

Chapter 2

GLOBALIZATION AND EMERGING MARKETS

The Challenge of Continuous Global Network Optimization

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Abstract: In pursuit of new revenue opportunities and lower-cost operations, manufacturers around the world are creating ever-more complex global networks of sourcing, manufacturing, marketing, sales, and service, and research and development activities. Over the last two years, we have monitored the development of such networks through our global benchmark studies of the global operations of nearly 800 manufacturers based in North America, Western Europe, Central and Eastern Europe, South Africa, and Asia-Pacific. These companies represent a broad range of industries, including consumer business, automotive, high-tech, diversified industrials, pharmaceuticals, and the chemical process sector, and together account for about \$1 trillion in global sales.¹ Our research finds that most companies have made little progress in optimizing their operations from a global perspective. Rather than take a holistic view in the expansion and optimization of their global networks – the complex web of suppliers, production and R&D facilities, distribution centers, sales subsidiaries, channel partners, and customers, and the flows of goods, services, information, and finance that link them – most global manufacturers focus on fixing individual pieces of the network. In spite of launching many improvement initiatives across their global operations, most are overwhelmed by increasing strategic

¹ For further details on this research, see Deloitte Research, *Unlocking the Value of Globalization: Profiting from Continuous Optimization* (New York and London, 2005) upon which study this chapter is based.

and operational complexity. And the complexity will only increase as companies continue their global expansion efforts – as our research indicates they will. The problem is that those who let their global footprint grow without continuously determining how the various pieces of their operations should be re-designed, rationalized and optimized unwittingly build in huge redundant costs while losing opportunities for higher growth and profits.

2.1. The Optimization Paradox

Coordinating product development, supply chain, and sales and marketing activities that are oceans and time zones apart will become even more difficult in the years ahead as companies' operations become more fragmented with continued globalization.

This is just one of the key findings our global research on how companies can effectively optimize global networks. It is based partly on our comprehensive, in-depth global benchmark survey with executives at nearly 800 companies or business units around the world.

Over the next three years, more than 50 percent of North American manufacturers plan to enter or expand sourcing and marketing/sales operations in China. More than 40 percent say they will enter or expand into markets in Central and Eastern Europe. And more than 20 percent will initiate or expand sourcing and manufacturing operations in Mexico (Figure 2.1).

Western European manufacturers are not standing still either. With the eastern expansion of the European Union, more than 50 percent expect to increase their market activities in Central and Eastern Europe over the next three years and nearly 40 percent expect to enter or expand their sourcing and marketing/selling in China.

Such moves cannot but help introduce major inefficiencies into the value chains of global manufacturers. In addition, shrinking product cycles means less time for an increasingly dispersed workforce to collaborate and manage product transitions in each product cycle. This is especially important as companies come to rely more and more on new products to boost revenues and satisfy ever-more demanding customers. On average, companies expect new product share of total revenues to hit 35 percent in 2007, a 66 percent increase from 1998.²

² New products are defined as products introduced over the last three years. See also Deloitte Research, *Mastering Innovation: Exploiting Ideas for Profitable Growth* (New York and London, 2004).

Top 3 Future Growth Destinations		
Percentage of Companies Planning to Enter or Expand Operations over Next Three Years		
	North American Companies	Western European Companies
SOURCING		
China	55%	39.4%
Mexico	23.1%	
Other SE Asia	20.4%	19%
Eastern Europe		36.2%
MANUFACTURING		
China	35.8%	26.9%
Mexico	22.3%	
Western Europe	11.5%	
Central Europe		16.5%
Eastern Europe		27.4%
ENGINEERING		
China	23%	13%
India	13%	
Eastern Europe	10%	14%
Central Europe		13%
MARKETING/SELLING		
China	53.1%	38.7%
Central Europe	40%	51.3%
Eastern Europe	40.4%	60.3%

Source: Deloitte Research

Figure 2.1. Relentless Globalization: Emerging Markets Dominate Top Three Growth Destinations.

Despite the clear advantages that can be derived from optimizing the value chain, most manufacturers lack the capabilities to do so. Less than a third (30 percent) report an advantage in supply chain cost structure. In comparison, 70 percent say they had better product quality than their primary competitors (Figure 2.2). Perhaps not surprisingly, then, over the last three years, companies on average ranked initiatives to upgrade their supply chain network structures at

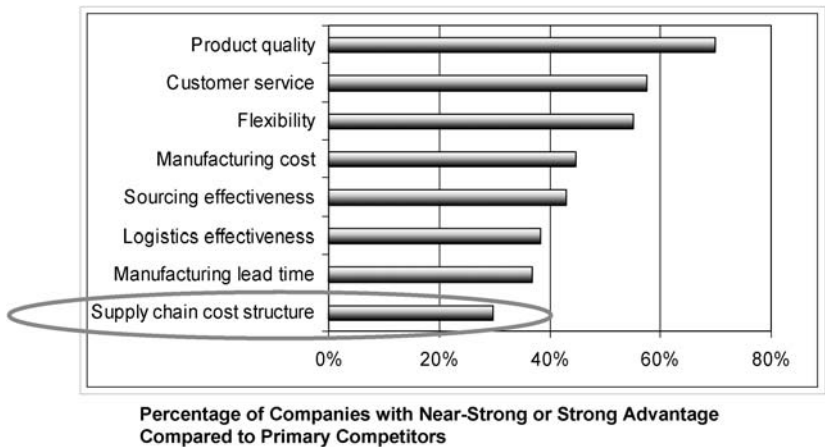


Figure 2.2. Forget Global – Most Optimization Is Local.

Ranking of Performance Improvement Initiatives Undertaken Over Last Three Years

Rank	All Industries	Automotive	Consumer Products	Discrete Manufacturing	High Tech	Life Sciences	Process / Chemicals
1	Operations/ Manufacturing	Operations/ Manufacturing	Operations/ Manufacturing	Operations/ Manufacturing	Operations/ Manufacturing	Operations/ Manufacturing	Operations/ Manufacturing
2	Forecasting/ Planning	Engineering	Forecasting/ Planning	Sourcing/ Procurement	Order Management/ Customer Service	Forecasting/ Planning	Order Management/ Customer Service
3	Order Management/ Customer Service	Forecasting/ Planning	Distribution/ Logistics	Forecasting/ Planning	Sourcing/ Procurement	Order Management/ Customer Service	Forecasting/ Planning
4	Sourcing/Procurement	Order Management/Customer Service	Order Management/Customer Service	Order Management/Customer Service	Forecasting/Planning	Distribution/Logistics	Sales & Marketing
5	Distribution/ Logistics	Sourcing/ Procurement	Sourcing/ Procurement	Sales & Marketing	Engineering	Research & Development	Distribution/ Logistics
6	Sales & Marketing	Distribution/ Logistics	Sales & Marketing	Engineering	Distribution/ Logistics	Sourcing/ Procurement	Sourcing /Procurement
7	Engineering	Research & Development	Supply Chain Network Structure	Distribution/ Logistics	Research & Development	Sales & Marketing	Research & Development
8	Research & Development	Sales & Marketing	Research & Development	Research & Development	Sales & Marketing	Supply Chain Network Structure	Engineering
9	Supply Chain Network Structure	Supply Chain Network Structure	Engineering	Supply Chain Network Structure	Supply Chain Network Structure	Engineering	Supply Chain Network Structure

Figure 2.3. Supply Chain Network Structure Optimization Initiatives at Bottom of List in Nearly All Industries.

the bottom of their list of improvements (Figure 2.3). Less than a third had undertaken “extensive” or “near extensive” initiatives to improve supply chain network structure performance over that period.

Thus, while companies are globalizing just about everything, most optimization still remains “local.” We refer to this as the “global optimization paradox,” and it creates a number of problems in a number of areas.

Attempting to enter new markets with new or existing products is always fraught with challenges; manufacturers that underestimate the strain on the global network and have limited insight into the true cost of products sold in different markets can jeopardize their investments and growth plans. For example, some companies are pursuing opportunities in low-cost countries such as China without realizing that the gains from lower unit costs of products can be eaten up by delays and uncertainty, regulatory and tax issues, and huge logistics costs.

