

# **The challenge of complexity in global manufacturing**

Critical trends in supply chain management





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# Executive summary



“With this study we explore the critical trends, challenges, and opportunities for supply chain management today and in the future.”

Imagine trying to design, source, manufacture, sell, and deliver a new product rapidly for a new, potentially lucrative market given today's realities: your suppliers are located in North America, Europe, and China; your customers are in the U.S., Europe, and Japan; your factories are in Brazil, Europe, and North America; and your development engineers are in Europe, India, and North America. You have a six-month window before competitors catch up. Cash is tight – the chief financial officer reminds you of the company's shortage of working capital. Missteps in product quality, availability, and customer service can cost you dearly, given that the competition is right behind you. You must deliver your product at your target price and brace yourself for margin erosion when competition sets in.

A frightening scenario? Certainly. Unusual? Unfortunately not. Manufacturers around the world – large and small – are in this predicament today. Customers and competitors are exerting enormous pressures on manufacturers' supply chains. The result is complexity, with a capital C.

For the last two decades, we have conducted extensive research on global manufacturing – including industries such as aerospace and defense, automotive, consumer products, high technology/telecommunications equipment, life sciences, process/chemicals, and general manufacturing. Nearly 4,000 executives from leading manufacturing companies around the world have participated in the research since its inception in the mid-1980s, making it one of the most comprehensive and in-depth studies ever conducted around global manufacturing strategies, operations, and business performance.<sup>1</sup>

With this study we explore the critical trends, challenges, and opportunities for supply chain management today and in the future. This latest research across nearly 400 manufacturers not only paints a picture of deeply fragmenting supply chains but also shows the extent to which the whole world has become a stage of operations for many companies. Customers exert unparalleled pressure on manufacturers to make things cheaper, better, and available everywhere. As our previous research indicates, this means manufacturers' supply chains have become a critical component to gain competitive advantage in a number of industries (think of Dell in personal computers, Porsche in automobiles, and Nokia in telecommunications equipment).<sup>2</sup>

The unyielding push toward complexity – through customer-driven pressures for innovation, new markets and channels, and cost reduction – suggests a number of paradoxes facing manufacturers in the areas of global optimization, customer collaboration, innovation, flexibility, and risk.

The early evidence from our research shows that most companies are optimizing their supply chains on a local basis (say, by function, facility, product, country, or continent) rather than seeking larger efficiencies by taking a global network view; that the focus of supply chain collaboration continues to be on the back end (with suppliers) rather than on the front end (with customers), where many of the biggest rewards await manufacturers; that few supply chains are ready to deliver on rapid-fire new product introductions; that flexibility is getting more difficult as supply chain activities grow more complex; and that the problem of managing risk is growing (both in terms of the product as well as the larger “customer experience”).

# Drivers of supply chain complexity in global manufacturing

Manufacturers' supply chains are growing enormously complex. With shorter product life cycles and ever-rising customer demands, as well as the increasing spread of distribution, manufacturing, sourcing, and engineering operations around the globe, companies large and small are finding it ever more difficult to synchronize all the pieces. Our research points to three critical trends that pull apart manufacturers' supply chains and make them more complex and difficult to manage:

- The unrelenting pressure to continually drive down supply chain costs, from product concept to delivery
- The pursuit of new lucrative markets and channels
- The quickening pace of product innovation

