent of respondents believe that their customers will reduce their supply base, while 50 percent plan to do so themselves.

Respondents' planned reductions are not correlated with their tier ranking, but they are related to the number of suppliers a company has. The larger the number of suppliers, the larger the planned reduction in size of supply base.[4] The data do not reveal whether there will be a change in the total number of suppliers, or simply in the shape of the supply chain. However, any company in the automotive industry clearly has reason to fear loosing business, or having to adjust to a new market position, because either its immediate customer has rationalized its supply base, or as a consequence of a change higher up the chain.

These findings are in line with those generated by the study performed in 2001. That study polled Tier 1 suppliers on their supply base and found that 77 percent planned to reduce their supply base, compared to 81 percent today.

Organizational and Technical Barriers to the Implementation of E-business

In a previous section we reported on beliefs about the business case for e-business. In addition to immediate business considerations, however, the course of e-business will be affected by the nature and extent of non-monetary barriers, e.g. the difficulties of implementing change, or the richness of an existing IT infrastructure. A series of questions were designed to assess these barriers. The data appear in Table 11.

[4]Spearman rank-order correlation was used. Spearman's rho correlation coefficient: .480 with 140 degrees of freedom, $p<.01$.

Table 11 Barriers to the Implementation of E-business*		
	2002	2001
Dollar cost	2.3	2.0
Conflicting demands from companies within the automotive industry	2.6	2.5
Lack of leadership	2.7	2.7
Lack of staff with adequate skills	2.8	2.5
Hesitation before the unknown	2.9	2.3
Lack of supporting applications	3.0	2.5
Conflicting demands from companies outside of the automotive industry	3.2	2.9
Lack of supporting hardware	3.2	2.8
Lack of access to outside help (e.g. consultants)	3.4	3.4
* Scaled question. 1=By itself would prevent implementation, 2=Major contributing factor, 3=Minor contributing factor, 4=Trivial, or of no consequence		

As with the impact of e-business on business objectives, here we were able to go beyond the emphasis placed on each individual barrier, and assess whether the barriers "clumped together" i.e. whether people who tended to emphasize one kind of barrier also tended to emphasize another. In fact, three groups appeared: 1) "*cost*", which stood alone, 2) *other resource issues*, e.g. lack of access to expertise or supporting applications, and 3) *industry dynamics,* e.g. conflicting demands from within and without the automotive industry.[5]

The findings pertaining to barriers provide a noteworthy comparison to results from the study completed in 2001. Respondents indicate that most barriers to implementing e-business solutions have decreased over the last year. Even cost, the most substantial barrier indicated in both studies, has experienced a decreased from 2.0 in 2001 to 2.3 in this year's study (using a 4 point scale with 1 being a barrier that by itself would prevent implementation).

The biggest drop has occurred in the category of "hesitation before the unknown," indicating that respondents are less leery of the changes a move into e-commerce bodes for their companies. A similarly large drop is observable in the category of "lack of supporting applications," an indication of the availability of a greater number of software solutions in the industry.

Conflicting demands from firms within the automotive industry are reported to be the second-biggest concern today and have experienced only a slight improvement from the survey conducted last year. The respondents from both studies indicate concern about the lack of a consensus on how e-commerce will be implemented in the automotive industry.

[5]Principle components analysis, varimax rotation, three factors accounting for 58.8 percent of the variance.

Conclusions

The results indicate that respondents acknowledge that their ability, as well as their suppliers' ability, to use e-commerce is of significant importance to their customers. The respondents overwhelmingly indicate an awareness that their customers care about their ability to use e-commerce and, even more importantly, a large percentage indicate that their ability to engage in e-commerce will be a determinant in surviving the consolidation they predict in the industry.

An analysis of the obstacles the respondents perceive in implementing e-business solutions reveals that no one consideration is a showstopper. Cost, as could be expected, is a concern, though it is not indicated to be an insurmountable barrier.

Statistical analysis showed no correlation dependent on firm size or place in the supply chain in many of the areas in which the respondents were surveyed. This is an indication that many of the challenges, as well as the benefits of e-commerce apply equally to a majority of the participants in the automotive supply chain.

The implementation of e-commerce, when viewed in light of its importance to the upper tiers of the automotive supply chain, might be expected to be readily undertaken by the lower tiers. However, this has not been the case.

The lower tiers of the automotive supply chain have lagged their customers in the adoption of e-commerce solutions. These firms have indicated that they don't see as strong a business case for these technologies as their customers. When surveyed on specific benefits of implementing e-business, such as the cost savings expected, the respondents' answers have been positive, though not overwhelmingly so.

Many good reasons to engage in e-business exist. In addition to gaining an edge on competitors in a time of industry consolidation, respondents indicate that they do expect to benefit from implementing e-business. Demand Planning and Management solutions, for example are expected to be of substantial importance currently, and, along with both engineering and procurement applications, are expected to grow in importance over the next two to three years. These reasons, however, are always being weighed against the cost of the solutions they require in an environment of dwindling supplier resources.