The case of one U.S.-based multinational highlights such pitfalls. After spinning off its manufacturing subsidiaries in Singapore, China, and other Asian countries, the firm set up a “commissionaire” structure to sell to European and U.S. markets. This meant, for example, that the company’s European divisions would be paid in commissions rather than profiting from value-added manufacturing activities as had been the case in the previous network structure. For the purpose of determining duties, however, the cost of goods was calculated on the basis of ownership of the product as it entered the European markets. As simply an agent, the company never owned the goods. Therefore, it had to pay duties on the sales price rather than the manufacturing cost – an increase of 50 percent. After a lengthy customs audit, the company determined that the miscalculation cost millions of euros in current and back duties.

Similarly, the logistics department of a Dutch company thought it could save 5 percent in production costs by outsourcing assembly to China, where individual parts were already being produced. The finished assemblies would then be imported into the Netherlands. However, the company’s tax department was paying the duties on the imported goods. With limited visibility and collaboration between the two departments, it took a year for the company to realize that its total costs had actually *increased* by almost 10 percent. While the company could import parts in this category duty-free, the final assembly came with a hefty 14 percent duty.

2.2. Why Are Companies Falling Behind in Optimizing Their Global Networks?

Given the wide range of problems the optimization paradox often creates, why is it that most companies are not making significant efforts to resolve it?

Today, the pace of change in most industries is significantly higher than it was 10 or 20 years ago. Faster product cycles, new and more diverse sources

of supply, and ever-more-complex global networks increase the need for companies to continually optimize their value chain networks.

Our research shows that the average time for manufacturers to bring a new product to market will be less than 13 months by 2007 – a more than 30 percent reduction from the 18-months it took in 2001. Putting more new products through the “development,” “demand” and “supply” chains will further raise cost and complexity – particularly with the increased number of plants, warehouses, and R&D centers through which those products will likely pass.

Also, as the process of outsourcing major pieces of manufacturers’ value chains continues unabated, companies will find it increasingly difficult to monitor and assess the total network cost and impact of new initiatives.

In addition, if not executed well, mergers and acquisitions can play havoc with existing networks. Financial markets increasingly penalize companies that make acquisitions without harvesting the fruits of consolidation and optimization of global networks. Some of the greatest benefits of acquisitions come from optimizing demand, supply, and product innovation networks and processes. Leaving supply chain, product development, sales and marketing, and other facilities intact after an acquisition ignores the benefits of optimization.

Changes in more complex economic and political matters – in regulations, environmental protection, international trade and investments, currency rate fluctuations, and taxation – compound the problem. This includes recent developments such as increased border controls and security concerns, the continued evolution of World Trade Organization (WTO) rules, the expansion of the European Union, new regulations on environmental safety and health, fluctuating currencies, and the emergence of new global players such as China and India, to name a few.³

In just one example, electronics makers in Europe will likely be forced to spend an estimated US\$100 billion over the next decade to comply with new EU directives on hazardous materials that become operational in 2006.⁴ Companies in a variety of industries that manufacture products with electronics content such as automobiles or lighting equipment will also be affected by these regulations. The impact will in fact be global: Every company importing relevant products into the European Union will have to comply.

To meet these new standards, companies must also prove that they comply at every stage of the value chain, from design and production to service and

³ See also Deloitte Research, *Prospering in the Secure Economy* (New York, 2004).

⁴ Based on cost estimates from a European trade group, ORGALIME, in reference to EU Directives on Waste from Electronics and Electrical Equipment (WEEE) and Restriction of Hazardous Substances (RoHS).

disposal. This means detailed product traceability across the entire global network. Expanding supply chains into new and emerging markets will only make this even harder to achieve. To comply, companies will need change many of their current business practices and spend a lot of money in the process. OR-GALIME, a European trade body, predicts European companies will spend up to €15 billion in up-front costs to redesign their processes. The biggest portion, however, will likely be for retiring products in circulation, a cost estimated to be €40 billion.

Keeping pace with change on a global scale is a challenge for even the best companies. Sony realized this when it had to recall 1.3 million Sony PlayStation 1 game systems and 800,000 accessories because of cadmium levels in peripheral coupling cables that did not meet environmental standards.⁵

The global automotive industry finds itself under similar pressure to address environmental issues throughout the product lifecycle. Consider the End-of-Life Vehicles Directive (ELV) that will be in effect in Europe by January 1, 2006. Cars will have to be 85 percent recyclable, a figure that increases to 95 percent by 2015; this is up from 75 percent today.⁶ In addition, to comply with emissions legislation and new fuel efficiency requirements, it is estimated that Ford and GM will need to spend US\$400 per vehicle. This could reduce margins between 10 percent and 15 percent by 2015.⁷ BMW, for its part, would have to spend more than US\$600 per vehicle, although this will impact BMW less than to other automakers because of the company's higher margins. Other companies would be less affected for other reasons. Honda, for example, is

⁵ By some estimates, the company experienced a US\$110 million loss in revenue due to the incident. See "Sony: Dutch authorities seized PlayStations; cadmium fears," *Dow Jones International News*, December 4, 2001. See also "Sony faces PS One dilemma in Europe," *Consumer Electronics*, December 10, 2001. For more information on Sony's work on corporate social responsibility, see Sony, *CSR 2004*, http://www.sony.net/SonyInfo/Environment/environment/communication/report/2004/qfhh7c000000lv99-att/CSR2004_E.pdf.

⁶ For details, see "Directive 2000/53/EC Of The European Parliament And Of The Council of 18 September 2000 on end-of life vehicles," *Official Journal of the European Communities*, L 269/34, October 21, 2000.

⁷ See Duncan Austin, Niki Rosinski, Amanda Sauer, Colin Le Duc, *Changing Drivers: The impact of climate change on competitiveness and value creation in the automotive industry* (Washington, D.C.: World Resources Institute (WRI) and Sustainable Asset Management (SAM), 2003). Estimates are based on WRI's methodology of assessing the risks and opportunities of carbon constraints due to increased regulation needed to achieve emissions reductions and fuel efficiency demands. The 'value exposure' assessment measures risk due to increased costs from improving fuel efficiency of vehicles already sold.

forecasted to need only an extra US\$24 per vehicle to meet new standards,⁸ partly due to more fuel-efficient vehicles.

The global chemicals industry is also a ripe target for environmental regulations. If enacted as expected, by 2006 a new piece of EU legislation – Registration, Evaluation and Authorization of Chemicals (REACH) – would force producers to track up to 30,000 of an estimated 100,000 chemicals.⁹ Companies would have to register these substances *and* prove they are safe. Moreover, the plan is to extend regulatory requirements to customers downstream in the supply chain, thereby affecting nearly every manufacturing industry.

The impact of this kind of legislation is daunting. While analysts say the United States government is lobbying hard to weaken or stop the new laws,¹⁰ they predict such efforts will only be a stopgap measure. As health issues continue to be uncovered, companies in the leading industrial economies should expect to see more such legislation in the near future.

The challenge of responding to these kinds of new national, regional or global compliance demands is magnified by the fact that few companies are able to take a holistic look at their business and end up responding in a sub-optimal way. Segregated management of functional, business unit, and geographic divisions of most companies means that opportunities for significant improvement in areas such as global supply chain redesign or tax-efficient global intellectual property management are rarely pursued. This “silo” mentality is sometimes furthered by the often short-term considerations of capital markets to which companies respond. Designing and optimizing a network of operations takes time, and while many short-term results can be achieved, most benefits accrue over the life of an investment.

⁸ See Duncan Austin, Niki Rosinski, Amanda Sauer, Colin Le Duc, *Changing Drivers: The impact of climate change on competitiveness and value creation in the automotive industry* (Washington, D.C.: World Resources Institute and Sustainable Asset Management (SAM), 2003).

⁹ Registration, evaluation and authorisation of chemicals (REACH) was outlined in a February 2001 white paper and subsequently adopted by the European Commission. See The Commission of the European Communities, White Paper, “Strategy for a Future Chemicals Policy,” COM(2001) 88 Final, February 27, 2001. For further information, see <http://europa.eu.int/comm/environment/chemicals/reach.htm>. The REACH proposal will replace more than 40 existing directives and regulations with a single, integrated system in which 30,000 chemicals would need to be registered. Under this system, companies that produce and import chemicals will need to assess the risks to the human health and the environment and take steps to manage any risks identified, thereby shifting the burden of proof for ensuring the safety of chemicals on the market from public authorities to industry. See Karen Wontner, “Far-reaching proposals,” *Supply Management*, January 8, 2004.