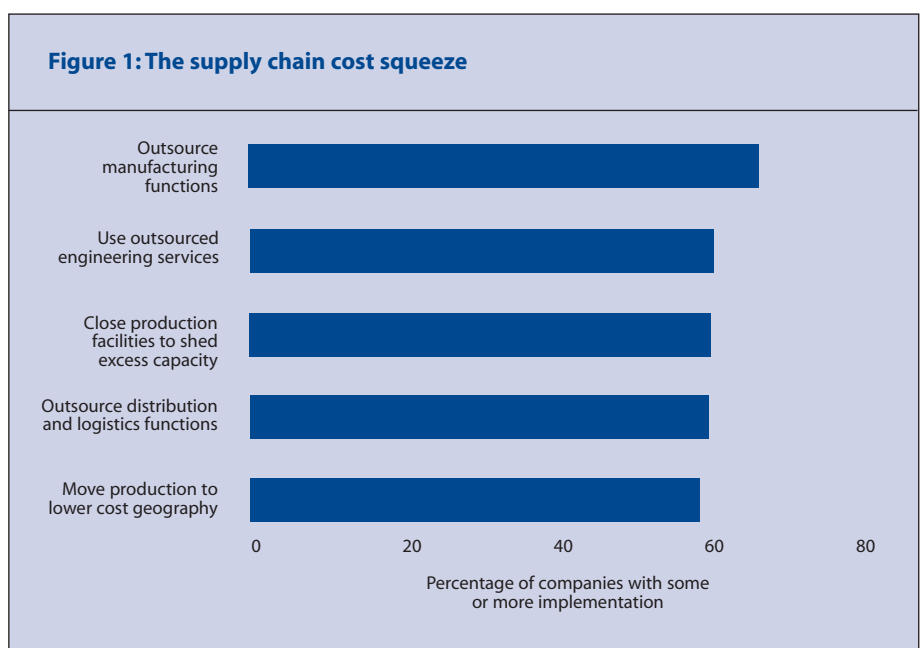
## The cost squeeze

“To reduce costs, many companies are being forced to relocate or outsource pieces of their supply chain.”

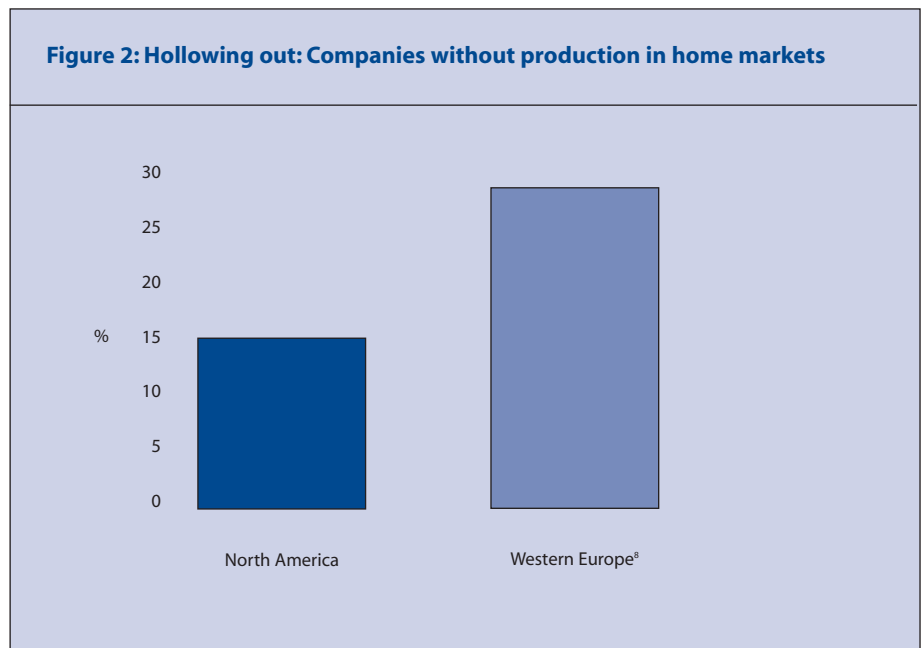
To reduce costs, many companies are being forced to relocate or outsource pieces of their supply chain. One big reason: In a world where mega-retailers like Wal-Mart and Carrefour have amassed enormous buying power, cost pressures for manufacturers in most industries are immense. For example, Finnish telecommunications-equipment maker Nokia has factories in Finland, China, Hungary, Germany, Mexico, the U.S., Brazil, and South Korea, and R&D centers in 14 countries. Archrival Ericsson has stopped manufacturing its cell phones altogether; it now focuses on R&D, marketing, and sales.

In addition, companies trying to minimize taxes and cross-border duties and tariffs, or take advantage of investment, export, R&D and other tax credits, often locate plants, R&D centers or warehouses in locations they wouldn't otherwise choose.

Whatever the reason for the change, the impact is the same: dispersing the pieces of the supply chain adds complexity. The majority of companies in our survey have moved production to lower-cost locations (57%), closed production facilities burdened with excess capacity (59%), and outsourced some manufacturing and distribution activities (67% and 58%, respectively) (Figure 1).



