BY STUART A. ROSENFELD

BEST PRACTICE SERIES

INDUSTRIAL-STRENGTH STRATEGIES

Regional Business Clusters and Public Policy

The Aspen Institute
Community Strategies Group

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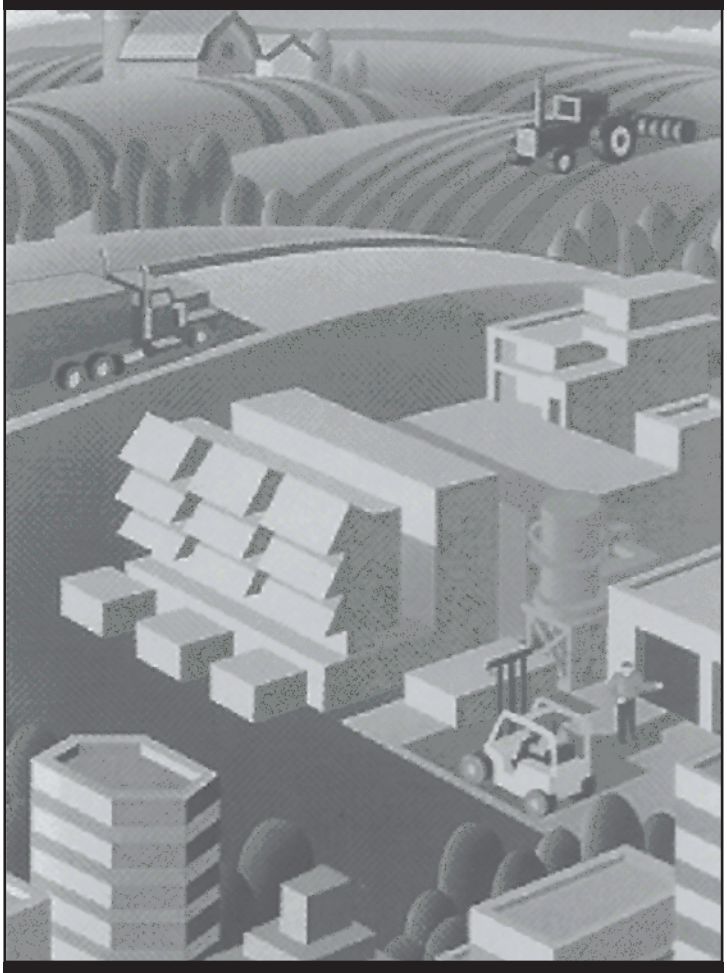

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INTRODUCTION

Oregon's Economic Development Department is helping organizations representing 13 of the state's top industries identify and overcome major barriers to—and exploit opportunities for—growth. The Economic Development Council of Louisville/Jefferson County, Kentucky, is strengthening and encouraging collaboration within and among four of the region's key industries. New York has targeted clusters of both primary and major importance in each of eight regions of the state for its new technology and economic development strategies.

This book explains, explores and illustrates how policymakers and practitioners—particularly in rural areas—can move toward cluster-focused economic development.

What all of these government actions have in common is that they target groups—or clusters—of firms rather than individual businesses. This is a radical departure from traditional economic development strategy, which, whether aimed at business development or business retention, is always applied firm by firm.

Economic development strategy that targets groups of firms recognizes the basic interdependence of modern manufacturing. It encourages industry leadership to participate in the design and implementation of economic development programs. It facilitates development of group reference or benchmarking systems that define better and best practice. It helps achieve economies of scale and scope. And, perhaps most importantly, it reinforces trends toward partnering, networking and collaboration to promote sharing of information, markets and resources.

This book explains, explores and illustrates how policymakers and practitioners—particularly in rural areas—can move toward cluster-focused economic development.

- **Chapter 1** sets the stage by defining several key concepts. It explains what cluster-focused economic development policymaking is all about—and why it has been so fiercely resisted. It defines the basic

terms of clustering, answers some controversial issues surrounding cluster-focused development policies, and presents the factors that characterize industrial clusters. By the end of the chapter, the reader should know how to recognize a regional cluster—and understand why it's necessary to do so.

- **Chapter 2** discusses how to collect and analyze data about a region's clusters with an eye to developing targeted, relevant development strategies. It describes the kinds of data that are available, and explains the strengths and weaknesses of each data source. It emphasizes the absolute necessity of rigorous analysis, and the various tools and techniques available for these analyses. It presents case studies that illustrate the points made, and provides a checklist to use to better understand a region's industries.

Cluster-based development strategies hold promise for strengthening America's industrial base in both urban and rural areas and for improving its competitive advantage.

- **Chapter 3** explains how to identify and target a region's clusters and how to develop strategies appropriate to those clusters and their needs. It presents various classifications of strategies, emphasizing their different purposes and techniques. It provides examples for many of the strategies discussed.

- **Chapter 4** presents two full-length case studies that show how a region in North Carolina successfully applied the tools, techniques and philosophy of cluster-based economic development.

- **Chapter 5** gives state, federal and local governments separate, step-by-step guidance in implementing cluster-based development policies and programs. It defines their roles vis-à-vis these policies and programs, and warns of the factors that can sabotage these new approaches to economic development.

The appendices supplement this material by providing further detail on analytic techniques for interpreting business and industry data *(Appendix A),* endnotes identifying sources of in-text references and of additional information *(Appendix B),* and a list of references and recommended readings *(Appendix C).*

Cluster-based development strategies hold much promise for strengthening America's industrial base in both urban and rural areas and for improving its competitive advantage. These innovations are being successfully applied around the world and throughout the United States. They allow us to build on existing strengths and to preserve precious development resources through wiser and more efficient use.

CHAPTER 1. BUSINESS CLUSTERS, REGIONAL ECONOMIES AND PUBLIC POLICY

Why do the economies of some regions consistently grow and regenerate, while others—even those of regions that share similar characteristics—fail to achieve their potential or stagnate altogether?

Governments continually search for the magical policy formulas that will let them replicate high-growth regions. They tour and study and try to relate the successes of North Carolina's Research Triangle Park, California's Silicon Valley or Italy's Emilia-Romagna to factors controlled by the public sector—incentives, infrastructure, business incubators, schools, services, seed capital.

But the real magic lies hidden *outside* of government, *within* the regional economies. Successful economies are based on more than infrastructure and capital—no matter how strong—and on more than labor, no matter how skilled. They are complex, dynamic production systems of innovative companies connected to each other by business transactions, and linked by a constant exchange of employees, information and ideas.

Governments are beginning to recognize that there are differences between economic development strategies that simply lay infrastructure or reduce operating costs and those that build an industry's competitiveness and increase innovation. We are concerned here with the latter, strategies that target groups of firms related either by product similarities (sectors) or by relationships and proximity (clusters). *(See "The Vocabulary of Business Clusters.")* We also focus on the relevance of these strategies in less populated areas that lack large concentrations of firms.

Governments continually search for the magical policy formulas that will let them replicate high-growth regions.

Development innovation: clustering for effect

Consider, for example, the following list of recent state and local business development innovations. Common to

THE VOCABULARY OF BUSINESS CLUSTERS

Sector. A sector is a formal industry category as specified by the Department of Commerce's Standard Industrial Classification (SIC) code system. This scheme classifies firms by their dominant products, going from general (a first-level sector—for example, durable goods manufacturing, SIC code 3000) to increasingly specific (a fourth-level sector—for example, power hand tools, SIC code 3546). For policy purposes, a sector is often defined more broadly; the "metals" sector, for example, could be defined to include primary (3300) and fabricated (3400) metals, as well as industrial machinery and equipment (3500).

Cluster. A cluster is a loose, geographically bounded agglomeration of similar, related firms that together are able to achieve synergy. Firms "self-select" into clusters based on their mutual interdependencies in order to increase economic activity and facilitate business transactions. Harvard Business School professor Michael Porter notes that "Once a cluster forms, the whole group of industries becomes mutually supporting. Benefits flow forward, backward, and horizontally."[1] The self-selection can be based on proximity to customers or suppliers (called value-added chains), labor markets with special skills, sources of information and technology, industry leaders and innovators, or even competitors.

Flexible manufacturing network. This term has recently begun to be applied to small groups of cooperating businesses. In the context of industrial policy, a network is three or more firms that cooperate to take advantage of their complementarities, exploit new markets, integrate value-adding activities to produce more complex goods, or pool resources or knowledge to achieve economies of scale or solve common problems. These forms of associative behavior occur more naturally and more frequently within clusters.

Cluster vs. sector-based strategies. The terms "cluster" and "sector" suggest different but overlapping strategies. "Cluster" describes a geographic configuration and ways of organizing for individual and collective benefit. "Sector" implies a production configuration and involves the organization of services by government agencies and nonprofit organizations to support state or local economies. Cluster strategies enhance the region in which a concentration of firms occurs;

sector strategies target specific industry needs. We use the term "cluster" generally when describing locational and transactional relationships among firms; "sector" when discussing industry-targeted strategies and policies to enhance competitiveness.

Industrial district. This is the European version of a cluster. Typically, it's made up of a large number of companies located in a relatively small area. These firms work either directly or indirectly for the same end market, share values and knowledge so important that they define a cultural environment, and are specifically linked to one another in a complex mix of competition and cooperation. Industrial district producers often develop a common supply of inputs and a wider variety of specialized resources. This presumably drives price down and quality up to the mutual benefit of all the region's producers. Europeans apply terms to industrial districts not generally associated with business relationships in the United States—trust, solidarity, cooperation. These districts exhibit both community and productive dimensions. The daily social, cultural and economic lives of the people are closely intertwined with them.

Industrial modernization. The National Institute for Standards and Technology defines this as "the application of upgraded technologies, design, manufacturing, and marketing methods, improved quality control systems, and enhanced management and training to raise productivity, quality, product performance, workforce skills, and company manufacturing capabilities to best international levels."[2]

each of these efforts is the targeting of groups or clusters of related businesses rather than individual firms or discrete locations:

- In 1991, the Oregon legislature passed Senate Bill 997, which charged the Oregon Economic Development Department with establishing organizations to help each of 13 key industries overcome major barriers to—and identify and exploit opportunities for—growth. These organizations subsequently formulated their own strategic plans and proposed benchmarks to measure their progress. Multi-

county regions within Oregon followed suit, selecting their own key industries and planning accordingly.

- Leaders in Kentucky's small-firm-based secondary wood products sector organized and won sufficient support to pass House Bill 561, which created the Kentucky Wood Products Competitiveness Corporation. Concurrently, another bill established eight basic and applied research and development (R&D) centers targeted at key industries.

- Following an intensive industry study of its economy, the state of Arizona created industry councils. It charged them with developing plans for strengthening firms in their sectors by identifying needs, filling gaps and promoting interfirm relationships.

- Thanks to massive showrooms, an advanced technology center, a highly skilled labor force and dozens of suppliers that support its more than 250 furniture manufacturers, the rural region in and around Tupelo, Mississippi, has become the nation's leading source of upholstered furniture. Intense rivalry and rapid, irrepressible diffusion of technology and innovation throughout Lee County, home to Tupelo, and its surrounding counties are propelling the industry's growth.

Governments are beginning to recognize the differences between strategies that simply lay infrastructure foundations or reduce operating costs and those that build an industry's competitiveness and increase innovation.

Each of these examples marks a dramatic shift in thinking about economic development. Traditionally, economic development strategists have assumed that they are expected to generate jobs by providing attractive, convenient, low-cost business sites as well as support and subsidies for those firms willing to locate, expand or start up in their regions. Consequently, public policy has targeted *places* and *individual enterprises* rather than industries. Although economic developers do seek suppliers for large companies, they generally consider diversification safer—and thus preferable—to targeting or cluster strategies.