¹⁰ See Demetri Sevastopulo, “Concern at US efforts on chemicals law,” *The Financial Times*, April 6, 2004.

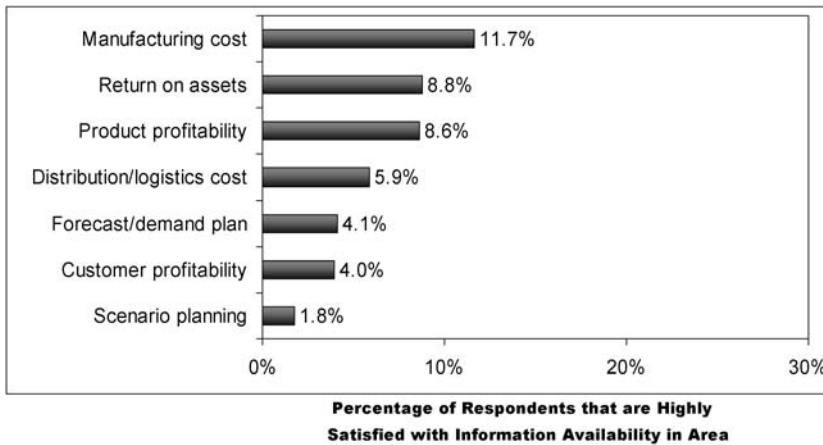


Figure 2.4. “Flying Blind: The Challenge of Visibility in Complex Global Networks.

Rationalizing and managing operations in customer-facing, product innovation, and supply chain areas from a global, holistic view is a major undertaking. The internal resistance to shutting down operations, changing processes and reporting relationships, and serving markets in new ways can be immense. The risk of doing the optimization wrong can also be significant.

That fact is that most companies lack fundamental capabilities necessary for monitoring, designing, and effectively restructuring their networks on an ongoing basis. For example, fewer than 12 percent of the companies in our study say they are “highly satisfied” with their information on critical metrics such as manufacturing cost, customer service levels, and product profitability (Figure 2.4). Without this information, it is no wonder that most manufacturers improve operations on a “local” basis – i.e., creating efficiencies one link at a time as our research indicates they do.

Given the complexities, one might ask: Is it worth it? Should global manufacturers even consider such wrenching change? The answer is that they indeed should, for several reasons. Global expansion is inevitable. Vast new markets await most manufacturers in areas such as China, India, Eastern Europe, and South America. This will pressure companies to move their supply lines and demand-generation activities quickly. With the rapid acceleration in new product introductions and the need to leverage R&D expenditures on a global scale, companies will face mounting pressure to boost the efficiency of their global networks – not just every five or 10 years, but on an ongoing basis. And they must ensure that new initiatives are always implemented in alignment with current and future optimal global network structures. This will help them min-

imize or avoid costly future network changes and gradual loss of competitive position due to poorly structured operations. This does not mean, of course, that companies should consider constantly moving pieces of the global supply chain, or restructuring flows at every little turn of event. The cost of constantly changing locations or the directions of physical or information flows simply would be too high. Rather it means that companies should ensure that the global network structure is optimal today while positioned appropriately for future changes and major new investments.¹¹

So how can large, global manufacturers overcome the barriers and generate the extraordinary benefits from optimizing their networks?

2.3. Profiting from Continuous Network Optimization

Optimizing global networks is not a trivial task.¹² However, it is becoming a key capability of some of the world's leading manufacturers. In our research, we have identified a small group of global manufacturers that has significantly outdistanced the competition through superior capabilities for managing complex global networks. We call these companies "complexity masters" (Figure 2.5). These companies have very complex, global operations—measured as the spread of the four main parts of the value chain (R&D/engineering, sourcing, manufacturing, and marketing/sales) across 13 countries/regions around the world. But they also have better capabilities for managing their global value chains—measured by an index of 10 capabilities. (For more details on the methodology and classification of complexity masters and other companies in the global database, see appendix "Defining Complexity Masters.")

Comprising just 7 percent of all companies in the analysis – and less than 15 percent of the most global companies (quadrant 3 and complexity masters combined) – complexity masters are a select group. With higher asset returns, faster growth, and profit levels up to 73 percent higher than their competition, the complexity masters clearly outperform their competitors. Compared with the peer group of the most globalized and complex companies in quadrant 3, complexity masters are nearly 50 percent more profitable. Indeed, because they have better capabilities for managing their global value chains, complexity masters can design their operations more holistically when determining where

¹¹ See also, Deloitte Research, *Performance Amid Uncertainty in Global Manufacturing: Competing Today While Positioning for Tomorrow* (New York, 2002).

¹² On network optimization, see also an extensive treatment by David Simchi-Levi, Philip Kaminsky, and Edith Simchi-Levi, *Managing the Supply Chain: The Definitive Guide for the Business Professional* (New York: McGraw-Hill, 2003).

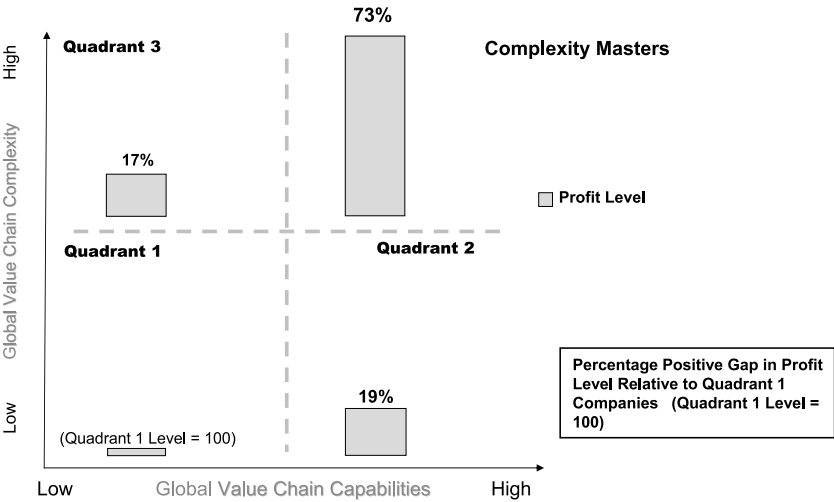


Figure 2.5. Global Value Chain Capabilities Matter to Performance in Complex, Global Networks.

to place and how to manage manufacturing, distribution, R&D, sales, marketing, and other activities. The result is a more optimized business with a better balance of growth goals, cost reductions, and risk.

By analyzing the performance of complexity masters and the leading practices of companies around the world, we are able to take a closer look at how companies can manage investments, capabilities, and practices to optimize their global operations. (See appendix B for more details on the methodology and profile of these companies.)

2.3.1 Taking a Holistic View

The most successful manufacturers take a holistic approach to managing their global networks. While they still have a long way to go, complexity masters are ahead of their competitors in building the capabilities for continuously optimizing global network investments (Figure 2.6). Indeed, industry leaders such as Procter & Gamble, Toyota, and Dell are more deliberate about including a broad set of relevant factors (customer service levels, lead time, flexibility, cost, risk, tax, regulatory issues, and environmental issues, etc.) into major

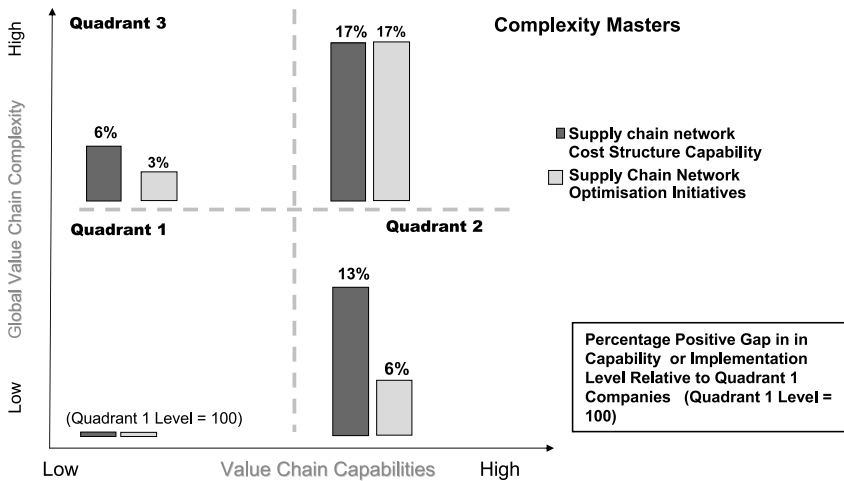


Figure 2.6. Supply Chain Network Structure Matters to Competitive Differentiation.

decisions on sourcing, manufacturing, new product introductions, or entry into new markets.¹³

Crucially, they understand that building these factors into the design of their networks is key to optimization. They know that excluding any of them (such as R&D, tax, and other regulatory issues) can expose the firm to higher costs or additional risks down the road. This is equivalent to the process of designing of new products. If sourcing and supply chain design are not taken into account early in product development, a manufacturer can lose significant (70 percent to 80 percent by some estimates) of its future cost reduction or revenue enhancement opportunities over the lifecycle of its product. The reason: Certain product features and designs can make it harder to reduce cost and incorporate new features and functions quickly and inexpensively later. This principle can be applied to most other investments in the value chain as well.