In fact, many manufacturers no longer make things in their home markets. Our study found that 15% of North American firms and 29% of European companies today do not manufacture products in their home markets (Figure 2).<sup>3</sup>



Even the “crown jewels” of a manufacturer – its product engineering capabilities – are increasingly going into the hands of other companies that can do it for less. Some 62% of all manufacturers we have polled to date use outsourced engineering services (Figure 1 and Figure 3).

**Figure 3: Moving the crown jewels**  
 Top destinations for engineering outside home region for North American and Western European manufacturers over the next three year.  
 (Percentage of respondents indicating entry and expansion plans).

| North America (percent)     | Western Europe (percent)  |
|-----------------------------|---------------------------|
| China (22)                  | China (16)                |
| India (12)                  | United States/Canada (16) |
| Eastern Europe (11)         | Eastern Europe (15)       |
| South East Asia (10)        | Central Europe (14)       |
| Mexico/Central America (10) | India (8)                 |
| Western Europe (10)         |                           |

- While it's true that three-quarters of North American producers maintain product engineering operations in North America, 22% plan to establish or expand an engineering base in China over the next three years, and between 10 and 12% in India, Southeast Asia, Eastern and Western Europe.
- Western European companies are less keen on their home market engineering capabilities. Just two-thirds (64%) have engineering operations in their home region. Many plan to place or grow engineering capabilities in China and North America (both 16%), Eastern Europe (15%), Central Europe (14%), and India (14%) over the next three years.

Of course, along with engineering will go many professional jobs; "hollowing out" of the supply chain is no longer a concern just for factory workers.

## The pursuit of markets

"Companies increasingly look at the whole world as their market, especially given the soaring cost of developing and manufacturing products."

Companies increasingly look at the whole world as their market, especially given the soaring cost of developing and manufacturing products. The world's largest companies have long since spread supply chain and other operations far and wide. Many have more assets in foreign countries than they do in their home markets. Nestlé, the epitome of a global corporation, has 87% of its assets residing outside its home country of Switzerland. Two-thirds of ExxonMobil's assets are not in the U.S., and only a third of BMW's assets are in Germany. Nearly half of Sony's assets (44%) are outside of Japan.<sup>4</sup> And our survey shows this is by no means a phenomenon reserved for Fortune Global 500 companies.

The North American and Western European manufacturers that have participated to date in our study – from global giants to regional and national companies – operate in markets worldwide. For example, about half the North American (47%) and Western European (48%) companies sell products in China today. And a similar percentage say they will expand their market presence there over the next three years (48 and 44%, respectively) (Figure 4). Companies from both continents also predict strong market expansions in other markets. More than 40% of North American manufacturers will grow their marketing base in Central and Eastern Europe, Mexico, and Central America by 2006. In Western Europe, 50 to 60% of manufacturers will expand their markets in Central and Eastern Europe.

**Figure 4: Going for growth**

Top 5 market destinations for North American and Western European companies outside home region over the next three years.

(Percentage of respondents indicating entry and expansion plans).

| North America (percent)     | Western Europe (percent) |
|-----------------------------|--------------------------|
| China (48)                  | Eastern Europe (60)      |
| Western Europe (47)         | Central Europe (50)      |
| Eastern Europe (42)         | China (44)               |
| Mexico/Central America (42) | US/Canada (43)           |
| Central Europe (41)         | South America (29)       |

## Product innovation

“No other strategy for driving the top line is more important than developing innovative new products and services.”

North American and Western European companies are certainly not abandoning their home markets. Nearly two-thirds (58%) of North American manufacturers say they will expand their marketing base on their home continent, while nearly half the Western European companies (49%) plan to widen sales in their home market.

But it's their pursuit of foreign markets that is stretching their supply chains. Sometimes trade restrictions force it; in some countries, the price for market access may be local production and sourcing. In essence, pursuing new market territory often requires manufacturers to pull their supply lines behind them.

Making and selling products for worldwide markets, whether it's socks, cereals, or cars, demands adherence to local tastes. That, in turn, requires supply chains that can effectively deliver suitable products on time, in the right quantity and quality, and at the right cost. Now reduce the half-lives of those products – meaning new ones must replace the old ones ever faster in a world of continuing breakthroughs. The impact: supply chains overrun by innovation.