Firms, on the other hand, take a different view of what is important in their location and expansion decisions, and tend to cluster according to their own self-

interests. Firms depend on one another for supplies, sales, advice and ideas. They recognize and value the strength and synergy that concentration affords, even among competitors. The major detriment of clustering—that new technologies or products will render the cluster's primary products obsolete—can be minimized if firms view themselves in terms of *core competencies* rather than just *product lines*. This makes them less susceptible to the vagaries of markets and technological progress. Thus, even in beleaguered industries, innovative and dynamic groups of firms have been able to react and adapt their competencies to market changes—to restructure, regroup and prosper.

The challenge for states and regions is to find ways to reinforce the collective strengths of business clusters for the overall benefit of the region.

In short, much government policy and practice is at odds with the reality of industrial relationships and needs. Because they recognize that there is strength in numbers, businesses—even in rural areas—*will* cluster. The challenge, then, for states and regions is not to protect or favor particular sectors, but to find ways to reinforce the collective strengths of clusters for the overall benefit of the region.

Driving Forces: Competitiveness Imperatives

In the States: Manufacturing Restructures

The decline of the nation's manufacturing sector has, over the past two decades, become cause for alarm. A steady stream of thoughtful analyses argues that the economy cannot continue to prosper without a competitive industrial base.

Indeed, U.S. industry presently is undergoing a huge restructuring of its manufacturing base. Under mass production, for which U.S. industry became renowned, companies employed highly specialized workers operating customized equipment to produce large quantities of standard products at low cost. Companies following this path grew horizontally to achieve internal economies of scale, and vertically to gain greater control over the production process. The public sector's role in this growth was

to ensure adequate infrastructure and sufficient levels of trained workers—and to help keep costs down. There was little need or desire for the public sector to concern itself with what went on inside the companies.

But the rules of the game—and the corresponding needs of industry—have changed. Pressed to ensure quality, reliability and prompt delivery to increasingly segmented markets, businesses are forsaking mass production for flexible specialization. They are employing adaptable, skilled workers to operate multi-use equipment that can produce customized products at reasonable costs. This flexible specialization can be achieved by restructuring either *internally* into autonomous production units, or *externally* by outsourcing selected components to smaller, independent companies. Consequently, the vertical integration and rigid hierarchies that mass production employed to control costs are giving way to smaller units of production and flatter organizations able to respond more quickly to change.

Pressed to ensure quality, reliability and prompt delivery to increasingly segmented markets, businesses are forsaking mass production for flexible specialization.

The public sector's role must change, too: It now must help industry transform itself in accordance with this newer, more competitive model. According to Porter, that role is to be "catalyst and challenger and to encourage—or even push—companies to raise their aspirations and move to higher levels of competitive performance, even though the process may be inherently unpleasant and difficult."[3]

Overseas: clusters get competitive

Over the past decade and a half, Pacific Rim and European nations have usurped many product niches once securely and confidently dominated by American companies, particularly in consumer products such as television and stereos, but also in machine tools and communications equipment. Much of our competitors' success has been attributed to its government-initiated or -supported programs that target specific kinds of businesses.

Moreover, highly successful small and mid-sized firms in western Europe have demonstrated the global market potential of smaller, nim-

ble producers—particularly when they are highly concentrated. The spectacular success of flexible and innovative artisan firms, particularly in northern Italy, southern Germany and Scandinavia, became one of the top economic stories of the 1980s. Recent stresses on leading industries in these and other nations notwithstanding, the resiliency exhibited by some of these industries suggests that a solid foundation for modernization and learning can accelerate recovery.

Western Europe's widely publicized industrial districts contain large numbers of firms clustered both horizontally (with suppliers and customers) and vertically (with similar firms) to produce families of products. *(See "Prototypical Clusters: Western Europe's Industrial Districts," next page.)* Production in these districts is divided among many specialized units that operate as interconnected systems.

Highly successful small and mid-sized firms in western Europe have demonstrated the global market potential of smaller, nimble producers—particularly when they are highly concentrated.

A COMPETITIVENESS FRAMEWORK: NO PLACE LIKE HOME

A resurgence of interest in manufacturing, in the lessons of Europe and Japan, and in industrial restructuring is leading U.S. regions to test new development strategies that support existing industry—particularly sectors dominated by smaller, locally owned companies. These strategies view a region not simply as a collection of individual employers, but as a system of interdependent employers.

Porter, based on what he observed in Europe and the Pacific Rim, establishes a framework for a new approach and persuasively relates the competitiveness of regions directly to the competitiveness of their home industries. Porter's conceptual framework names four geography-dependent determinants of competitiveness:

- **FACTOR CONDITIONS**—human resources, capital and advanced infrastructure
- **DEMAND CONDITIONS**—size and sophistication of local customers

PROTOTYPICAL CLUSTERS: WESTERN EUROPE'S INDUSTRIAL DISTRICTS

- In northern Italy, firms in Sassoulo and Fiorano produce nearly 35 percent of the tiles sold throughout the world. Tile companies in the Valencia region of Spain produce another 30 percent.
- Hosiery firms clustered around the town of Castel Goffredo produce a third of the pantyhose sold in Europe.
- Firms in the Dolomites on the Austrian border produce half the ski boots sold worldwide.
- Companies around Udine, Italy, produce half of all chairs sold in Europe.
- Germany's leading cutlery manufacturers are concentrated in Soligren, its optical equipment producers near Oberkochen and Wezlar, and its tooling industry in Remscheid.
- Footwear production and telecommunications are concentrated in France's Rhône-Alpes region, porcelain in Limoges, perfumes in Cannes.
- Plastics production is centered in Jönköping, Sweden.

- **RELATED AND SUPPORTING INDUSTRIES**—suppliers and distributors
- **FIRM STRATEGY, STRUCTURE AND RIVALRY**

"No nation," Porter writes, "can be competitive in (and a net exporter of) everything...Successful firms are frequently concentrated in particular cities or states within a nation [because] something about these locations provides a fertile environment for firms in these particular industries."

The Attributes of Business Clusters

The idea that businesses cluster is not particularly new. Beginning with economist Alfred Marshall, who wrote more than a half-century ago "that the collective efficiency of a people with a given average of individual

OLD AND NEW AGAIN: THE ANNALS OF U.S. CLUSTERS

U.S. industrial history offers up several examples of clustered businesses:

- The mid-19th century musket industry, centered in the Springfield Armory but extending up and down the Connecticut River Valley, operated effectively as an industrial district until government restrictions on joint purchasing and pressures for vertical integration altered its organization.[4]
- The movie industry formed in the first half of the 20th century as a district in southern California. It persists to this day, albeit in a somewhat different form.
- Heavy concentrations of U.S. hosiery producers and suppliers cluster in the Catawba Valley of North Carolina and around Fort Payne, Alabama.
- Upholstered furniture concentrates in northeastern Mississippi and Hickory, North Carolina, and carpets around Dalton, Georgia.
- Plastics companies are centered in and near El Paso, Texas, and hundreds are in western Massachusetts and Connecticut.
- About 100 eyelet manufacturers are clustered near Waterbury, Connecticut.
- Machine tool companies thrive in northwestern Pennsylvania, and small engines manufacturers in southeastern Wisconsin.
- A large number of jewelry makers call Providence, Rhode Island, home.

strength and energy may increase more than in proportion to their numbers"[5]—in other words, "The whole is more than the sum of its parts"—experts have tried to explain the advantages of industrial concentration. A concentration of efficient, innovative and interdependent firms can create a synergy that enables a region to influence and capture markets and create jobs.

What are the key attributes of business clusters—or the regions that support them? Existing experience and research suggest the following features, each present in the real world in varying proportion. The degree to which any one of these is a critical factor in competitiveness depends largely on the nature of the industry, local circumstances and current public policy.

A concentration of efficient, innovative and interdependent firms can create a synergy that enables a region to influence and capture markets and create jobs.

Geographic boundaries. Proximity among firms and to local institutions improves effectiveness both of the individual firms and of the region as a whole. An advanced telecommunications infrastructure that connects remote firms is no substitute for face-to-face interaction when it comes to building trust. Geographic concentrations tend to encompass a few small cities or contiguous counties, seldom more.

Vertical division of labor. Clusters enable firms to specialize. Specialization lets a firm concentrate on achieving the highest proficiency in a particular phase of production, the use of a particular technology or the design of a particular type of product. Even the largest corporations are reducing in-house manufacturing to their core competencies and spinning off non-core production to suppliers.

Implicit in industry's growing reliance on "flexible specialization" is maintenance of interfirm relationships. These relationships must be sufficiently durable and provide access to needed services so that a complex end product—one formerly produced by a single vertically integrated firm—can be produced by a region's clustered firms working together.

Tailored infrastructure. As industry concentration increases, individual businesses benefit from the development of sophisticated institutional and physical infrastructure tailored to the needs of the specific industry. Regions that host industrial concentrations are able to maintain local product showrooms, foreign sales offices or distribution centers, supply centers, common waste treatment facilities. The upholstered furniture companies in Tupelo, Mississippi, for example, enjoy access to two large showrooms and the local community college's advanced technology center. A growing number of community colleges are developing such centers for local key industries.

Specialized services. A critical mass of firms tends to attract specialized services such as product and material testing, export assistance, customized training, legal expertise and environmental assistance—all of which offer these firms an advantage beyond concentration. When third-party providers are able to deliver such services at an efficient scale, individual firms are spared the necessity of developing the requisite expertise internally. Furniture and metals firms in Michigan's Upper Peninsula, for example, have access to the Northern Economic Initiatives Corporation, which coordinates, brokers and provides technical assistance, financing and training for these industries.

As industry concentration increases, individual businesses benefit from the development of sophisticated institutional and physical infrastructure tailored to the needs of the specific industry.

Support industries. Clusters also attract firms that support production. Producers of advanced equipment are one example. Others include financial institutions, design companies and production maintenance firms attuned to the special needs of an industry. Firms that work together during design, installation, start-up, debugging and operation tend to use advanced equipment more effectively than firms that purchase such equipment off the shelf.[6] Italy's ceramic tile district, for example, includes firms that produce the most advanced tile-making equipment. The district exploits that proximity to maintain a comparative advantage.

Demanding customers. Demanding and sophisticated consumers provide firms with insights into future markets and spur them to produce higher-quality products. Italy's ceramic industry receives a boost from consumers who are more likely to improve their existing home than to build a new one—and whose tastes tend to be less conservative than the norm. Remarked the owner of one of the largest Italian tile firms: "In Europe, we sell many colors; in America all they want is stone, stone, stone and beige."

Skilled labor markets. Competitive advantage can also accrue to a critical mass of skilled workers who are more likely to produce at higher rates of productivity. Good working conditions, wages and opportunities for advancement foster an aptitude for industrial work and careful work habits. Worker mobility within concentrations of companies also promotes rapid dissemination of new technologies and innovations. The

Employees and owners of different firms who associate with one another in joint training programs or socialize after hours tend to educate one another.

labor pool in Washington's Olympic Peninsula supports a high-quality, high-value-added wood products industry cluster, and Silicon Valley is very much a product of the large number of skilled professionals congregated in that four-county region.

Indeed, employees and owners of different firms who associate with one another in joint training programs or socialize after hours tend to educate one another. As Marshall observed, "Where a mass of skilled workers is concentrated, the mysteries of the industry 'become not mysteries; but are as it were in the air, and children learn from them unconsciously.'"[7] For example, machining skills passed down through families as a consequence of industrial concentration in central Massachusetts have kept that region at the forefront of the metals industry.