As companies restructure their networks to introduce new products, bring in new suppliers, or enter new markets, the optimal design of the network is bound to change as well. And as each restructuring moves beyond the design and planning stage, the ability to optimize the entire network efficiently becomes limited. Continuously optimizing the network to ensure that each new initiative is designed and implemented with the overall network structure in mind has become critical to remaining competitive (Figure 2.7).

¹³ See e.g. Gary Rivlin, "Dell bucks the outsourcing trend," *The New York Times*, December 20, 2004;

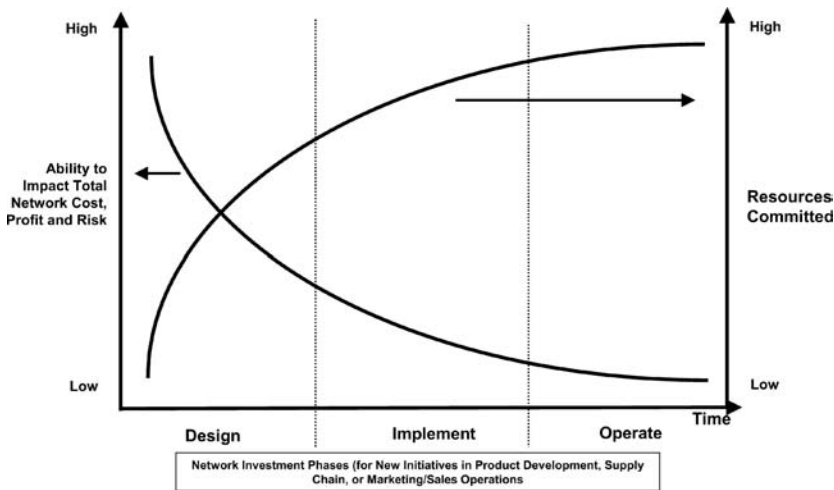


Figure 2.7. The Case for Continuous Network Optimization.

Doing this requires significant “visibility” into all parts of the value chain – a picture that is aided by improved technologies and information processes. Without the organizational, process, and technology infrastructure to support global optimization, most initiatives will fail. It requires not only better management processes for decision-making and execution but it also that top management oversees and supports continuous network optimization. It is not surprising, for example, that complexity masters are up to 50 percent more likely than other groups studied to have one executive in charge of the overall supply chain.

From our research, it is clear that successful companies are making significant investments to ensure continuous optimization of their global business by taking a number of actions (Figure 2.8).

- **What?** They incorporate all relevant competitive (markets, product development, supply chain) and compliance (regulation, taxation, etc.) drivers into optimizing major network investment initiatives and restructuring efforts.
- **When?** They ensure early and constant identification of current and future opportunities to redesign and optimize the global network.
- **How?** They build a network optimization infrastructure to align people, organizational incentives, and processes to make it easier to continuously redesign and restructure the network.

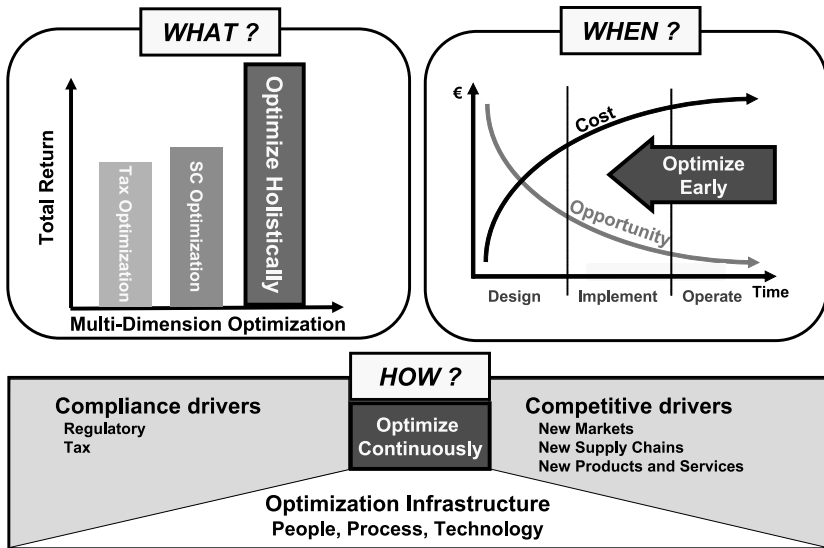


Figure 2.8. The Continuous Optimization Model.

- They establish an integrated, flexible technology infrastructure to gain visibility and dynamically support changes in the network structure.
- They enforce ongoing communication about global optimization goals and opportunities across the organization to boost awareness and influence local or functional initiatives on new market entry, low-cost sourcing, or product development. They realize that each initiative represents a low-cost opportunity to optimize the global network.

At one of the world's largest industrial product manufacturing companies, a global network optimization initiative boosted performance dramatically. Pressured by competition in an oversupplied market, the company benchmarked its value chain against those of other companies around the globe. The findings showed that the company lagged behind in a number of key areas. The manufacturer then traced the roots of its deficiencies and discovered that one downside factor was its decentralized operations. Because of misaligned incentive structures, from country to country, executives rarely worked together to reduce costs or improve operations. Each plant operated largely independently and focused on reducing its own costs. There was little standardization from business unit to business unit in business processes, procedures, performance metrics, and software applications. Production allocations to plants were also

suboptimal. For example, the company was manufacturing high-margin products in locations with the highest tax rates.

Even after building a leading-edge plant in one of its largest markets with the aim of reducing costs, the company could not deliver the expected savings because it had inadvertently increased lead times to markets in other countries. With high variability in demand, the company quickly realized that increased inventory costs consumed the unit cost savings it had achieved in manufacturing. So it was back to the drawing board. After assessing key value chain functions, the company launched a global initiative to restructure and continuously optimize its business. It included the following actions:

- Streamlining organizational, decision-making, and incentive structures to align managers' objectives and metrics with company goals.
- Realigning and standardizing supply chain processes and systems on an enterprisewide basis.
- Consolidating and reorganizing factories – including shift of production from higher-cost/higher-tax-rate plants to larger, more strategically located facilities with lower-costs and tax rates – and the adoption of lean manufacturing processes to increase productivity and reduce inventory costs.
- Creating a global sourcing center to pool purchases by business units, gain volume discounts, and improve efficiency; upgrading interfaces and information technology infrastructures with trading partners; and identifying and implementing outsourcing opportunities.
- Adopting results of global optimization analysis, including establishment of a global freight management center.
- Improving customer management to enable the sales force to focus on marketing a more profitable mix of products to customers around the world.
- Creating global shared services capabilities for finance and accounting, order management, HR, and other headquarters activities.

The result of the efforts so far has been a stunning 75 percent increase in profits. How so? Optimization is enabling the company to deliver the same product volume at a significantly lower overall cost base, while ensuring the sale of a more profitable product mix.

Despite some success stories, most companies have a long way to go. In the following section we discuss the key design elements of optimization, the challenges and opportunities, and how a number of companies are optimizing their networks.

2.3.2 Designing the Global Network

Companies have struggled for decades to optimally design and restructure their value chain networks.¹⁴ Yet, the need for network redesign and restructuring has increased for two primary reasons.

1. **Competitive Drivers.** Not only are the networks themselves more complex than ever, they are also changing at an unprecedented rate.¹⁵ The reasons are many. Product and technology cycles are becoming shorter, time to market is shrinking, new locations for low-cost sourcing are emerging, and customer demand grows more fickle by the day. This forces companies to constantly rethink the optimal location and configuration of their facilities.
2. **Compliance Drivers.** Factors such as the increasing complexity and changes in national regulations, taxation, and international trade and investment regimes (e.g., new WTO rules and admission of new WTO members such as China) can wreak havoc with existing network designs.