No other strategy for driving the top line is more important than developing innovative new products and services. Out of seven factors for increasing revenue over the next three years, launching new products and services ranked highest, ahead of macroeconomic and external industry factors (Figure 5). This is not a surprise; a prior Deloitte study, in fact, shows the importance of innovation to manufacturers.<sup>5</sup>

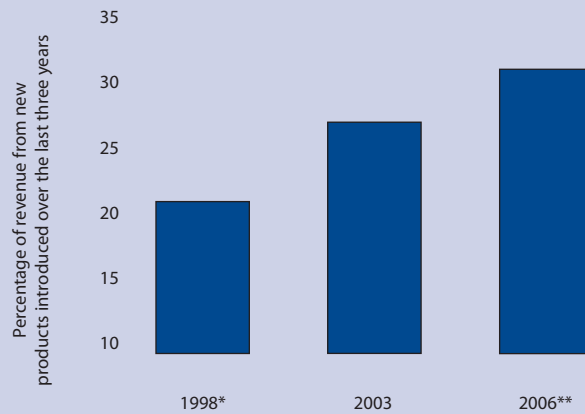
**Figure 5: Top five revenue drivers – next three years**

|                                   | Percentage of respondents indicating moderate to high importance |
|-----------------------------------|--|
| New products and services launch  | 89   |
| Economic turnaround               | 85   |
| Industry market growth rate       | 80   |
| Developing new market channels    | 72   |
| Entering new geographical markets | 66   |

Further illustrating the importance of innovation, manufacturers across industry segments and geographic sectors said they would spend more on R&D by 2006. According to our preliminary data, manufacturers said they would increase R&D spending as a percentage of revenue by more than 40% over the next three years.<sup>6</sup>

Of course, in raising R&D investments, manufacturers expect results. They are forecasting that revenue from new products introduced within the last three years will grow from 27% of total revenue today to 31% in 2006. That continues an upward trend. According to our previous research, manufacturers around the world expected 21 percent of total revenue to come from new products in 1998 (Figure 6). The implications for supply chain complexities are staggering.

**Figure 6: The unrelenting push for innovation: new product revenue expected to exceed 30% in 2006**



Note:

\*Based on Deloitte Research, Global Report – Vision in Manufacturing (New York: Deloitte Research, 1998).

\*\*Expected.

# The paradoxes of complexity

Our research provides evidence that many manufacturers' supply chains are becoming highly complex – with little relief in sight. From further analysis of these trends, five major paradoxes emerge. Each raises substantial issues that manufacturers now must understand and manage:

## The optimization paradox

**Despite the potentially huge economies from designing supply chains from a global view, most manufacturers optimize locally.** Manufacturers are spreading supply chain operations across the world. Yet, most still appear to be optimizing their supply chains on a “local” basis – by product, function (say, production), facility, country, or region. This means they are losing opportunities for large-scale efficiencies. When designing the supply chain from a global view, a manufacturer configures factories, warehouses, engineering activities, transportation routes, marketing, sales, and other operations in a way that maximizes the value of the network as a whole. Plants may serve multiple markets (even the whole world). Distribution routes may carry multiple product lines for regional business units, rather than narrow lines for country unit. And, product development, production, distribution, and marketing capabilities may be shared with other companies – even competitors.



Despite such advantages, our survey indicates that few manufacturers are designing their supply chain networks from a global perspective. Among major performance improvement initiatives, manufacturers ranked supply chain network structure as their lowest priority. Additionally, only about half of the companies have a senior executive in charge of the global, end-to-end supply chain, a key factor in optimizing the total supply chain network. Functional improvement initiatives predominate. In fact, only 4% of companies say they have a strong advantage in their supply chain cost structure. Furthermore, few survey respondents had instituted the process changes and technologies necessary to achieve substantial strategic and operational improvements such as advanced planning and optimization, product lifecycle management, and customer relationship management (CRM), despite saying that keeping a lid on supply chain costs was one of their most difficult challenges. Overall, few companies understand their total supply chain cost, particularly the often hidden cost from the added complexity in global supply chains. This raises a number of issues:

- Why are most companies optimizing their supply chains from a local rather than a global perspective? Why aren't executives focused on cross-functional and cross-enterprise supply chain collaboration? How are they incorporating tax strategies into network optimization?
- What supply chain process improvements and tools should companies invest in to gain competitive advantage? How are companies structuring their supply chains to reduce costs and increase profitability across their total global network?
- What are the barriers to improving supply chain network efficiency, and how are top manufacturers overcoming them? What benefits are companies seeing from network optimization?