Learning and innovation. Concentration promotes learning and the transfer of technology and know-how among firms. Such pooling of knowledge is essential to innovation.[8] According to Roberto Camagni, clusters create an innovative milieu, a "complex network of social relationships...which enhance the local innovative capability through synergetic and collective learning."[9] Saxenian concludes that it is socialization and the pooling of technical expertise that enables specialized firms in Silicon Valley to continue to innovate and react flexibly. "Silicon Valley has a regional network-based industrial system that promotes collective learning and flexible adjustment among specialist producers...The region's dense social networks and open labor markets encourage experimentation and entrepreneurship."[10]

Entrepreneurial energy. In dynamic clusters, as innovation progresses, new businesses are encouraged to spin off. When the five best technicians of a successful machining company near Modena, Italy, left to form three new companies, the owner was not only supportive—which he demonstrated by investing in their equipment and subcontracting work to them to help them get started—but also proud. Many of Tupelo's leading furniture companies were started by former employees of the area's first employer, Futorian Furniture, and large numbers of owners in Silicon Valley once worked for Fairchild.

Cooperation and trust. Specialized firms must, by definition, work closely with companies with complementary specialties to produce an end product. Cooperation gives firms the opportunity to achieve economies of scale and resolve common problems more quickly than if they were acting independently. Clusters maximize opportunities to make deals through trade and business associations and frequent social interaction.

Representatives from the 30 firms that make up the Technology Coast Manufacturing and Engineering Network in Florida's panhandle meet regularly to discuss problems and arrange team-bidding on contracts. Silicon Valley firms, according to AnnaLee Saxenian, see "social relationships and even gossip as a crucial aspect of their businesses. In an industry characterized by rapid technological change and intense competition, informal communication was often of more value than more conventional but less timely forums such as industry journals."[11]

"Mark" and reputation. Concentration lets firms establish a common name or mark that promotes a region's products. Swiss watches, German optics and machine tools, Danish modern furniture, Grand Rapids office furniture, Japanese cameras, Belgian chocolate and Vermont maple syrup all conjure up images of quality, style and reliability. Oregon's secondary wood products manufacturers are attempting to create such an image of excellence by labeling their products "Oregon Made."

In dynamic clusters, as innovation progresses, new businesses are encouraged to spin off.

Competition and firm rivalry. Clusters notwithstanding, firms that produce the same products or that are in the same phases of production will continue to compete vigorously for market share. The owners of small machining firms in Sakaki, Japan—although they admitted sharing equipment and information freely—denied that this constituted cooperation. And business economist Michael Enright relates the story of the owner of a small firm in a northern Italy industrial district who ended a tour of his production equipment with a visit to a vital piece of technology—a rooftop telescope which he used to observe his competitors. Such competition and free exchange of information drives firms to innovate and continually look for an edge.

How Do Clusters Develop?

To understand how to influence clusters, one must understand how they come about in the first place. Each results from some combination of historical circumstances, special physical resources, industrial change and the decisions of individual firms. The following well-known examples, drawn from Europe, Asia and the United States, illustrate factors that can spark the evolution of clusters. It's worth noting that these factors rarely operate in isolation from one another; in fact, each example could probably serve to illustrate several of the factors cited.

Built on history and tradition

History has played a major role in the formation of clusters. Certain clusters in Europe and Asia evolved over centuries of industrial and social development. Some are based on proximity to critical raw materials or particular geographic or climatic circumstances, others are rooted in a local culture rich in community pride and participation. Two examples illustrate this phenomenon.

To understand how to influence clusters, one must understand how they come about in the first place.

Fukui, Ishikawa and Toyama, Japan. One three-prefecture region of Japan that enjoys a competitive advantage in synthetic weaves is a product of its historical climatic advantages (temperature and humidity) for raising silkworms and dyeing silk. Silk-weaving skills were handed down from artisans to apprentices over the centuries; eventually, they transformed—with research, support structure and quality standards—these skills to produce synthetic substitutes. The industry today is organized around a few larger firms that supply fibers to many small weaving companies.

Lombardia, Italy. The collapse or downsizing of a large corporation gave rise to a cluster in the women's hosiery industry. In the 1920s, Noemi, a large German manufacturer, located plants in Lombardia, Italy, a region with a number of very small towns. The company began to fail in the 1950s. When it closed, many of its employees purchased the plants and equipment and set up their own shops, strongly supported by

the local rural cooperative bank and an agricultural system that was willing to invest its excess savings in manufacturing to ensure the communities' long-term future.

Today, a cluster of some 250 companies, run by the children and grandchildren of Noemi's employees, produce approximately 30 percent of all hosiery sold in Europe. The local rural cooperative bank continues to support the sector, recently helping to build a service center to provide quality assurance, market information, training and technology to all the cluster firms.

Some clusters are based on proximity to critical raw materials or particular geographic or climatic circumstances, others are rooted in a local culture rich in community pride.

Rising with corporate ups and downs

Particularly in the United States, clusters have been catalyzed by a thriving large company that spawns other companies—in a location selected for any of a variety of reasons, including low cost, available labor or power generation. For example, clusters can form when large firms want upstream and downstream linkages nearby.

Large companies can also inadvertently generate clusters when they fall on hard economic times and rapidly downsize, as their displaced skilled workers seize the opportunity to start businesses or seek new markets for their skills. Clusters also emerge when downsizing firms subcontract work to small and medium-sized enterprises (SMEs) to reduce labor costs.

Prato, Italy. With its thousands of artisan firms, the wool textile industrial district of Prato, Italy, dates back to at least the 12th century. The region's modern mechanized wool textile industry developed in the 19th century, soon after the industrial revolution began. In the early 20th century, mechanization led to vertical integration, and Prato's industrial production soon was dominated by a small number of large companies. Many of these companies closed in the 1950s when new competition from less developed nations caused a drop in wool prices.

But with this crisis came opportunity. The skilled workers who had lost their jobs purchased their former employers' equipment and set up shop. They turned their attention to short-run, specialty markets, mas-

tered the process of "quick response" to their customers, and combined their particular skills in each phase of production to produce fashion fabrics. Today, Prato's wool textile industry includes some 15,000 firms, with an average of four employees each. Although, as Harrison notes, the region may be too fragmented and is increasingly outsourcing to low-wage nations,[12] Prato nevertheless retains most of the characteristics of a cluster—constant exchange of information, tailored services, cooperation and intense rivalry.

Particularly in the United States, clusters have been catalyzed by a thriving large company that spawns other companies.

Evolving from industry hubs

Connecticut river valley. One of the United States' first and most resilient regional clusters incorporates metalworking firms that range over a 150-mile stretch of the Connecticut River Valley from Springfield, Vermont, through Springfield, Massachusetts, to Middletown, Connecticut.[13] The cluster formed in the early 19th century to mass produce the interchangeable parts needed to manufacture rifles for the government. The Springfield Armory served as a hub and clearinghouse for special equipment, workers, technology, information and materials.

For a century, the firms that comprised the Connecticut River Valley cluster were able to adapt their expertise in metals to a range of mechanical and capital goods. But recently, the large defense contracts on which the region had become overly dependent began to disappear, leaving its firms to scramble for alternative markets. At the same time, economic developers, worried that the industry would be unable to recover, started to pursue alternative industries.

Competencies and tradition in metalworking remain strong in the valley, and the interfirm cooperation which helped found the industry is now being rediscovered by firms driven to compete vigorously for fewer and fewer contracts. Today, the industry is striving to reinvent itself in its former image.

Silicon valley. Silicon Valley, the progeny of the Department of Defense and Stanford University, is one cluster that evolved from re-

search and entrepreneurship. Some believe the Silicon Valley semiconductor cluster is the closest U.S. equivalent to the European industrial district. Substantial government investment in research, the nation's first high-tech industrial park, a university policy that actively encouraged commercialization, and strong university-industry relationships provided a fertile environment.

Metalworking firms in the Connecticut River Valley and the Silicon Valley semiconductor cluster are two examples of business clusters that have evolved from industry hubs. In Mississippi, one furniture company begun in the 1950's helped spawn the 250 firms and 80 suppliers that operate in the region today.

Spawning entrepreneurs

Northeastern Mississippi. Morris Futorian, the entrepreneur who founded the upholstered furniture sector in northeastern Mississippi around Tupelo, moved there to mass-produce furniture in the 1950s. Futorian's employees learned their skills well in his plant. Many eventually left to become owners and managers of new companies. This emerging cluster attracted other furniture companies and other specialized suppliers. Today, some 250 furniture companies and 80 suppliers operate in the multi-county region. *(See "Tupelo: Serendipity Spawns, Community Builds a Cluster," next page.)* Aggressive marketing and the recent housing boom have made this one of the more successful clusters in the nation.

Silicon valley—again. Just as in Mississippi, many of the leading firms in the Silicon Valley cluster can be traced to a single entrepreneur, William Shockley, who co-invented the transistor and founded the firm that produced it. Employees of Shockley's original company were responsible for nearly every semiconductor firm founded up until 1980.[15]

Common Questions about Cluster Strategies

Despite the fact that it increasingly makes common sense, discussions about support for cluster and sector development in this country invariably raise as many questions as they answer. Following *(on page 31)* are the most common—and often controversial—issues that surface around the cluster-focused development strategies in the United States.

TUPELO: SERENDIPITY SPAWNS, COMMUNITY BUILDS A CLUSTER[14]

The 11-county region of northeastern Mississippi, anchored by the city of Tupelo, has become one of the largest producers of upholstered furniture in the nation, second only to North Carolina. Employment in the region's furniture industry grew from 7,800 to 16,900 between 1980 and 1991.

Of the 14,904 new industrial jobs that Mississippi reported in 1992, 41 percent were in furniture. "Almost everyone you meet around here," observed one company owner, "has worked in furniture by age 30."

Today the Tupelo region boasts 243 producers of upholstered furniture —including the nation's leaders in mid-range recliners and incliners— and approximately 80 industry suppliers; together, they employ 22,000 people in the region.

The largest manufacturers use advanced technologies and sophisticated techniques. Some mid-sized firms also use computer-aided equipment, but most of these companies are not very automated. Smaller firms continue to depend largely on the skills of their owner-managers, who tend to rely on intuition and hunches rather than on new manufacturing concepts.

Wages in northeastern Mississippi's furniture industry are high, equal to those in the highest technology industries in the state—even though educational requirements for furniture workers are lower. But this high-pay/low-skill industry, by deemphasizing education, is creating a skills shortage in other industries.

Tupelo might easily have become more renowned as the birthplace of the "King," Elvis Presley, than as the kingdom of upholstered furniture. In part, serendipity set it on the latter course.

MORRIS FUTORIAN: CATALYST FOR INTERNAL GROWTH

Until the middle of this century, Grand Rapids, Michigan, and later, High Point, North Carolina, dominated the craft-based furniture industry. Morris Futorian, a Russian immigrant living in Chicago, became convinced in the 1940s that, by mass-producing it, upholstered furniture could be made more affordable.

Turned away by North Carolina, Futorian found access to raw material, lower-cost labor, and a community open to his ideas—and willing to raise money for his

plant—in Mississippi. He opened the doors of his new company in New Albany in 1948. To this day, mass production methods distinguish Mississippi's upholstered furniture industry from North Carolina's, which employs a team approach, in which two workers might produce an entire piece.

Futorian invested heavily in passing on to his workers not only the skills and production methods of the business, but also the entrepreneurial drive that made him successful. Because the industry requires little capital—just skill, some basic equipment and courage—over the years, many Futorian employees have left to form their own companies in the region. The firms they started form the core of the region's industrial cluster. Today, they refer to themselves as graduates of the "University of Futorian."

CDF: CATALYST FOR EXTERNAL GROWTH

The success of Mississippi's furniture sector is also widely attributed to the vision and participation of community leaders and the Community Development Foundation (CDF), which was formed the same year the Futorian plant opened. CDF's early successes helped the region achieve its current national reputation as a place that has limited natural resources but is smart about developing its economy.