Indeed, manufacturers are not standing still. Most have major initiatives planned or already under way to change sources of supply, overhaul manufacturing operations, and enter new markets over the next three years. In such an environment, it is highly unlikely that a network designed five or 10 years ago is optimal today. Yet, as we have shown, few companies are taking advantage of the opportunity to optimize their global operations fully.

Leading companies, however, are pushing forward with a more comprehensive view of optimization, including both competitive and compliance drivers. Consider the efforts drug giant GlaxoSmithKline has made to restructure a global production and distribution network that was hampered by the proliferation of product variations and production complexity. The company moved from a country-based manufacturing approach to a global approach with fewer plants that are dedicated globally to specific parts of a drug's lifecycle, such as the ramp-up phase. In total, the annual savings resulting from the restructured global network is about US\$500 million a year – approximately the bottom-line impact of a blockbuster drug.¹⁶

¹⁴ See Virginia Postrel, "Operation everything: it stocks your grocery store, schedules your favorite team's games, and helps plan your vacation. A primer on the most influential academic discipline you've never heard of," *The Boston Globe*, June 27, 2004.

¹⁵ For evidence, see e.g. Deloitte Research, *Mastering Complexity in Global Manufacturing: Powering Profits and Growth through Value Chain Synchronization* (New York and London, 2003); and Deloitte Research, *The Challenge of Complexity in Global Manufacturing: Critical Trends in Supply Chain Management* (New York and London, 2003).

¹⁶ See Deloitte Research, *Mastering Complexity in Global Manufacturing: Powering Profits and Growth through Value Chain Synchronization* (New York and London, 2003).

2.3.3 The Role of Competitive Drivers

For simplicity, we discuss “competitive drivers” as they affect the three broad business areas that make up a manufacturer’s value chain:

- Demand chain (marketing, sales, and service)
- Supply chain (sourcing, manufacturing, and logistics)
- Innovation and product lifecycle management (R&D, design, engineering, development, and launch).

Demand Chain: Optimizing Marketing, Sales, and Service from a Global Perspective. Companies are constantly on the hunt for new growth opportunities – launching new products to expand existing markets or entering new markets with existing or new products. These efforts, however, put significant strains on the organization’s global network. For example, bringing supply chains into a new market not only increases complexity and costs, it also can create challenges for marketing and sales strategies in other markets. While the initiative may have been local, the repercussions on the network are global.

While new, potentially large markets can appear to be irresistible, the increased complexity creates significant challenges for even the best companies.¹⁷ Preparing for the long haul is almost always a necessity when entering new markets such as China and India. For example, with more than a dozen major regions and over 2,000 languages and dialects, India is not the unified market one might think. Similarly, China, the new epicenter of the globalizing economy, consists of more than 60 distinct regions with varying regulatory, legal, infrastructural, cultural, and language differences.

As global mobile-phone makers Nokia, Motorola, and Samsung have learned, in order to drive growth and market share in emerging markets, distribution must be extended to ever smaller markets. For example, in China, Nokia is developing relationships with specialty retailers, consumer electronics chains, and small, regional or city-level distributors rather than working simply with a limited set of national distributors. Colin Giles, Nokia’s senior vice president for customer and market operations in the region, says: “China is so big and diverse that it’s not possible to classify it as a single market. That

¹⁷ Before the end of the second quarter of 2004, automakers will have recalled more than 14 million units in North America, exceeding the total of 2003 by 2.5 million, with warranty expenses exceeding manufacturers’ annual profits. Source: AMR Research and National Highway Traffic Safety Administration (NHTSA). See Kevin Mixer, Joe Souza, and Fenella Scott, “Early warning solutions: A transformation roadmap,” AMR Research, June 21, 2004). Narishiko Shirouzu and Sebastian Moffet, “As Toyota closes in on GM, quality concerns also grow,” *Wall Street Journal*, August 4, 2004.

is what we did three years ago. Today, we look at every market as different and we look for the best distribution or business model to suit that market.”¹⁸

To capture these markets profitably, companies will find that planning, persistence, and flexibility are key. From our research, however, it is clear that few companies effectively build and leverage their global network when entering new markets. Not surprisingly, for most the major challenge to supply chain flexibility is forecast error, followed by long lead times, product proliferation, and supply chain visibility. These are all fundamental issues in building a profitable, sustainable business; without strong capabilities in these areas, global companies can rapidly lose the edge to smaller, national or regional competitors.

Carlsberg, one of the world’s largest beer producers, acquired Poland’s Okocim to gain access to a valuable brand and expand into new markets in Central and Eastern Europe. To guarantee the future viability of the expansion, Carlsberg quickly realized that it had to restructure Okocim’s operations. Through an extensive assessment of production, packaging, distribution, and sales and marketing operations, the new network design includes a reduction in production sites from four to three, packaging sites from 12 to seven, and warehouses from 12 to six. Overall, the network optimization is expected to reduce total supply chain costs 15 percent while positioning the company for sales growth.

Supply Chain: The Global Pursuit of Lower Manufacturing and Supply Costs. Sourcing from low-cost countries is the obsession of the day at multinationals around the world. Pushed by maturing markets and price competition from competitors sourcing in those low-cost locations, companies in all industries are aggressively assessing new locations for sourcing components and manufacturing goods.

Our research suggests that China is at the top of everyone’s list for sourcing. Over the next three years, 55 percent of North American manufacturers and 39 percent of Western European manufacturers plan to enter or expand their sourcing in China. While the promises are great, the obstacles for leveraging the opportunities are vast. Consider the supply chain challenges alone. By some estimates, in China, 30 to 45 percent of the cost of goods sold is logistics cost – double the level in Europe and the United States – and there are few national third-party logistics providers. Road, air, and rail transportation systems have trouble keeping up with the requirements for a 21st-century supply

¹⁸ See Phil Tinari, “Hung up: Multinational cell phone makers figured they knew best how to sell their products. Then they got to China,” *Wall Street Journal*, September 27, 2004.

chain.¹⁹ In addition, quality risks are plentiful. One company that redirected the sourcing of critical pumps to a Chinese supplier experienced a 70 percent defect rate – seven out of 10 pumps failed – with a severe impact on ongoing operations.

Nevertheless, the opportunities for low-cost sourcing and selling to vast and fast-growing markets are too great to ignore. Companies in just about all industries need to find a way to incorporate emerging economies like China and India into their global networks.

Indeed, the importance of taking a holistic view of new sourcing and supply chain opportunities cannot be overstated – as Ingersoll-Rand has found. The global, diversified manufacturer identified US\$200 million in potential savings if it increased purchasing from low-cost countries to 30 percent of its total sourcing expenditures. The company initially assumed that transportation, duties, and taxes would add about 13 percent to the cost of imported materials. But a detailed assessment showed average ranges of 13 to 24 percent. Tony Bozzuto, Ingersoll-Rand's director of global logistics, pointed out: "We found cases where it was 200 percent" if antidumping penalties or other special fees were included in the calculation.²⁰

Innovation and Product Lifecycle Management. Despite having product innovation at the top of their growth agendas, few manufacturers are organizing R&D and product lifecycle management operations from a global perspective.²¹

For example, many companies fail to take advantage of regulatory and tax issues when deciding where to locate R&D facilities, or to consider intellectual property rights in making such decisions. The result: suboptimal investments and possible leakage of critical product or process technologies, a major concern, especially in developing markets. In India, it is estimated that counterfeit products make up 20 to 30 percent of the automotive parts market.²² One automotive manufacturer calculates that 50 to 60 percent of counterfeit products with its trademark are made in China.²³ An inspection of a Chinese auto parts

¹⁹ See also Deloitte Research, *The World's Factory: China Enters the 21st Century* (New York: Deloitte, 2003).

²⁰ See Merrill Douglas, "The total cost of global sourcing: Ingersoll-Rand scopes out the full cost of sourcing from different overseas suppliers," *LIT Toolkit*, February 2003.

²¹ For more evidence of this "innovation paradox," see Deloitte Research, *Mastering Innovation: Exploiting Ideas for Profitable Growth* (New York, 2004).

²² See "Spurious automobile parts industry turning 'organised'," *India Business Insight*, December 5, 2003.