## The customer collaboration paradox

**Despite the need to be much more responsive to customers, few manufacturers are collaborating closely with them.** Manufacturers rank customer service as their second-highest supply chain priority, trailing only quality. However, very few companies (from 3 to 8%) extensively collaborate with customers across key areas, from strategic planning and forecasting to inventory management and cost reduction. In nearly all potential areas for collaboration, survey respondents work more extensively with suppliers than with customers. In essence, more manufacturers are looking “backward” (to collaborate with suppliers) rather than forward (to collaborate with customers). In terms of supply chain flexibility, companies say forecast error is their No. 1 obstacle to supply chain flexibility, yet few (5%) collaborate at the highest level with customers on forecasting and demand planning. This customer paradox poses a new set of questions to executives:

- What are the obstacles to customer collaboration? Why aren't more manufacturers investing in this area?
- How do successful manufacturers overcome the obstacles to customer collaboration?
- What is the role of supply chain management (SCM) and customer relationship management (CRM) strategies and technologies to support customer collaboration?
- What are the main benefits for manufacturers? And for customers?

## The innovation paradox

**Product innovation is continuing to accelerate, yet few manufacturers are preparing their supply chains for faster new product introductions.** While manufacturers say product innovation is their top priority for driving revenue growth, it ranks last on the supply chain agenda. Time-to-market is second to last, another sign that many manufacturers' factories and logistics operations aren't prepared for a world of rapid product changes. Given that supply chain activities are increasingly being dispersed, the speed or velocity of getting products to market quickly and effectively is being tested. Furthermore, few manufacturers have adopted modern supply chain techniques and technologies for accelerating product innovation. For example, the majority of manufacturers do not use product lifecycle methodologies (55%) or the software necessary to support it (73%). This raises a number of questions for executives to consider:

- What must manufacturers do to their supply chains to support accelerating product innovation?
- How are advances in product lifecycle management software changing the way companies design, develop, source, manufacture, market, and service new products?
- What are the key barriers to making supply chains ready for accelerating product innovation, and how are leading innovators addressing them?

## The flexibility paradox

**Flexibility is a key priority, but it is being sacrificed in the drive to cut unit costs.** The pursuit of supply chain flexibility – the ability to quickly change sourcing, manufacturing, distribution, and other activities to balance supply and demand – continues to top executive agendas around the world. Yet companies are continuing to move or outsource supply chain functions to distant locations, often giving up speed and flexibility in favour of direct product cost reductions. Companies surveyed to date say their top three barriers to flexibility are errors in demand forecasts, long supplier lead times, and product proliferation. But shorter product cycles, increased customer demands, the pursuit of lower-cost locations, and the race to new markets raise these barriers even higher. It is no surprise manufacturers report that visibility of customer forecast data and inventories at key customer and supplier sites is largely mediocre. This strains production planning, work floor systems, logistics systems, and other supply chain activities. Few companies have developed and synchronized the supply and demand sides of their businesses to reduce the barriers to flexibility and profitability.

This raises several key issues:

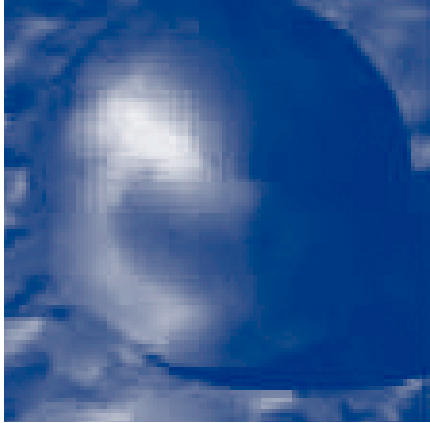
- How are manufacturers keeping their supply chains flexible in the face of poor visibility? Will visibility ever be good enough given fluctuating demand?
- What advanced techniques and technologies lead to more flexibility and visibility in the supply chain? What forecasting errors are unavoidable and how can manufacturers compensate for them?
- How important is supply chain collaboration (i.e., the integration of business processes and information systems across companies) to increasing visibility and flexibility? Where does supply and demand come together inside the company?