CDF devotes significant resources both to helping its region's existing industries develop and to attracting new—often complementary—industry to the area. So, although much of the growth in upholstered furniture has been internal, Mississippi also has aggressively recruited non-upholstered furniture companies such as Krueger International, an office furniture maker that moved to Tupelo in 1963. CDF will go to great lengths to attract new companies. A Canadian wood manufacturer was lured to the region in 1944, for example, when area residents planted some 300,000 loblolly pines for it. Tupelo is presently working hard to round out its upholstered furniture cluster by attracting a fabric company to the region.

As the industry grows, so do its suppliers and support services. Futorian, working with community leaders, attracted many key suppliers to the area, among them, producers of mattresses, frames and springs. For its part,

(continued on next page)

the community has created more than 950,000 square feet of showroom space in two buildings; more space is under construction. One show last year drew more than 20,000 buyers. The showrooms themselves have served to attract other companies to the area.

Cooperative *and* competitive

The upholstered furniture cluster has given rise to social networks that reinforce entrepreneurship and quality standards. Owners and managers—most of whom were born and raised in the area, attending the same schools and churches—exchange advice or information and visit one another's plants freely. They often travel together to the same trade show, exchanging information in the process.

The companies share services related to training and research. A few, both individually and collectively, use the services of Mississippi State University's Forestry Lab for R&D. According to a former furniture company owner, they share more technology than they might be inclined to admit.

Indeed, since they are part of a tight-knit community, the area's businesses have not needed formal trade associations to bring them together. So, for example, the American Furniture Manufacturing Association, although a source of information to firms, was unsuccessful in its bid to establish a local chapter.

On the other hand, the region's companies remain fiercely competitive. Appearances to the contrary, Futorian did not appreciate losing his skilled employees to their own entrepreneurial activities, nor do many other employers. Indeed, many resent losing their employees—even though it strengthens the region's economy—and often will not do business with them.

The firms are intensely protective of their designs and innovations. Ironically, were someone to suggest a regionwide government policy to nurture the types of dense concentrations and relationships that produce benefits similar to those they currently experience, the owners probably would renounce it and reaffirm their individualism.

Fighting complacency

Some believe that success may lead the region's firms to become

complacent and, perhaps, make poor business judgments. The current strength of the market forgives many mistakes: With domestic demand keeping the industry at or near capacity, SMEs in particular are making little effort to seek out, develop and nurture export markets or consider newer technologies. According to one large local firm, most of the small firms have no idea how much it costs to make their goods. Moreover, demand for training and retraining is low among SMEs; they assume that anyone hired off the street will be productive after a short time on the job.

These attitudes notwithstanding, the region is committed to ongoing education and training. Itawamba Community College believes that higher skills will further increase productivity. Consequently, it is offering education and training programs in furniture design and production and demonstrating and providing training on new automated equipment in the nation's only advanced technology center for furniture upholstery.

U.S. BUSINESS CULTURE: LIVE INDEPENDENT OR DIE?

Can rugged individualist U.S. businesses develop the levels of trust and collective vision needed to sustain a dynamic cluster? Despite popular and political rhetoric to the contrary, alliances and coalitions among firms are as much a part of U.S. business culture as is competition. When businesses believe that what they do is better done together than alone, they *will* cooperate. Even direct competitors who avoid any other form of cooperation turn to one another when they need help—to fill a large order, share training or resolve problems with new equipment. Such relationships facilitate business' effective use of financial and human capital.

Alliances and coalitions among firms are as much a part of U.S. business culture as is competition.

Businesses that enter into alliances do not necessarily cease to compete. Competitors that perform the same function or sell to the same markets may continue to

compete vigorously, pushed toward ever-higher levels of performance by the steady flow of people and information within the alliance. Conversely, firms that pursue fierce individualism or isolation from their peers can actually inhibit innovation by reducing the access to information that might inspire improvement.

Branch plants: in or out?

Are clusters by definition composed exclusively of small and medium-sized enterprises (SMEs), or can they also include large, multi-plant corporations? Most of the current literature assumes that clusters are made up of small-scale firms that split the division of labor. The highly touted European cluster examples are predominantly composed of SMEs. Indeed, "cluster" has become almost synonymous with "flexible specialization"—that is, broad division of labor and decentralized production.

Large corporations, particularly as they establish relationships with suppliers, *could* be a focus and an anchor for clusters. But their size enables large firms to internalize critical production and service functions economically and, if they choose, to own the skills and information they need to compete. Because large enterprises can use internal economies of scale, they don't need proximity to complementary firms in order to operate efficiently. This can be a disincentive to invest locally. "Large multi-plant firms," writes Bryant College professor R.D. Norton, "even though headquartered in a particular city, are more likely than small firms to invest internally generated funds in other places."[16] After studying many sectors, Harvard Business School's Michael Enright similarly concluded that "large establishments of large firms do not, on average, promote the geographic concentration of an industry."[17]

Distinctions between large and small firms are becoming irrelevant because, in the effort to remain competitive, large firms increasingly are operating like loose federations of small firms.

On the other hand, some branch plants are organized as profit centers rather than cost centers. Thus, they enjoy greater autonomy in their investment and marketing decisions and are able to operate more like independent companies.[18] Indeed, MIT's Charles Sabel argues that distinctions between large and small firms are

becoming irrelevant because, in the effort to remain competitive, large firms increasingly are operating like loose federations of *small* firms. Large corporations become holding companies that make services available to branches and monitor their performance, while the branches carry out increasingly specialized operations autonomously in their local environments. The more specialized these branches become, the more they rely on public sector services—and on their relationships to other firms engaged in different phases of the production process.

The more specialized plants become, the more they rely on their relationships to other local firms engaged in different phases of the production process.

Firm size: (when) does it matter?

Are small firms really the key to regional competitiveness, or do the large corporations remain in the driver's seat? Not everyone believes that clusters of flexible, successfully competing and cooperating SMEs are generating most new jobs today. Bennett Harrison contends that small firms considerably lag behind large firms in the use of technology and in wages and benefits. Indeed, he suggests that SMEs are led and dominated by the largest corporations, and that many small firms are created by the large firms as commodities, with the expectation that they will eventually merge into the larger companies.[19]

That large corporations dominate many sectors, pay higher compensation (surely, in part, because they are more frequently unionized), and are responsible for considerably more job growth than they are given credit for (whether directly, or by outsourcing production to suppliers) is indisputable. Harrison's quarrel, however, is not with the concepts of sector strategies or clustering or the importance of relationships among firms. Rather, he objects to the current policy emphasis on small firms. Harrison urges greater attention to small firms that are networked to larger customers, which he contends remain the chief engines of employment and economic growth.

Rural clusters: prosper or perish?

Can clusters or districts prosper in rural areas, or do they need higher population densities? In the United States, greater urbanization is often used to

justify targeting resources at particular regions. Yet most of Europe's successful industrial districts are located in towns or small cities. The hosiery firms in Castel Goffredo, Italy; the injection molders in the village of Oyannax, France; and the machining cluster in the remote village of Sakaki, Japan, are but a few examples of successful clusters in very rural areas.

Just as the Grange and other agricultural organizations once fostered learning and innovation among farmers, rural areas may offer a more amenable context for interfirm collaboration, even if they cannot support as high a concentration of firms and services as larger cities.

In the United States, too, clusters can be found in smaller cities. Furniture companies are clustered in and around Tupelo, Mississippi; carpet producers in Dalton, Georgia; hosiery companies around Fort Payne, Alabama; wood product firms in Bemidji, Minnesota; and plastic companies around Pittsfield, Massachusetts.

In small towns, relationships are more personal, business transactions less formal and the concept of community more highly valued. Thus, less urbanized settings may actually be a more favorable milieu for learning and exchanging information.

Also, the agricultural tradition that favors small, entrepreneurial units of production and cooperatives creates a supportive environment in many smaller communities. Just as the Grange and other agricultural organizations once fostered learning and innovation among farmers, the town or small city may be a more amenable context for interfirm collaboration, even if it cannot support as high a concentration of firms and services as larger cities.

The information highway: will proximity remain an advantage?

Do sophisticated information and telecommunications technologies—and, indeed, the "information superhighway"—make geography obsolete when defining clusters? One facet of the restructuring of industry in western nations is the increasing willingness of firms to work with distant suppliers, given the enhanced ability to communicate without having to travel from site to site. Place is becoming increasingly irrelevant to information-dependent industries, particularly those that produce simple or mature products.

Nonetheless, a recent article in *The Economist* disputes the argument that computers will eliminate the importance of space: "Companies that have gone furthest towards linking their global operations electronically report an increase, not a decline, in the face-to-face contact needed to keep firms running well: with old methods of command in ruins, the social glue of personal relations matters more than ever."[20]

Sabel links the importance of proximity to the life cycle of the product a group of firms produces: "The shorter the product life cycle, the more likely it is that indispensable knowledge about production will become local knowledge: imbedded in the half-articulated practices of persons who are in daily contact, and who alone are in a position to grasp the implications of what they say and do."[21]

In short, face-to-face contact is the most effective way to develop the trust that facilitates the information sharing and informal give-and-take that lead to innovation.

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Government Policy and Business Clusters

Assuming that clusters can create competitive advantages, can government play a role in their formation? Experience to date here and abroad shows that governments cannot by themselves *establish* clusters, but they *can* foster conditions that strengthen them.

The arguments against

Nonetheless, government often is reluctant to target significant resources to specific industries, sectors or clusters. This fact is attributable to various concerns.

Fairness. Firms expect to be treated fairly by governments, to receive no more and no less than other, similar firms. And governments, unless some overriding principle or social purpose is at stake, such as redress-

Governments cannot by themselves establish business clusters, but they can foster conditions that strengthen them.

ing past discrimination, are inclined to honor this presumption. Targeting sectors clearly affords some groups of firms an advantage over others.

Making mistakes. When it's defined solely in terms of products, targeting implies predicting winners and losers—one activity that most believe governments do *not* do well. At times, an overdependence on producing specific goods using specific processes has wrought disastrous consequences for regions that lost their comparative advantage to newer technologies or lower-wage regions. For example, textiles moved from the Northeast to the South, and footwear and consumer electronics everywhere moved offshore. It is hardly surprising that so-called "industrial policy" has gotten a bad reputation, and that governments are reluctant to target resources.

Lack of knowledge. It is rare that a government possesses the knowledge required to understand a cluster and its dynamics. What intelligence there is—often limited to the data government itself collects—is seldom extensive or timely, Fortunately, methodologies for conducting industry studies are rapidly improving, enabling regions willing to invest in learning about their key industries to do so.

Loss of independence. Public sector agencies generally assume that small businesses are independent and individualistic—and want to remain that way. Evidence collected from surveys and interviews, however, belies that assumption. A recent study by the Manufacturing Studies Board of the National Academy of Sciences concludes that isolation is one of the major barriers to industrial modernization. Businesses rarely operate alone, nor do they want to; they are interlinked as suppliers, customers, advisors, sources of information and rivals.

Inefficiency. That markets allocate capital more efficiently than the public sector is a basic premise of capitalism. Porter notes that "Governments have been notably unsuccessful in managing firms and in responding to the fluid market changes that characterize international competition. Even when staffed with the most elite civil servants, governments make erratic decisions about industries to develop, the technolo-

gies to invest in, and the competitive advantages that will be the most appropriate and achievable…Government simply cannot be as in tune with market forces as industry participants. Government cannot create competitive industries."[22]

The arguments for

Despite these policy objections, some governments are crafting policy and programs that seek to support business clustering in their regions. They believe that targeting resources at existing dynamic clusters or sectors need not interfere with markets; rather, it can reflect their reality. They argue for cluster-focused initiatives on the following grounds:

Economies of scale. State programs that support industrial competitiveness tend to be small compared to the need. It's unlikely that today's government will ever create a program for manufacturing modernization on the scale of its agricultural extension services. Quite simply, no existing or planned services could possibly reach the nation's 360,000 manufacturers individually. Dealing with problems and needs common to *groups of firms* by targeting clusters—including fledgling clusters in rural areas—can greatly expand the capacity of public and private services and come closer to achieving the scale needed to affect a local economy.