²³ See Tim Trainer, "Counterfeiting and theft of tangible intellectual property: challenges and solutions," International Anti Counterfeiting Coalition Inc., Washington DC, March 2004.

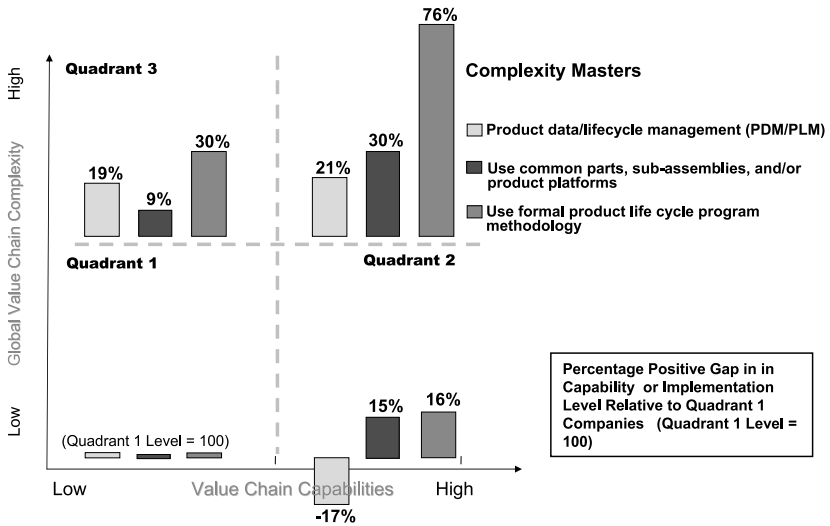


Figure 2.9. Managing the Product Lifecycle: Processes Key in Complex Global Networks.

factory found 7,000 sets of counterfeit brake pads destined for exports.²⁴ Not only does counterfeiting result in revenue loss, it can also jeopardize product and consumer safety and the integrity of the brand. Nokia reported there was a possibility that counterfeit batteries used with its mobile phones could explode.²⁵

Some companies are better than others at guarding and exploiting their product innovation and process techniques. They build closer links between R&D, supply chain, and marketing and sales to improve the global design of their networks and maximize profitability over the lifecycle of products and services. Key action points include:

- Building supply chain considerations into product development processes early to make it easy and less expensive to upgrade products. Not surprisingly, complexity masters are much further ahead in using product data and lifecycle management technologies and processes to design more flexible product structures (Figure 2.9).²⁶

²⁴ See Joann Muller, "Stolen cars," *Forbes*, February 16, 2004.

²⁵ See "Bogus batteries pose safety threat," *The Vancouver Sun*, December 12, 2003.

²⁶ For more details, see Deloitte Research, *Mastering Innovation: Exploiting Ideas for Profitable Growth* (New York and London, 2004).

- Incorporating intellectual property matters into supply chain design initiatives early on to protect patents and manage regulatory and tax issues. After experiencing copyright infringements by competitors from China, Invacare, a U.S.-based medical product manufacturer and distributor with US\$1.5 billion dollar in sales, is now including the extensive involvement of lawyers in the product design process to ensure protection of intellectual assets.²⁷
- Maximizing the value of R&D and intellectual property through better buying, selling, and licensing of technology. With nearly 76 percent of its value in intellectual property and intangible assets, by one estimate, 3M is one of the most innovative companies in the United States.²⁸ As one example of leveraging innovation, the company has built a technology transfer website to license and find new applications for more than 20,000 of its patented technologies.²⁹

2.3.4 Factoring Compliance Drivers into the Network Design

Compliance drivers are external factors such as regulatory and taxation issues, which a manufacturer must consider before designing or restructuring a global value chain. Unfortunately, most organizations treat these matters as an afterthought. Typically, this happens when manufacturers perceive such drivers to be static and assumes that they will affect all competitors in similar ways, thereby leveling the playing field.

But this perception is far from the truth. While it might be easier to design a network by ignoring complex current regulatory and tax regimes, and potential future changes, these factors have profound impacts on the efficiency and effectiveness of the global value chain.

Regulatory Issues in Global Optimization. For any global company, complying with regulatory issues is no small burden; such compliance requires dealing with local, national, and international regulatory matters on an ongoing basis. Ensuring that the global network is managed and optimized appropriately from a regulatory perspective renders the task even more challenging.

The list of regulatory issues impacting the design of a global supply network is long. It includes product traceability, end-of-life recycling and disposal, labeling, product liability, food safety, subsidies, labor laws, and corporate governance and financial reporting issues such as those surrounding the

²⁷ See also Eric Sherman, "Taking intellectual property seriously: there's more at stake in protecting and selling your IP than you may think," *Chief Executive*, Vol. 203, November 2004.

²⁸ See Gordon V. Smith, and Russell L. Parr, *Valuation of Intellectual Property and Intangible Assets*, 3rd Edition (New York: John Wiley & Sons, 2000).

²⁹ Source: 3M Annual Report 2003.

Sarbanes-Oxley regulations. Consumer perceptions of regulatory issues also count. Creating the wrong image in the eyes of the consumer can be extremely costly, as many consumer product makers have found over the years.

Failing to account for new regional and national regulatory issues in the network design can greatly worsen business performance. For example, consumer product manufacturers have recently run up against barriers to entering or expanding into new product markets in Europe due to specific national product regulations. The European Union is also stepping up enforcement of its antidumping rules and has increased by more than fivefold its staff dedicated to pursuing antidumping cases. Multinational companies are thus finding it increasingly risky to source from low-cost countries that violate the rules.

Furthermore, local content requirements that reduce taxation and import duties can force companies to rearrange their supply lines. In established markets of Western Europe and North America and emerging markets like China, Russia, and India, governments continue to put demands on multinationals that want to enter their markets. As Harley-Davidson's Chairman, Jeffrey Bleustein, said recently: "We cannot sell a motorcycle in China unless we are willing to manufacture it there and, frankly, I don't think Harley-Davidson with its Americana image and the kinds of quality and features we put into the motorcycle would have the same cache even in China if it were built in China."³⁰

Calculating local content requirements, however, is no easy matter. And designing a network that balances these requirements with possible future changes can challenge even the best analysts. As products and industries evolve, product classifications can change as well, with significant impact on business design. Take the example of LCD and plasma monitors for computers. In the past, European Union customs authorities assigned them a zero percent duty rate. But given the fact that such screens are now used increasingly in high-definition-television sets, customs authorities recently decided that such monitors with video connectors should be classified as TVs, which are levied 14 percent import duties.³¹

Leading companies are more proactive when factoring in regulatory issues in the design of their global networks. They not only consider regulatory constraints as a cost of doing business, they leverage them for competitive ad-

³⁰ See "Let's have a level playing field: Not even Harley-Davidson can penetrate China's market," *Manufacturing and Technology News*, April 2, 2004.

³¹ For a discussion, see "EU customs distinction between plasma monitors and televisions under discussion," *TDC Trade*, March 19, 2004. <http://www.tdctrade.com/alert/eu0405.htm>. See also Jennifer L. Schenker, "EU may redefine the computer screen," *International Herald Tribune*, May 20, 2004.

vantage.³² For example, Toyota, one of the market leaders with its hybrid gas-electric engine technology, may boost earnings before interest and taxes (EBIT) 10 percent by 2015, according to some estimates, due to current and future regulatory demands for low-pollution vehicles.³³ In vehicle-part recycling, Toyota and Denso, one of the world's largest automotive suppliers, are collaborating with DuPont on a new process – Composite Recycle Technology – to produce parts from 100 percent recycled material. The goal is a recycling rate of 95 percent by 2015.³⁴

Managing Taxation from a Global Optimization Perspective. Business taxation can be a touchy subject. Minimize taxes and risk the ire of governments and public opinion; ignore it and wait for competitors with lower tax bases to exploit it to their advantage.

Simply *complying* with tax regulations around the world – be it direct corporate taxes or indirect taxes (including sales tax, value added tax, customs duties, and environmental taxes) – is a big challenge. Not surprisingly, as customs authorities around the globe move away from paper-based systems toward electronic processing, technology is playing an increasing role in managing compliance. With authorities imposing stiffer penalties for noncompliance, companies will need to integrate customs software into their enterprise resource planning (ERP) systems and key supply chain modules such as warehouse and transportation management. Being at the forefront of responding to demands like these, complexity masters are ahead of the game in adopting global technology platforms such as advanced planning and scheduling, and transportation management systems (see Figure 2.11 further below).