## The risk paradox

**Keeping supply chain quality high is critical, yet manufacturers' risk of supply chain failures keeps growing.** The risk of not meeting ever-increasing customer demands – from product and service quality, to new product introductions, delivery, and warranty – remains a major concern for manufacturers around the world. Yet moving and outsourcing supply chain functions can significantly increase the chance of disruptive events. The quandary is understandable. For many companies, relocating supply chain functions to distant locations is no longer an option. It's a prerequisite. But keeping quality high is not optional either. And the focus of quality is no longer just on the product itself (which is manufacturers' No. 1 supply chain priority). The new quality imperative has moved beyond the product itself to pre-sales and after-sales service and delivery as well. This places huge demands on the entire supply chain, and the penalty for failure is severe<sup>7</sup>. The risk paradox raises important issues:

- What new or accentuated risks for product quality and service delivery arise from outsourcing and locating supply chain activities across the world? How are successful manufacturers addressing them?
- How does the acceleration of new product introductions increase these risks?
- Does collaboration with customers and suppliers reduce quality risk?

# Next steps

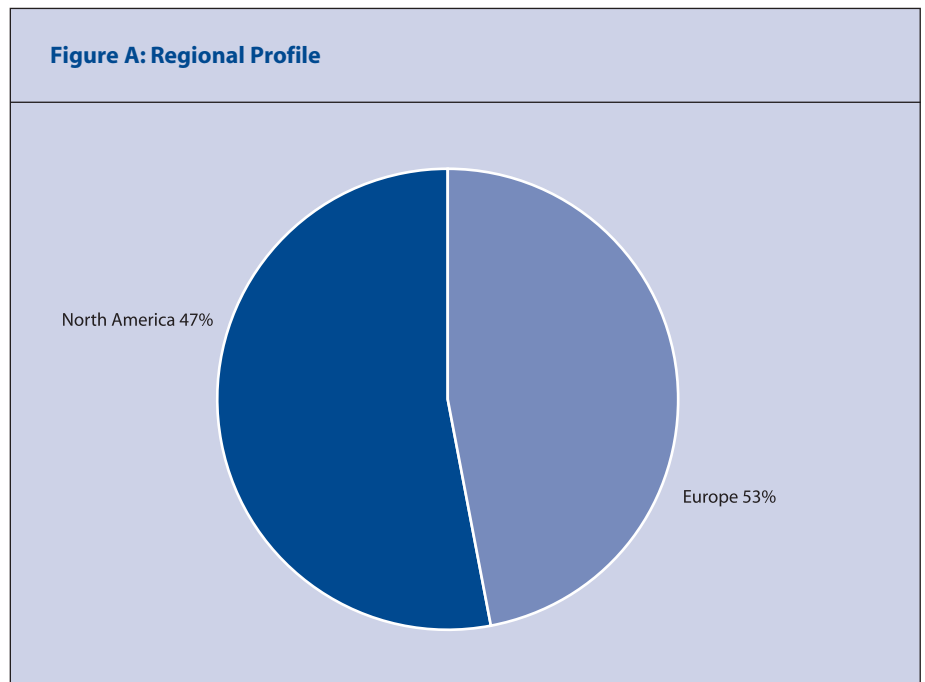


Three inescapable forces in a world of demanding customers – severe cost pressures, attractive new markets, and accelerating new product introductions – have substantially increased the complexity of manufacturers' supply chains. By dispersing engineering, production, sourcing, and other components of their supply chains around the world, manufacturers have dramatically increased the number of places where their supply chains can break down, amass hidden costs, and increase the risk of quality failures. In short, the forces raise a number of paradoxes that manufacturers must resolve to compete in an ever-changing global marketplace.