Dealing with problems and needs common to groups of firms—by targeting clusters—can greatly expand the capacity of public and private services.

Comprehensive SME services. The requirements of small and medium-sized business seldom are simple or one-dimensional. Needs for new technology, for example, are linked to needs for capital, training, reorganization and markets. When government organizes its services by function, it forces businesses to find and deal with many agencies to effect a single change. Moreover, those agencies—although typically expert in the *function* they offer—often do not understand the *industries* they serve. Providing comprehensive services organized by specific cluster is another service option. Such services can be provided by agency staff drawn from, and therefore able to understand, the industries served, or can allow current staff the opportunity to learn a particular industry in-depth.

Synergy effects. The public sector can foster synergy—essentially, the effect of the whole becoming more than the sum of its parts—as firms discover that they can accomplish more together than individually. Synergy drives competing firms that are seeking comparative advantage toward excellence and niche markets. It enables related firms to reduce transaction costs and times and to achieve economies of scale. And it promotes learning and skills development in labor markets. By supporting clusters, the public sector can thus catalyze the multiplier for private goods and services that inevitably develop around concentrations of firms.

Regional competitiveness. Porter has observed that regions cannot be more competitive than their industries: "Firms compete in industries," he writes, "not nations." If Porter is right, then actions that strengthen its key industries ought to strengthen a region, and government's role is to improve the circumstances that impinge on competitiveness.

Although public policy is moving toward closer ties between business, government and labor, smaller manufacturers are often left out of the pact.

Porter calls these "factor conditions"; Harrison, the "three T's"—technology, training and technical assistance; and Michael Best, "shaping and using" rather than "planning" for markets. Maryellen Kelley calls for intervention strategies to accelerate interorganizational learning and technology diffusion—like industrial extension, technology demonstration and information services. Oregon, in 1991, designed such a policy for its dominant industry, wood products. *(See "Oregon Wood Products Competitiveness Corporation," facing page.)*

Social contracts. Although public policy is moving toward closer ties between business, government and labor, smaller manufacturers are often left out of the pact. They have little trust in government; they typically believe it makes demands on them but offers little in return. Individually, these businesses may be too small to justify spending the time and resources to get involved in policy formation and the social or business organizations that might legitimately represent their interests. Collectively, however, small firms have the potential to exert a considerable impact. Public programs that serve targeted firms collectively and are staffed by industry- or region-savvy personnel are much more likely

OREGON WOOD PRODUCTS COMPETITIVENESS CORPORATION

Sometimes public policy is moved more quickly by crisis than by opportunity. Oregon is a case in point. In the late 1980s, a court ruling designating the spotted owl an endangered species required West Coast states to protect its habitat, many of the old-growth forests. Oregon, with more than one-third of its manufacturing jobs in the wood and lumber industries, was hit hard by the ruling. But the state managed to turn a disadvantage into an opportunity by shifting its industry emphasis from *primary* wood products—harvesting and exporting logs—to *secondary* wood products and adding value through manufacturing.

"A WAKE-UP CALL"

The seeds for this policy change were sown when the Northwest Policy Center, a multi-state regional organization based in Seattle, arranged for key legislators and state officials to make a study tour of western Europe. The state leaders were quite intrigued with how government catalyzed industrial modernization and how firms worked with one another in Germany, Scandinavia and Italy. "The trip to Europe was like a wake-up call," recalled former state senator Wayne Fawbush, who then chaired Oregon's Joint Committee on Trade and Economic Development. "This was just what we were looking for. Using cooperation and competition together was a totally new concept to us." Upon return, the legislative staff director Joe Cortright noted: "The opportunities to apply the European ideas were right in front of us: the Oregon wood products crisis."

To see what might be done, the legislature commissioned a study of the wood products sector. This study examined local circumstances, the industry itself and what was being done elsewhere. The local industry emerged fiercely independent and suspicious of any government effort to help it. The study also conducted a series of focus groups with small businesses. The resulting report recommended a new course of government action that included:

- technical assistance
- flexible manufacturing networks
- financial incentives
- a new coordinating entity and industry commission

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Public dollars, private decisions

This process and an interim committee's recommendations produced Senate Bill 364 which established the Oregon Wood Products Competitiveness Corporation (WPCC) in July 1991. The nonprofit WPCC's purpose is to "improve and promote the competitiveness of Oregon's secondary wood products industry." The legislature appropriated $2.3 million for WPCC's first two years.

WPCC is not a typical state program. With it, the legislature created a sector strategy that is truly customer-driven—and one that would, after two years, be self-financed.

The legislation establishes a framework and desired outcomes, but leaves daily operations to WPCC's directors, seven manufacturers initially appointed by the governor. So, although the legislature proposed using an extension service, service vouchers with incentives for multifirm projects, networks and capital access programs, WPCC has had free rein to develop its own agenda.

WPCC's directors subsequently traveled to Europe to learn for themselves what had so impressed the state's leadership. But their private sector background led board members to somewhat different conclusions about the European programs. They liked the idea of collaboration, but were leery of some of the financial incentives used in Europe, fearing these might favor some firms over others.

WPCC directors thus moved toward a sector strategy to build capacity to support the modernization of industry in the region, create a capital pool, and establish the social foundation necessary for cooperation. Networks, they believed, would develop as firms became better acquainted with one another, and as they were presented with structured opportunities for collaboration. After hiring an executive director, WPCC began to formulate a plan around its top priorities: access to capital, market development and workforce preparedness.

Solid results

Within a year and a half, WPCC became a solid industry association, providing many functions associated with government agencies in some states and with trade associations in Europe. It is creating a co-

operative pool of working capital—the Credit Enhancement Fund—and educating bank officers about the needs of small manufacturers. WPCC is active in market development, organizes buyer-supplier conferences, provides seed funds for collective product development and design, and is a clearinghouse for information about market opportunities. It promotes industry interaction and cooperation through direct communications, meetings and tours.

Finally, the corporation's workforce development efforts plan to include youth apprenticeships, student internships and more general school programs aimed at expanding industry training. The first class to graduate from WPCC's Basic Technology Training Program, offered through the community college system, is undertaking a needs assessment of the industry. One result is that WPCC discovered that its training needs can be better met in a more flexible system. Therefore, it has formed the "Targeted Training System," which is governed by a seven-member board of manufacturers. Various skills courses are offered at a variety of locations in the state, including the plants of equipment manufacturers.

With additional public funding through 1998—for such services as training and market development—WPCC now has more time to reach its goal of earning two-thirds of its revenues from memberships and fees for services. During FY 1994, its first full fiscal year as an independent nonprofit organization, it received 15 percent from non-public services; for FY 1995, it projected that figure to rise to 25 to 40 percent. In March 1995, paid membership, which began only in January 1994, had reached 75 firms, representing about 5,000 workers.

A CLUSTER OF CLUSTERS?

The true challenge is to pursue self-sufficiency without ignoring innovation and modernization. In the effort, WPCC itself is learning to cluster. In alliance with WoodNet, a network/association in the Olympic Peninsula, and the Evergreen Partnership for Exports, WPCC formed the Northwest Forest Products Consortium, which won a $201,000 regional alliance grant from the U.S. government in 1994. The new alliance, whose goals are regional marketing, training and policy coordination, will enhance WPCC's competitiveness efforts and provide breathing room to strengthen support from industry.

The idea that competitiveness is associated with industries as well as with places and individual firms is still quite new to most development agencies.

to establish social contracts that merge the goals of the private and public sectors.

Changing mindsets. The idea that competitiveness is associated with industries as well as with places and individual firms is still quite new to most development agencies. It turns economic development policy on its head—*from* developing the business climate of locations in order to attract industry *toward* developing the capabilities and improving the effectiveness of industries in order to attract customers. In so doing, it demands a new mindset, in which "production" takes precedence over "consumption."

A growing number of innovative government agencies are turning to industrial modernization and beginning to build sector strategies into their policies and programs. To do so, they need new types of information about industry and business relationships, special infrastructure and new ways of measuring outcomes. These are all discussed in Chapter 2.

CHAPTER 2. KNOWING YOUR CLUSTERS: TECHNIQUES FOR UNDERSTANDING REGIONAL ECONOMIES

It is no secret that the textile and apparel industries are a big part of North Carolina's manufacturing base, that automobiles account for a sizable portion of Michigan's manufacturing output, or that the wood products sector employs the largest share of Oregon's manufacturing workforce. Such concentrations are equally obvious in some large metropolitan areas. Aerospace in Seattle and Wichita, microelectronics in Austin, and office furniture in Grand Rapids dominate their respective local economies.

Understanding rural economies—and identifying industry clusters in the process—is much like assembling a jigsaw puzzle with some of the pieces missing.

Readily accessible national- and state-level government statistics can be used to help assess the scale of such high-visibility, high-output industries, or to analyze some changes that affect them. Likewise, data to help gauge large urban industrial clusters are frequently available, if more limited.

But for smaller cities and rural communities, the quantitative picture is much less clear. Analysts may be able to discern the outlines of clusters and key industries with some effort. But it is much more difficult to see—and to measure and map the structures of—substate economies, which are less concentrated and more likely to depend on small firms that are missed by government data collection methods. Consequently, in less populated areas, small but important clusters of firms can easily be overlooked when formulating public policy.

Understanding regional, and particularly rural, economies—and identifying industry clusters in the process—is much like assembling a jigsaw puzzle with some of the pieces missing. The picture can't be completed without the missing pieces. Edges and corners—the easiest pieces to locate—are like the data collected by government agencies. These data, although available, may not be in quite the form needed. The missing pieces depict not-so-obvious relationships and patterns of interaction

This chapter is about finding and assembling all the pieces needed to complete a picture of an industry in a given region.

and transaction among people and firms; currently, this information simply is not captured by existing databases.

This chapter is about finding and assembling *all* the pieces needed to complete a picture of an industry in a given region. It's about discovering how, where, with whom and from whom people acquire information, skills and knowledge—and how they transact business. It details this discovery process: taking objective, relatively easily available data, and subjecting it to increasingly sophisticated and creative analyses in order to put together the whole dynamic picture of regional activity. Specifically, this chapter:

- describes common data sources that can be used to **MEASURE INDUSTRY CONCENTRATIONS AND RELATIONSHIPS**
- describes and provides examples of various approaches to **UNDERSTANDING THE NATURE OF REGIONAL ECONOMIES**
- provides a set of questions to **SPUR FURTHER RESEARCH** efforts
- suggests mechanisms for **DETERMINING FIRM RELATIONSHIPS WITHIN A REGION**

Measuring Industry Concentrations and Relationships

Every U.S. company is classified by the Department of Commerce according to its primary product, assigned a Standard Industrial Classification (SIC) code that corresponds to that product, and asked to submit some basic data on a regular basis. The department compiles and releases these data in ways that do not compromise individual establishments' confidentiality. Primarily, the data are used to obtain a rough picture of industry and business trends. Data collected by the federal government also capture industry relationships that are based on interfirm purchases and sales. But other types of relationships among firms—reliance on a common technology, for example—cannot be easily discerned using government data, if at all.