Corporate tax treatment and rates can vary significantly from country to country. For multinationals it matters where profits are accrued. It is thus critical for managers to understand the differences – in compliance and reporting,

³² See also “HP, Dell, IBM and Leading Suppliers Release Electronics Industry Code of Conduct; Global Supply Chain Standards Promote Socially Responsible Business Practices,” *Business Wire*, October 21, 2004.

³³ See Duncan Austin, Niki Rosinski, Amanda Sauer, Colin Le Duc, *Changing Drivers: The Impact Of Climate Change On Competitiveness And Value Creation In The Automotive Industry* (Washington, D.C.: World Resources Institute (WRI) and Sustainable Asset Management (SAM), 2003). See also “The Drivers: How to Navigate the Auto Industry,” Deutsche Bank AG, July 31, 2002, for a discussion of the strategic implications of Toyota’s leadership in environmental technology.

³⁴ See Duncan Austin, Niki Rosinski, Amanda Sauer, Colin Le Duc, *Changing Drivers: The Impact Of Climate Change On Competitiveness And Value Creation In The Automotive Industry* (Washington, D.C.: World Resources Institute (WRI) and Sustainable Asset Management (SAM), 2003).

tax rates, treatment, and tax credits – when considering expansion, R&D investments, restructuring of existing networks, or mergers and acquisitions.

Transfer pricing issues become a critical component in those decisions. With intangible assets such as patents, know-how, and brand value becoming critical components of the value of products and services, identifying the “right” transfer price between entities under common control is no small task. However, understanding the issues involved is critical to designing an optimal network. Over the last two decades, the value of intangible assets as a share of total market capitalization of U.S. companies has nearly doubled to more than 70 percent.³⁵

To boost growth and attract high value-added activities, dozens of countries now offer companies tax credits on R&D activities, not only for laboratory research but also for other types of innovation (including process improvements in manufacturing, production trials, and software integration). For example, new investments in radio-frequency identification (RFID) technologies for improving the supply chain may be candidates for R&D tax credits.³⁶ Incorporating these tax credits into global supply chain development and restructuring decisions can have a significant impact on the bottom line.³⁷

This also includes intellectual property (patents, trademarks, trade secrets, trade names, copyrights, etc.), intellectual assets (such as codified knowledge, contracts, permits, licenses, and non-competes), and intellectual capital (human capital, organizational capital, customer capital, distributor relations, and supplier relations). Different countries treat the valuation and returns on those assets very differently for regulatory, tax, and other purposes.

While most media discussion is about corporate – or direct – taxation, indirect taxation is often more important. Indirect taxes are not levied directly on income but rather on ongoing business activity. They can take many forms – import duties, antidumping levies, safeguard measures,³⁸ value-added taxes (VAT), goods and services taxes (GST), excise/consumption taxes, agricultural

³⁵ Kevin G. Rivette and David Kline, “Discovering new value in intellectual property,” *Harvard Business Review*, January-February 2000.

³⁶ See e.g. Larry Shutzberg, *RFID in the Consumer Goods Supply Chain: Mandated Compliance or Remarkable Innovation?*, Industry White Paper, October 2004. http://www.packagingdigest.com/newsite/Online/RFID_IWP.pdf

³⁷ See e.g. “Dupont Canada Develops Breakthrough Product at Half the Cost Thanks to Canada’s R&D Tax Credits,” Advanced Materials Draft Paper, Canadian Chemical Producers Association, September 10, 2002, Calgary, Alberta, Canada.

³⁸ A World Trade Organization (WTO) member may take a “safeguard” action (i.e., restrict imports of a product temporarily) to protect a specific domestic industry from an increase in imports of any product which is causing, or which is threatening to cause, serious injury to the industry. For further details, see http://www.wto.org/english/tratop_e/safeg_e/safeg_e.htm.

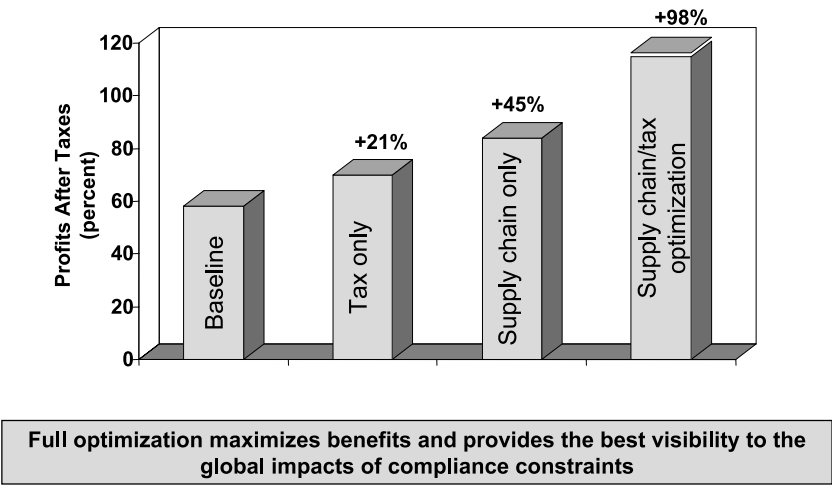


Figure 2.10. Taking a Holistic View: Building Tax Issues into Optimization.

levies, and stamp taxes. Having to deal with such complexities on a global scale, managers can easily become overwhelmed with the job of managing indirect taxes in a holistic, optimal manner.

Despite the increased complexity, however, there are significant benefits from taking a comprehensive approach to taxation in network optimization. From studying the design and restructuring of dozens of global supply chains, we have found that incorporating global tax issues into restructuring efforts typically can double bottom-line results as compared to restructuring without tax considerations (Figure 2.10).³⁹

Consider the case of a U.S.-based global consumer goods manufacturer. To streamline operations and reduce costs, the company wanted to centralize purchasing across Europe into a pan-European procurement center. While the benefits from optimizing the supply chain alone would be worth several hundred millions of dollars, when it factored in both direct and indirect taxation, the company found the bottom-line benefits were twice as high.

³⁹ Though restructuring of the network considering both operational and taxation drivers can actually increase a company's total direct taxes, other factors will offset this result: Total profits before taxes increase faster and the net profits after taxes are higher, thus reducing the effective tax rate for the company. Note: The effective tax rate is calculated as total income taxes paid as a percentage of total taxable income before taxes.

2.3.5 Optimization Infrastructure – the Role of People, Process, and Technology

As we have seen, optimizing a global network can generate significant benefits – particularly if all relevant factors are taken into account early on in the design phase. However, most companies do not have the global infrastructure to support the design, implementation, and management of an optimized network. This includes capable organizational structures, business processes, and information systems.

Why is this the case? Most multinationals have grown organically and through mergers and acquisitions. Entering new markets and accessing new sources of supply around the world often creates new silos of operation. These silos seldom adopt the same systems and processes of the rest of the company, because during their creation they were focused on seizing new opportunities. International mergers and acquisitions only exacerbate the problem because they create even larger constellations of dissimilar global infrastructures. The result is often a spaghetti-like web of different processes and systems around the world.

Consider the example of General Motors. In 1996, before undertaking a major initiative to streamline supply chain, product development, and order management systems, the giant automaker found it had more than 7,000 discrete information systems. Most of them were legacy, silos of information that did not integrate data flow across the enterprise. For example, design engineering used 22 different engineering systems, hindering collaboration among the global product development staffs. Since then, GM has dramatically overhauled its global infrastructure in an attempt to reduce or eliminate such problems and is building a platform for continuing optimization of its global network.⁴⁰ To optimize its global logistics operations, GM and global logistics company CNF have established a joint venture, Vector SCM.⁴¹ Launched 5 years ago, Vector SCM has grown rapidly and plans to manage US\$4.8 billion of GM's US\$5.5 billion total logistics spending worldwide in 2005. Vector SCM has built strong capabilities for continuously analyzing, designing, implementing, managing, and monitoring a global supply chain. This includes a

⁴⁰ From P. Koudal, H. Lee, B. Peleg, P. Rajwat, S. Whang, and R. Tully, "General Motors: Building a Digital Loyalty Network Through Demand and Supply Chain Integration," Stanford Case Study, January 1, 2003. See also Deloitte Research and Stanford Global Supply Chain Management Forum, *Integrating Demand and Supply Chains in the Global Automotive Industry: Building a Digital Loyalty Network at General Motors* (New York, 2003). For further information, see Laurie Sullivan, "Business integration—car maker takes global approach," *Computing*, September 30, 2004.