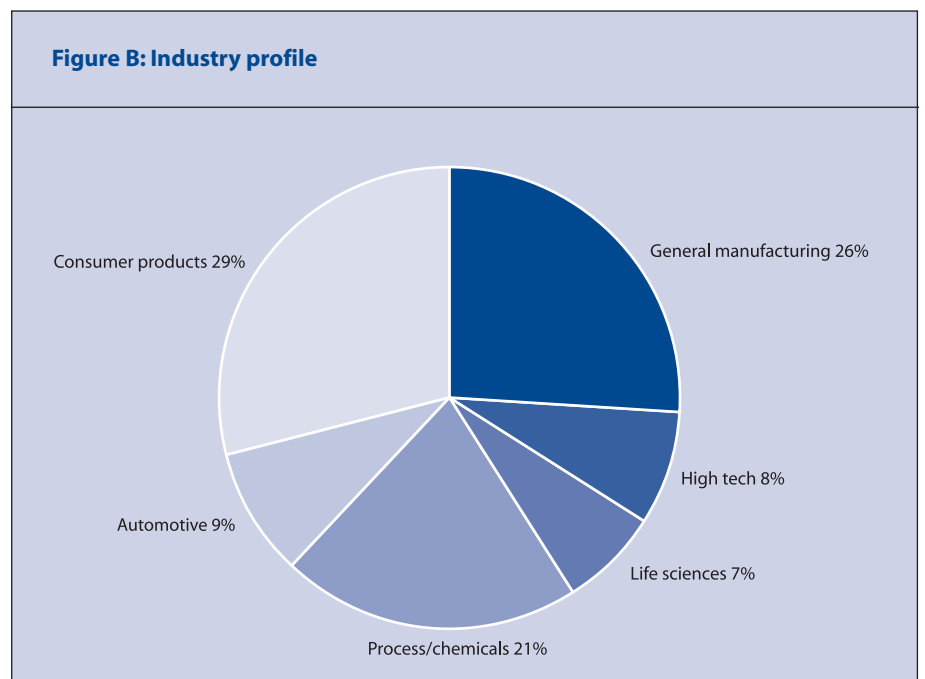
Understanding, leveraging, and profiting from supply chain complexity is fast becoming the new battleground for manufacturers everywhere. Our continuing global research will shed light on how leading manufacturers are meeting the challenges and how they are developing and implementing successful strategies, processes, and technologies for mastering complexity.

# Appendix: Survey methodology and respondent profile

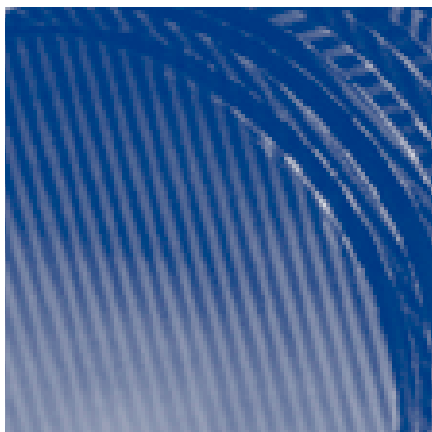
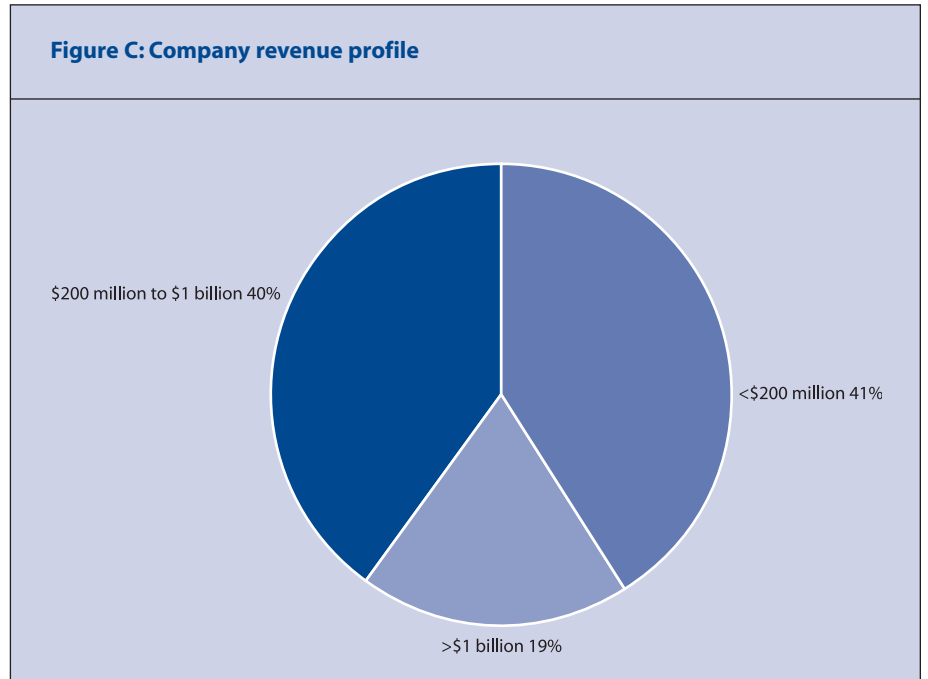
Our research on the emerging complexity of supply chain management is based on a comprehensive, in-depth survey of 392 executives in companies based in North America (47% of total respondents) and Europe (53%) (Figure A).<sup>a</sup>