LOOKING AT THE WRONG PICTURE: GOVERNMENT DATA WEAKNESSES

Significant gaps and difficulties can surface when trying to use government data to uncover regional clustering activity. Here are just a few examples:

The unit of analysis: firm vs. industry. Traditional industrial development strategies (for example, business recruitment) tend to use the individual firm as their unit of analysis. But development policies that focus on modernization and enhanced competitiveness demand data that allow analysis of a specific industry. Currently, the only way to approximate this kind of information from government data is to aggregate individual firms within an industry.

Static vs. dynamic data. Even if you do aggregate, an additional problem appears: Most data are like "snapshots" of one-time, static conditions rather than "moving pictures" that illustrate the dynamic flows over time that are typical in an active industry cluster. To understand an industry, data are needed about the formal and informal activities that generate business transactions and diffuse technology, knowledge and innovation. Companies in a dynamic industry engage in vertical relationships with one another—called value-added chains or commodity chains—to yield final products. Although value-added relationships can be estimated using models based on the national aggregate of purchases and sales recorded by businesses, these models are based only on gross estimates which, at the regional level, may diverge significantly from reality.

SIC limits. Data that is organized by the Standard Industrial Classification (SIC) codes of industries focuses on firms that produce the same end products. It does not capture industry groupings that are based instead on the use of common technologies, specialized expertise or skills, or ties to a scarce resource.

Industry changes and predictive ability. Because large corporations are increasingly decentralizing and outsourcing production, it is changing their make-versus-buy decisions—and consequently, purchases and sales—so rapidly that official statistics cannot keep pace. Thus, these data may lose their value for predicting.

As the puzzle that depicts an economy is pieced together, the image that forms tends to be abstract and open to interpretation. Economists, geographers, business experts and social scientists have invented and refined a broad range of techniques for making sense of regional economies and analyzing the implications of their workings for public policy.[23] These are summarized below, and a few are fleshed out further in Appendix A.

Determining scale and patterns

The wealth of quantitative and qualitative information about product-defined industries that is collected by federal and state government agencies, researchers and industry associations provides a good starting point for measuring and comparing industries. Primary resources follow.

County business patterns. This annual publication of the U.S. Department of Commerce is probably the most widely used source of industrial data. It reports numbers of establishments, employees and size of payroll by county and SIC code. The data are usually at least three years old when released, but are generally adequate for policy and planning purposes, since the aggregate numbers change little from year to year unless a dominant employer closes or moves.

Economists, geographers, business experts and social scientists have refined a broad range of techniques for making sense of regional economies and analyzing the public policy implications of their workings.

County Business Patterns has a more serious limitation: exclusion. This is a particular problem in rural areas where, to ensure firms their confidentiality, detailed information may be suppressed at the county level. If, for example, five or fewer establishments operate in a county and one is large, data are reported for none of the establishments. The routine withholding of information about Washington State's aircraft and New York's photographic equipment industries to protect Boeing and Kodak, respectively, exemplifies this practice.

In addition, *County Business Patterns* misses many of the smallest manufacturing firms. While North Carolina's 1990 *County Business Patterns* lists 804 furniture and fixture establishments, a state industrial ex-

tension service agent has identified about 3,800 companies, many of them "small shops that probably don't want government knowing they're there."

Still, *County Business Patterns* does provide a rough picture of establishment and employment clusters. In 1991, for example, it placed approximately two-thirds of the nation's hosiery firms in North Carolina and a third of those in Catawba County.

The wealth of quantitative and qualitative information about product-defined industries that is collected by federal and state government agencies, researchers and industry associations provides a good starting point for measuring and comparing industries.

Business directories. Business directories maintained by state extension agencies, chambers of commerce and trade associations can be used to obtain more detailed information, verify government figures or obtain addresses in order to distribute surveys. State directories are expensive to maintain and, for most industries in most states, not regularly updated. Moreover, it's difficult to make comparisons across the various data sets contained in these directories since each reports on different populations of establishments.

Census manufacturing data. The Census Bureau's *Census of Manufactures*, published every five years, contains data for every industry at the four-digit SIC code level, aggregated by state and metropolitan statistical area, on capital expenditures, inventories, cost of materials, value added and shipments.

Although it draws data only from the nation's largest firms, Census' *Annual Survey of Manufacturing* does cover the majority of manufacturing employees; thus, it offers a good estimate of national output. Because it includes such a small proportion of establishments, it is less useful for identifying concentrations of production facilities.

The *Current Industrial Report*, also published by the Census Bureau, reports production and foreign trade activity for approximately 5,000 products each month. These data are only for the nation as a whole, and only represent the largest firms.

Balance of trade data. Another measure of an industry's performance and importance is its balance of trade. The Census Bureau com-

Reports on county business patterns, local business directories, census data on manufacturing and balance of trade, industrial overviews and measures of competitiveness each have limitations—but together can help to flesh out the picture of a regional economy.

piles exports and imports annually by industry and state in *Exports, General Imports and Imports for Consumption, SITC-Rev 3 Commodity by Country.* The Department of Commerce's International Trade Administration (ITA) uses these data to estimate exports and imports by SIC code.

ITA estimates state-level exports by industry from the *Shipper's Export Declaration, Census of Manufactures* and *Annual Survey of Manufacturing*. The validity of this survey is questionable, however, because it tracks merchandise not to the point of production but to the point of origin, which may be a wholesaler or distribution center rather than the manufacturer.

Industrial overview data. For a summary national overview of an industry, economic development officials can turn to the *Industry Outlook Handbook*, published annually by the Department of Commerce. This report presents, in a few pages for each major industrial sector, major trends in trade and exports, technological changes, expected sources of competition, market outlook for the coming year and long-term prospects for growth.

The report's shortcoming is its requisite brevity; all information is aggregated at the national level, and none is available at more than the three-digit SIC code level. With those restrictions, there is no mention, for example, of North Carolina's concentrated hosiery industry. Moreover, forecasts are based only on extrapolated demand; they do not take into account innovation, technological advancement or industrial restructuring.

Competitiveness data. Measures of competitiveness generally are neither available nor highly reliable; when collected, they are expensive. For example, in 1988, the federal government surveyed firms in selected two-digit SIC code durable goods industries about their current and planned uses of 17 advanced computer-based technologies. The survey was not repeated until 1992, when it was administered in abbreviated form. Findings from both surveys were of insufficient scale to produce statistically sound findings for a state or region.

Specific, detailed information about technology applications is sometimes collected or contracted for by industry associations or private businesses, but is usually priced beyond the reach of small firms or the public sector.

Besides similar businesses, business clusters can also include those firms' value-added chains—that is, the supplier and service firms that contribute to producing the end product.

Describing value-added chains

Besides similar businesses, business clusters can also include those firms' value-added chains—that is, the supplier and service firms that contribute to producing the end product. Therefore, clusters may include firms with a variety of SIC designations. A company might, for example, make wooden pallets (SIC 2448) for a firm that supplies electronic equipment (SIC 367) to an aircraft assembly plant (SIC 3721). Unfortunately, there is a scarcity of data available to help identify value-added activity in a region.

At the national level, the U.S. Department of Commerce periodically collects purchase and sales information, which it uses to construct a model that explains value-added chains and predicts growth patterns. The data are aggregated and organized into a national industry *input-output table* that reflects flows of goods among sectors—that is, national value-added chains—at a given time. The national input-output table shows change in demand for a final product, and estimates the impact of this change on all other industries. Each cell in the input-output table contains a number (a "coefficient") that represents the relative proportions of goods sold by one sector (plotted on the x-axis) to another (plotted on the y-axis)—that is, the output of each industry that goes into the next stage of production of all other industries, all the way to the final product.

The biggest problem with using such tables to model flows of goods and services is that the coefficients represent nationally aggregated business transactions that occurred more than a decade earlier. These estimates may be obsolete, given the rapid restructuring of industry and diffusion of technological change. Further, because firms are classified by primary product (SIC codes), the table misses relationships that involve secondary products.

At any level of detail, input-output analysis describes only average patterns of transactions, not what specifically occurs within regions. Analysts rely heavily on input-output tables to identify and measure the scale, employment level and output of regions' key supplier industries, but have no assurance that the local firms in those sectors are the firms that actually supply the region's final producers. Private information providers that have synthesized and manipulated the federal data have managed to produce only gross estimates of input-output data at the state level.

Unfortunately, there is little information available to help identify a region's value-added activity.

Understanding Regional Economies

Even the most careful data analysis can yield only a sterile, incomplete picture of industries within regions. The richer contextual information needed to understand actual industry dynamics requires more creative analyses. Such analyses generally view industrial relationships from one of four perspectives:

- As **PATTERNS OF BUSINESS TRANSACTIONS**. This view is favored by regional economists.
- As **SOCIAL SYSTEMS** related, for example, to learning and division of labor. This view is often espoused by economic geographers.
- In terms of **ECONOMIC OUTCOMES.** Business schools typically pursue this route.
- As multidisciplinary **ENVIRONMENTAL SCANS.** Government agencies and consultants generally favor this approach.[24]

Each perspective is described in more detail below; with examples drawn from recent practice or observation.

...As patterns of business transactions

One school of thought holds that regional economies are defined primarily by patterns of business transactions—that is, purchases and sales among

A SAMPLING OF REGIONAL SECTOR ANALYSES

Many of the most rigorous and useful regional industry studies have been conducted under grants or contracts from private foundations or government agencies. A few examples:

Appalachian hardwood. In 1991, the Appalachian Regional Commission (ARC) supported a study on the flow of goods in the northern Appalachian hardwood industry to estimate the potential for exports and new product development. Unable to find public data on the flow of hardwood products into or out of the region—which includes parts of several states—ARC was forced to rely on estimates.

For various SIC codes, ARC analysts compared production/demand ratios, to determine whether the region was a net importer or exporter of various wood products; they also assessed the industry's technological capacity and problems. ARC concluded that lowering costs was the key to competitiveness—and that one way to do this was to increase the concentration of firms so as to achieve economies of scale.

Baltimore area machining. In 1992, the Institute for Policy Studies at Johns Hopkins University, with support from the Maryland Department of Economic and Employment Development, conducted a thorough study of the competitiveness of the machining industry in the Baltimore region. To assess network opportunities, the study closely examined relationships among firms by gathering information directly from businesses through focus groups, interviews and surveys.

The final report described the industry in some detail, including its composition, markets, use of technology, capital needs and sources of information. Recommendations addressed alternative ways to build networks—including single-purpose consortia, multipurpose networks, strengthening existing trade associations such as the National Tooling and Machining Association, and facilitating ad hoc associations of machining firms.

Mid-hudson clusters. The New York Department of Economic Development charged its Division of Policy Research with identifying the major clusters in one seven-county region. Picking clusters, the department noted, was not the same as picking winners; rather, it meant

(continued on next page)

finding proven successes and core competencies. The result, reported in December 1993, was Competitive Analysis of the Mid-Hudson Economy: The Role of Industry Clusters. Using location quotients, shift-share analysis and input-output models (*all techniques described further in Appendix A),* the department determined that information technologies, biomedical, distribution, business services and tourism were the region's key clusters. It subsequently examined the specific strengths and weaknesses of each of these industries to determine how to best position them for success.

firms. The assumption is that firms' desire to achieve external economies of scale and reduce transaction costs leads—without government intervention—to territorial agglomeration and the natural growth of vertically arranged, sector-specific industrial complexes. The input-output table, described in the last section, is a primary tool for measuring such patterns.

One school of thought holds that regional economies are defined primarily by patterns of business transactions—that is, purchases and sales among firms.

ITI'S HIGH-IMPACT SECTOR ANALYSIS. An example of this approach, developed by Michigan's Industrial Technology Institute (ITI) is a trade-based analysis called "high-impact sector analysis." This analysis uses customer-supplier relationships as its organizing framework. ITI's methodology was motivated by the increased reliance on outsourcing by many of the Midwest's larger producers, including Michigan's own "Big Three" auto companies.