⁴¹ Based on research by Stanford Global Supply Chain Management Forum and Deloitte Research.

global staff with deep technical skills, and a technology infrastructure that includes global network optimization applications and a multi-terabyte-size data warehouse for recording and monitoring information on global network operations and performance.

Vector SCM is not only helping GM optimize its existing investments, it is also helping the automaker to assess, support, and implement new global sourcing initiatives, logistics networks, and new product introductions. In addition, Vector SCM is helping GM expand into new markets such as China. With improvement percentages in spending efficiency ranging from the single to double digits, the total impact on the network is dramatic. It is expected to increase further as Vector SCM continues to help GM optimize and restructure its supply chain.

The organizational and people issues also matter. Major network restructuring efforts often require expensive staff relocation, which can be especially counterproductive if the most qualified staff members – those with years of experience and specialized skills – must be replaced. Our research suggests that the constraints imposed by current organizational structures, such as the location of regional headquarters, can significantly reduce opportunities for improvement. A European consumer products business that reorganized its supply chain estimates that due to the constraints involved in relocating managers it had to forgo about 50 percent of the benefits it might otherwise have

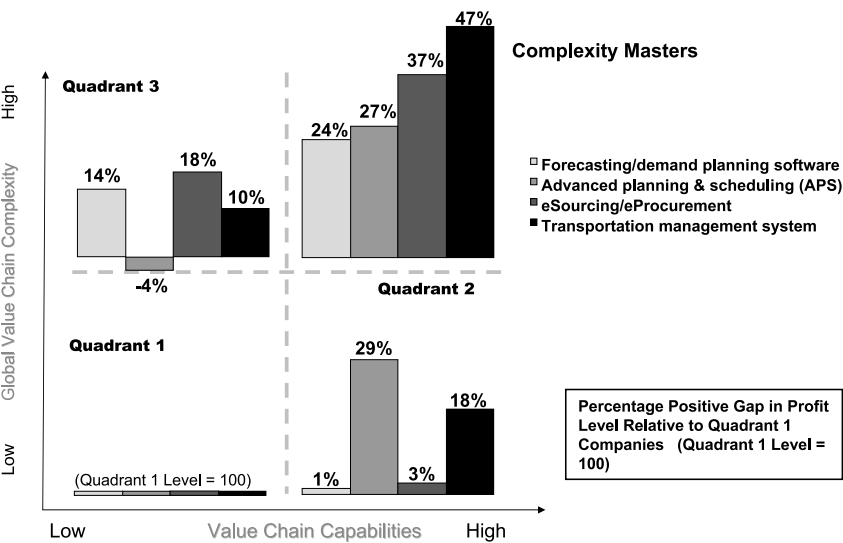


Figure 2.11. Staying Ahead on the Technology Curve.

realized from optimization. It is clear that organizational structure and change management issues need to be built into ongoing network optimization efforts up front to avoid wrong choices and allow for flexibility down the road. While complex, global and continuous optimization can actually make life *easier* for managers. When they make business decisions in light of what is good for the entire global network, they can help their companies avoid major mistakes and wasted efforts.

While the cost of instituting a global infrastructure to support network optimization is large, the experience of leading companies shows the benefits are worth the cost – and the effort. Perhaps not surprisingly, our research shows that complexity masters are far ahead in creating the systems, methodologies, and processes for the effective management of global networks (Figure 2.11).

2.4. Conclusion

Unlocking the value of globalization through continuous network optimization is important today – and will grow in importance tomorrow. To effectively optimize their networks, companies must factor in both competitive and compliance drivers. Without deep insight into operations, including current and future customers, distributors, and suppliers and in-depth knowledge of the effects of regulatory, tax, and other issues, it will be difficult for organizations to consistently make the right decisions. To get continuous network optimization off the ground, companies must carefully consider their investment in the needed people, organizational, process, and technology capabilities.

Optimization of the global network can no longer be done just every three, five or 10 years. With dramatic changes continuing to impact global networks, leading companies are building the capabilities to look holistically at their operations on an ongoing basis. This form of continuous network optimization is the *Holy Grail* – a key competitive advantage that can help to substantially differentiate global business networks. As our research shows, companies making the greatest strides in global optimization are reaping the benefits through higher growth, profitability, and shareholder value.

Appendix: Defining Complexity Masters

To determine the practices of manufacturers that manage complexity well, we focused on a subset of the total survey population – the more than 300 sur-

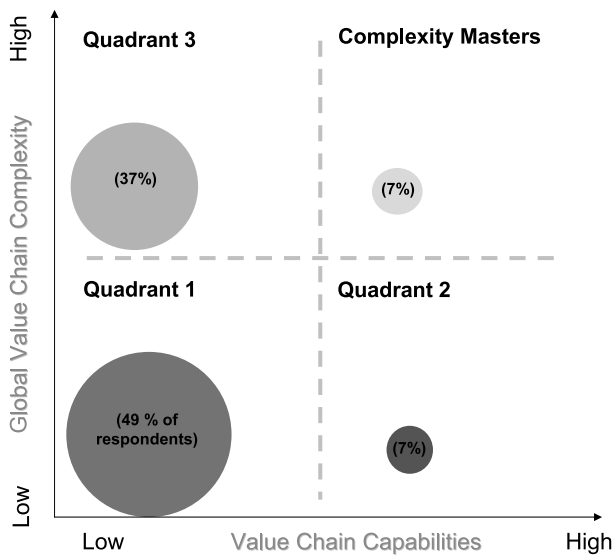


Figure 2.A. The Quadrants of Mastering Complexity.

vey respondents with annual revenues ranging from at least US\$200 million.⁴² We then divided the survey population by two dimensions (Figure 2.A):

- Degree of global value chain complexity. This was based on measuring the geographic diffusion (low or high) of four value chain functions (sourcing, manufacturing, engineering, and marketing/sales operations) across 13 geographic regions. We created a global value chain complexity index, scoring companies on a scale from 1 to 52. A manufacturer’s score depended on the extent to which it scattered the four value chain activities across the 13 geographies.⁴³
- Level of value chain capabilities. This axis gauges the relative competitiveness of each company on 10 value chain capabilities. We created a universal measure by taking a composite score of each respondent’s ratings in product innovation, time to market, sourcing effective-

⁴² For more on the complexity masters, see Deloitte Research, *Mastering Complexity in Global Manufacturing: Powering Profits and Growth through Value Chain Synchronization* (New York and London, 2003). See also Deloitte Research, *Mastering Innovation: Exploiting Ideas for Profitable Growth* (New York, 2004).

⁴³ The 13 countries/regions are: Australia/New Zealand, China, India, Japan, Korea, Other South-east Asia, Western Europe, Central Europe, Eastern Europe, Africa, United States/Canada, Mexico/Central America, and South America.

ness, product quality, manufacturing flexibility, manufacturing productivity and cost-effectiveness, manufacturing lead time, logistics effectiveness, customer service, and supply chain cost structure. Manufacturers scored themselves against primary competitors on a 5-point scale (1 equals “significant disadvantage,” 3 is “equal capability,” and 5 is “strong advantage.” Based on the 10 metrics and the 5-point scale, we then created a value chain capability index in which a company could score between 10 and 50.

By grouping survey respondents along the two axes, four groups result:

- Quadrant 1. Companies with low global value chain complexity (scoring below 20 on the global complexity index) and low-to-medium value chain capabilities (scoring below 40 on the value chain capability index). These manufacturers make up nearly half (49 percent) of the base.
- Quadrant 2. Companies with low global value chain complexity (scoring below 20 on the complexity index) but high value chain capabilities (scoring 40 and above on the value chain capability index – on average, exceeding the capabilities of their primary competitors across our 10 metrics). Only 7 percent of the respondents fell into this category.
- Quadrant 3. Companies with high complexity (scoring 20 and above on the complexity index) but low-to-medium capabilities (scoring below 40 on the value chain capability index). This group accounted for about 37 percent of all companies.
- Quadrant 4. Companies with high complexity (scoring 20 and above on the complexity index) and high capabilities (scoring 40 and above on the value chain capability index). We refer to this group as the “complexity masters.” Just 7 percent of the sample fell into this category.

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