Industries represented in the study include aerospace and defense, automotive, consumer products, life sciences, process and chemicals, high technology and telecommunications, and general manufacturing (including metal fabrication, industrial machinery and equipment) (Figure B).



Of all reporting companies, 40% have revenues between US\$200 million and US\$1 billion, and nearly 20% in excess of US\$1 billion (Figure C).



## Notes

1. For further details, see, e.g., Deloitte Research, [Global Report – Vision in Manufacturing](#) (New York: Deloitte Research, 1998).
2. See Deloitte Research, [Global Manufacturing 100](#) (New York: Deloitte Research, 2002); Deloitte Research, [Performance Amid Uncertainty in Global Manufacturing: Competing Today and Positioning for Tomorrow](#) (New York: Deloitte Research, 2002). For further information on our research on supply chain management and the impact on business performance in various industry segments, see e.g. Deloitte Research, [Profiting from Continuing Differentiation in the Global Chemicals Industry](#) (New York: Deloitte Research, 2003); Deloitte Research, [Competing on Collaborative Customer Solutions: Differentiation in High Tech Digital Loyalty Networks](#) (New York: Deloitte Research, 2002); Deloitte Research, [Automotive Digital Loyalty Networks: Driving Shareholder value Through Customer Loyalty and Network Efficiency](#) (New York: Deloitte Research, 2001); and Deloitte Research, [Digital Loyalty Networks: e-Differentiated Supply Chain and Customer Management](#) (New York: Deloitte Research, 2000).
3. For example, in the Netherlands, 30% of manufacturing companies surveyed recently plan to move a substantial part of their production capacity toward low-wage countries. See Deloitte & Touche, [Made in Holland II](#) (Amsterdam: Deloitte & Touche 2003).
4. See United Nations Conference on Trade and Development, [World Investment Report 2002: Transnational Corporations and Export Competitiveness](#) (Geneva and New York: United Nations, 2002).
5. See e.g. Deloitte Research, [Creating Unique Customers Experiences: The Next Stage of New Product Development](#) (New York: Deloitte Research, 2001).
6. Calculated as the change in median R&D spending as a percentage of revenues.
7. One study found that when companies announce supply chain problems, their stocks lose an average 8.62% (or an average \$120 million per company) 90 days afterwards. The study was released in 2000 by Vinod Singhal, associate professor of operations management at the Georgia Institute of Technology, and Kevin Hendricks, associate professor of operations management at the University of Western Ontario. The researchers pored through news announcements of supply chain problems at 861 public companies between 1989 and 1998. See <http://gtresearchnews.gatech.edu/newsrelease/CHAINR.html>
8. Europe includes Austria, Belgium, Denmark, France, Germany, Italy, The Netherlands, Norway, United Kingdom, Sweden, Portugal, Spain, (Western Europe), Bulgaria Croatia, Czech Republic, Lithuania, Poland, Serbia, Slovakia, Slovenia (Central and Eastern Europe). North America includes Canada and the United States.

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