The procedure starts by finding which manufacturing industries are the major sources of wealth generation in a region. ("Wealth generation" is defined in terms of the value of exports and levels of employment; a set of decision rules is established for selecting cut-off points.) Then it identifies the smaller firms that support the wealth-generating activities, and describes their technology profiles. Finally, it estimates industry competitiveness by applying national survey data for current and planned uses of technology.

UNCOVERING THE "INVISIBLE FACTORS"

Given sufficient time and resources, a region can be examined in great detail. In the late 1980s, Doerringer, Terkla and Topakian conducted a comprehensive study of an 18-county region of north central Massachusetts. The study, published as *Invisible Factors in Local Economic Development*, assessed the history, strengths, weaknesses and future of each of the region's key industries. Most of these industries were made up of small, niche producers that relied on workers' specialized skills, developed and passed down in families for generations.

Among the "invisible factors" revealed by the study—factors difficult to find in a more shallow analysis—were:

- the accumulated specialized skills of the labor force
- informal shopfloor R&D—based on workforce innovation achieved through "tinkering"
- critical linkages between the companies and the local economy

Unfortunately, the value of ITI's rigorous methodology is diminished by the weakness of available data. Input-output data and national surveys of technology use provide a rough estimate of a region's economy, but reveal nothing about sector-specific skills, organization and leadership, or about external conditions. Moreover, because of other data-dependent biases, the method tends to find nearly all of its agglomerations in metropolitan areas.

IED's input-output models. The University of North Carolina's Institute for Economic Development (IED) uses input-output models to analyze various sectors for the North Carolina Rural Development Center, Inc., and to identify industries that are sufficiently important to rural areas to justify industrial modernization initiatives.[25] In a recent effort, IED:

- plotted the locations of the goods and export industries it judged most likely to grow and benefit from modernization

- used the input-output tables to determine their suppliers
- precisely mapped the intermediate goods sectors, all at three-digit SIC code levels

After combining its findings with analyses drawn from the 1993 *Industrial Outlook Handbook* and data on employment, wages and quarterly growth, IED concluded that seven target industries merited expanded modernization efforts: lumber and wood products, printing and publishing, plastics and synthetics, rubber products, fabricated metals, miscellaneous machinery, and electrical and industrial equipment.

USFS' IMPLAN. The U.S. Forest Service has contributed a tool for estimating business transactions at a regional level. The IMPLAN—Impact Analysis for Planning—model can be used to estimate how changes in demand for particular products will affect other businesses in a regional economy. The model was used, for instance, to estimate the effects of trade in various sectors concentrated in Portland, Oregon, on the state's peripheral rural areas.

The social systems approach to regional assessment emphasizes relationships built around common markets and services, shared labor markets, and technology and innovation.

...As social systems

More closely related to sociology and organizational theory than to economics, the social systems approach to regional assessment emphasizes relationships built around common markets and services, shared labor markets, and technology and innovation. According to sociologist Walter Powell, "the key flaw [in conventional approaches to regional assessment] is the 'exclusive focus on the transaction, rather than the relationship,' along with neglect of the role of government in shaping the institutional 'context' in which the exchange is conducted."[26]

As Powell suggests, important interfirm relationships need not connect exclusively by purchases and sales. The optics and imaging firms clustered around Rochester, New York, and the microelectronics firms concentrated in Silicon Valley, California, for example, sell little to one another and have few formal business relationships. Yet the

constant interaction among entrepreneurs and scientists in these regions—through professional and trade associations, social and civic organizations, and local educational institutions—drives innovation and learning and accelerates the growth of these clusters. Sternberg observes that "employees [are] engaged in mutual learning by being employed at each others' firms (and the large corporations), participating in technical interactions, such as at local chapters of scientific and engineering organizations, and through relationships with local educational institutions."[27]

...As economic outcomes

Assessing regional economies on the basis of economic outcomes—rather than economic profiles—has become particularly popular among public agencies.

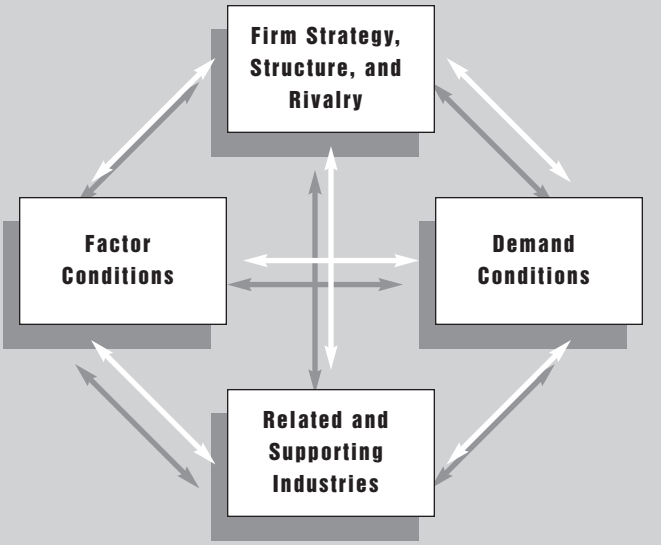
Harvard Business School professor Michael Porter's approach to assessing regional economies has become particularly popular among public agencies—perhaps because it is based on economic *outcomes* rather than economic *profiles*, and, thus, is easier to justify to politicians.

Porter developed his model to explain not *where* the largest regional complexes have formed, but *why* certain regional complexes have become more successful than others. Although levels of clustering in geographic areas can be measured—and often are obvious—the competitive potential of clusters is not obvious. This is the difficulty Porter sets out to address. Based on studies of industries in ten nations, he has established four sets of determinants essential to a region's—or nation's—competitiveness:

- firm structure
- local demand
- related and support industries
- "factor conditions"—that is, skills, infrastructure, capital and similar factors

Figure 1 illustrates how Porter depicts the relationships among these four as a "diamond."

FIGURE 1. PORTER'S DETERMINANTS OF REGIONAL/NATIONAL ADVANTAGE



Source: Porter, Michael. The Competitive Advantage of Nations. 1990.

A serious deficiency in any one of the model's four cornerstones, Porter contends, will undermine the others and reduce an area's overall competitiveness. Although Porter's diamond model is based on national systems, he believes that "the region or city is, in many ways, more important than the nation as a locus of competitive advantage."[28]

MASSACHUSETTS. In 1991, Porter used his diamond model to analyze the Massachusetts economy, industry by industry. At that time, the state was suffering a precipitous economic downturn after years of rapid growth; this was due in large part to the declining competitiveness of many of its high-tech industries—notably, minicomputers—following cuts in defense spending.

Porter concluded that Massachusetts still possesses most of the conditions essential for global competitiveness—skilled workers, sophisticated local buyers, support industries and rivalry. He traced the state's weaknesses to interruptions in the flow of capital.

Porter suggested this be remedied by improving fiscal affairs and introducing incentives to spur long-term investment; developing a human resource strategy; building long-term infrastructure, particularly for transportation; and launching a trade association initiative. The state subsequently collaborated with the University of Massachusetts to develop a detailed, region-by-region and industry-by-industry strategy, called *Choosing to Compete*. The strategy divided Massachusetts into eight regions, identified the key clusters within each and assessed competitiveness regionally.

Porter's diamond has generally proven to be more helpful in understanding clustering than in actually formulating policy. Thus, unlike Massachusetts and Quebec *(see "Quebec in the 90s: Going for Clusters," next page)*, although other states and regions have used the diamond analysis to analyze and organize firms in their key sectors, few have reorganized their services to correspond to these sectors.

New hampshire. A University of New Hampshire team used the diamond to analyze industry in that state. While the team was able to identify leading industries using productivity, wage and export growth rates, it did not find the tight relationships that characterize competitive clusters or the local firm rivalry that drives innovation.[30]

The team attributed this to the fact that most state firms tend to pursue niche markets. Very few New Hampshire firms—only 3 percent—compete head to head with other firms in the state or region. Most manufacturer concentrations in southern New Hampshire are more closely linked as suppliers to firms outside the state; two out of three are engaged in collaborative relationships with customers.

Although New Hampshire sectors lack the basic criteria to be a self-contained cluster, their concentration does provide external economies of scale and opportunities for the state and the New England region as a whole to develop and deliver services collectively.

...As environmental scans

The environmental scan offers a semi-structured approach to analyzing various aspects of a sector. It juxtaposes forecasts of market, technology

QUEBEC IN THE 90S: GOING FOR CLUSTERS

In December 1991, the Quebec government proposed a brand-new economic development policy based on industrial clusters. The Ministry of Industry defined an industrial cluster as "a set of industries in the same sector of activity that interact, come together and compete with each other to become more competitive and accelerate their growth."

"Success," the Minister of Industry stated, "can no longer stem from individual efforts in pursuit of short-term objectives. From now on, success will flow from pooling our collective efforts."

How did Quebec arrive at the decision to adopt a sector strategy? It was a response to industrial restructuring and a willingness to innovate.

Genesis: a decade of manufacturing slump

Quebec, like many areas during the 1980s, saw employment grow in the service sectors while it declined in manufacturing, particularly in mature industries. The province's competitive position was suffering from slow productivity growth and rising wages. Although several promising new industries were beginning to emerge, during this period government policy focused on improving management practices in traditional industries and attracting foreign investment.

Toward the decade's end, policy began to shift toward growth industries. Unfortunately, just as in the United States, most such policy tried to improve industrial efficiency by focusing assistance on business *functions* rather than industry *sectors*. Quebec did, however, target resources to SMEs.

Fourteen regional field offices employed 240 professional extension workers to help SMEs upgrade their management functions and production capabilities. But the focus of these efforts was the individual firm, particularly end producers. Little attention was paid to value-added chains or linkages among firms that might strengthen the economy.

Proposed: a new social contract with industry sectors

By the end of the 1980s, Quebec's Ministry of Industry began to realize that competitiveness is not simply the result of individual firms doing better, but a collective

outcome of groups of firms *interacting*. Provincial government, heavily influenced by the work of Michael Porter, began to rethink its industrial policy and to make *synergy* the focal point of its strategy. But Quebec had to adapt Porter's national analysis to the special circumstances of a province of about 7 million people with no direct control over national economic policy.

The result was a strategy focused on industrial clusters—one that predicated success on coordinating collective (rather than aggregating individual) efforts. The ministry declared that this strategy represented "a new social contract."

Targeting clusters

As part of its new policy, Quebec targeted 14 sectors. Five already were globally competitive—aerospace; pharmaceuticals; information technology; electric power generation, transmission and distribution equipment; and metals and minerals processing. The remaining nine industries, although they did not yet meet the ministry's requirements for competitiveness, were strategically important because of their development potential.

Within each cluster, the government established committees to analyze problems, evaluate competitiveness and potential, and propose new initiatives. Although the committees were drawn primarily from the private sector, the government committed support to improve those factors that it could influence: worker qualifications, modern infrastructure, tax policy, technological skills, R&D, access to North American markets, expertise in natural resources and quality of life.

The committees evaluated each cluster in terms of industrial base, growth potential and competitiveness, and then diagrammed the cluster's dynamics. So, for example, the aerospace committee reported that some 150 establishments, employing approximately 33,000 people, made up 44 percent of Canada's aerospace output. The sector, which includes prime contractors, equipment manufacturers, subcontractors and special products producers, was characterized by fierce international competition and—because of its dependence on defense contracts—widespread government involvement. Key challenges included developing commercial markets and identifying and focusing on new niche

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specialties. Its most pressing needs were R&D and training.

Adding value to exports

In implementing a parallel plan to boost value-added exports, Quebec decided to pursue a dual track to address both the macro needs of the sector and the micro needs of firms. In one of its first acts, the province convened cluster leaders to secure their agreement with the analysis, and to ask them to tackle the problems of their respective sectors and identify problems they might undertake collectively. All accepted the challenge.

The government subsequently committed roughly $30 million to a three-year effort to support its designated clusters, in which all projects originated in the private sector and all public funds had to be matched.[29] "We never put dollars up without private sector support," explained a spokesperson. "They must make the effort and commit resources and we follow."

Approximately two-thirds of the initiative's funding promotes partnerships within large clusters. About half of the remainder helps establish partnerships with universities, colleges and other non-profit entities in order to gather commercial intelligence about technologies, markets and environmental issues of interest to the sectors. Clusters must demonstrate leadership and membership support to be eligible to participate in these programs.

The aerospace industry provides an example of how the program works. This industry historically has purchased few components in Quebec. "Our job," observed an industry representative, "is not economic development; it's to sell planes. If you want us to buy here, then help us get suppliers with quality as high as those we now buy from in other countries."

Quality, the industry asserted, was hard to find in Quebec. Ensuing analysis revealed a key problem: Small firms did not have the resources to complete the extensive certification process required for the various specifications of each of the end producers. So the end producers agreed to "standardize" their specs; now certification by one automatically certifies a supplier for the others. Also, workshops were conducted to upgrade the suppliers' capabilities in order to help them qualify. The province provided some technical assistance; the companies bore most of the cost.

Nurturing networks

The government also encourages collective approaches to production, marketing and problem solving. A $3 million program initiated in 1992 was designed to activate 100 new networks within the targeted sectors. Government grants of $10,000 support feasibility studies for networks of three or more firms. If sufficient promise is demonstrated, an additional $15,000 may be requested to cover up to half the cost of implementation.

A complementary initiative is targeted at stimulating the formation of cluster service centers. This effort offers individual grants of up to $100,000 ($2 million total) for establishing service centers with at least four corporate sponsors that can match the grant.

and skill changes with information about the availability and uses of specialized resources and services, the strength of industry leadership and organization, and the linkages among firms. "Scanners" frequently use focus groups to gather detailed information and validate assumptions about an industry. Ideally, environmental scans take into account industry dynamics, as well as an industry's importance to a state or region.

Environmental scans take into account industry dynamics—looking at forecasts of market, technology and skill changes, the availability and uses of specialized resources, the strength of industry leadership, and the linkages among firms.

Oregon wood products. The Northwest Policy Center, on behalf of the Oregon Interim Legislative Committee on Forest Products Policy, conducted an environmental scan of the wood products industry, with the goal of increasing value-added production. A team compiled available information about the industry and reviewed best practice in sector-based strategies, including strategies used successfully in Europe. After digesting and analyzing these "off-the-shelf" data, the team invited owners and managers to a series of regional focus groups across the state.

NPC used the focus groups to learn what these decisionmakers believed were the barriers to and needs of their industry. The team found, for example, that:

- Rural firms, particularly in the eastern part of the state, felt distant and isolated from capital and sources of information and support, and that transportation costs made it difficult for them to be cost-competitive.

- There is no dominant secondary wood products commodity market; rather, there are hundreds of niche markets.

- The common bonds among these niche markets include their design and production skills and dependence on the unique quality and availability of Oregon timber.

This scan led to legislation establishing the Oregon Wood Products Competitiveness Corporation. *(See "Oregon Wood Products Competitiveness Corporation" on page 39.)*

Each of these four analyses—viewing industrial relationships as patterns of business deals, as social systems, in terms of economic outcomes, and as multidisciplinary environmental scans—can help people understand a region's economy.

Analyzing Cluster Dynamics

The dynamic flows in clusters

Each of the four approaches just described can help people understand a region's economy. Each considers some of the relationships that contribute to or constrain a region's dynamism—specifically, the patterns set by the continuous flow of information, goods, skills, services and capital. The patterns can flow:

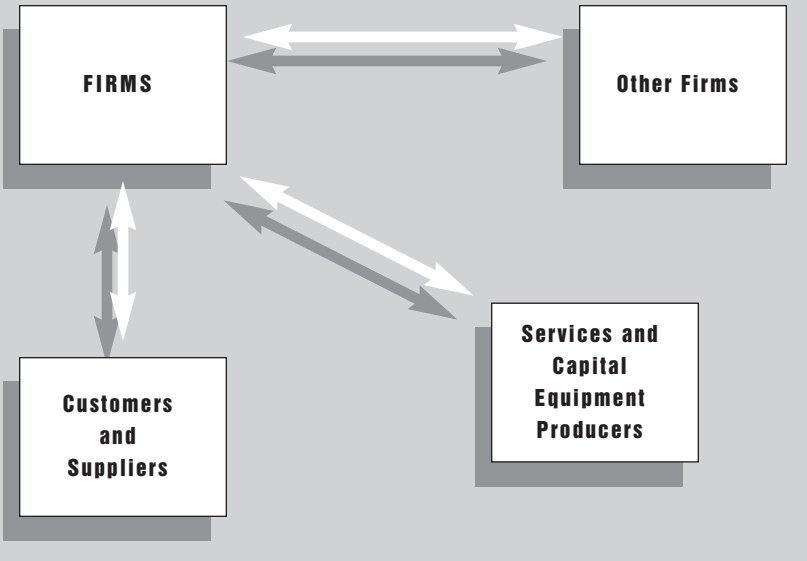
- **horizontally,** among and between owners and employees of businesses and industries

- **vertically,** between businesses and industries and customers, suppliers and vendors

- **diagonally,** between businesses and industries and central sources of services and information—such as sector headquarters, colleges, trade associations or research labs—and producers of equipment

Figure 2 captures these flows.

FIGURE 2. COMPETITIVENESS RELATIONSHIPS IN CLUSTERS



These flows occur, directly and indirectly, through gatekeepers and brokers, both within and across regional boundaries. The flow patterns that accelerate learning, innovation and growth—and the factors that facilitate or impede them—are mostly informal, rarely noticed or measured by policymakers. Figure 3 lists the various factors that contribute to competitiveness.

FIGURE 3. DYNAMIC FLOWS IN REGIONAL ECONOMIES

FACTOR	CONTRIBUTIONS TO COMPETITIVENESS
Information	Expanded knowledge of markets and technologies
Ideas	Rapid diffusion
Goods	Value-added chains between firms
Services	Supplementary local support and expertise
Customers	Demands for improved and new products
People	Skilled and experience labor force
Capital	Resources for investment, start-up and expansion

Finding the flows

Trying to understand the economic and non-economic activity flowing in business clusters raises a number of new questions, many of which cannot be answered by impersonal "bean-counting" statistics. Rather, answering these questions requires labor-intensive research—involving surveys, interviews, focus groups and interaction with business leaders and members of civic and economic associations and institutions—about how individuals act on behalf of their companies. Answering these questions, which focus on the factors that contribute to cluster competitiveness, demands creative approaches and thoughtful analysis.

Information. How and from whom do firms acquire their information about markets and technologies? The National Academy of Science's Manufacturing Studies Board concluded that isolation is one of the most significant problems facing small manufacturers.[31] Isolation diminishes when market demand or government incentives stimulate the formation of industry-specific organizations such as trade associations, technical colleges, export services or technology centers. What business organizations do exist, and how active are their members?

Trying to understand the economic and non-economic activity flowing in business clusters raises a number of new questions about how individuals act on behalf of their companies.

Ideas. How are ideas and innovations diffused throughout a region? Trading know-how, even among rival firms, fosters further innovation and the kind of continual improvement that characterizes high-performance firms.[32] But what circumstances facilitate or impede diffusion? Robert Putnam's study of Italy links economic vitality to civic mindedness and community-based civic and economic associations. Is there a social infrastructure that supports the diffusion of ideas?[33]

Goods. Which goods flow within a region? Also which flow in, and which flow out? Proximity alone does not make a cluster; synergy and value added are realized only when firms do business with one another. Most industries have lead firms or "locomotives," end-product producers that export their outputs. Lead firms typically purchase inputs from other, usually smaller, firms. Industries that produce complex products, which require substantial investments in facilities and R&D (for example, aircraft and pharmaceuti-

cals), tend to feature larger, fewer, more concentrated lead firms than industries that serve niche markets (like knitwear or furniture). So what are the real patterns of purchases and sales within a region? Which patterns are hypothetical, based on national averages or conventional wisdom?

Services. Where do firms acquire the skills and expertise they need? Specialized programs that help qualify entry-level employees and upgrade the skills of current workers are essential to modernization. Federal vocational education legislation specifies that people who complete these programs know "all aspects of the industry." Is high-quality training geared to the target industry available—whether provided by the public or private sector—and used? To whom do the businesses turn for expert consulting? Is that expertise available locally? Is it tailored to the firms' specific needs?

The missing pieces to the puzzle of understanding a regional economy are the measures that describe flows of ideas and information as well as business exchanges.

Customers. How is customer demand exerted on the region? Who and where are the customers, how do they communicate with producers, and what are they asking for? Regions gain comparative advantage when firms' customers are close enough to influence the design, function and cost of products, and are sufficiently discriminating and sophisticated in their tastes to push producers to strive for higher levels of excellence. By comparison, when customers demand only that price be competitive, and not quality, it impedes firms' decisions to make long-term investments in modernization.

People. What patterns of employment mobility exist among managers, technicians and entrepreneurs in area firms? Skilled, specialized labor markets are critical to successful regions. From northern Italy to Silicon Valley, when entrepreneurial firms spin off and skilled personnel shift among firms, it accelerates learning and drives clustered firms to continually improve in order to retain their comparative advantage. What is the success rate of new businesses started by the former employees of a region's leading firms? Are entrepreneurs and skilled labor inclined to remain in the region or to move elsewhere?

Capital. Where do businesses acquire their capital? If industry is to expand and modernize, local financial institutions must both under-

stand and support the particular capital needs of a region's sectors. Are investment and working capital adequate for the target industry? Do banks understand and actively encourage industry expansion and modernization?

Going for the flows

To find out how firms relate to others in a region requires labor-intensive research—surveys, interviews, focus groups and interaction with civic and business leaders.

As described above, the missing pieces to the jigsaw puzzle of understanding a regional economy are the measures that indicate or describe flows of ideas and information as well as business transactions. Hard data reveal little or nothing on this subject. While assessment tools are widely available, most focus only on the needs of individual firms.

To find out how firms relate to others in a region requires unorthodox proxies, unobtrusive measures, subjective judgments and labor-intensive surveys. Such information can only be gathered by talking with local business and industry leaders, spending time learning about their businesses and building coalitions. The following checklist contains questions that practitioners can use to build this kind of understanding of their region's industries.

When deciding how and when to pursue questions on this checklist *(see "Checklist: Understanding Cluster Dynamics" on next page),* note that:

- Firms already burdened by demands for information will respond more quickly to requests that originate in or have the support of trusted private sector organizations.
- The flow of business transactions and diffusion of innovation are best tracked unobtrusively, in ways that threaten neither firms' trade secrets nor their comparative advantages.
- Much of the needed information is personal, and can be best collected through focus groups, business associations and inconspicuous measures.

Once the information is gathered, it should augment standard industry data to provide a much clearer and more useful picture of the inner workings of a cluster—and of what interventions might further improve it.

CHECKLIST: UNDERSTANDING CLUSTER DYNAMICS

Flow of knowledge and ideas

- What trade or professional associations or industrial foundations have local chapters? What services do they provide?
- Who are their members and how active are they—do they attend meetings, take part in planned functions, use the services offered?
- How often are issues specific to the industry covered in the local business press each year?
- How many faculty members or professional staff in local colleges and universities do research, teach classes, do training or provide services tailored to the industry? What do they do?
- Do industry representatives participate on regional or state advisory boards, task forces or commissions?
- What sorts of interactions do companies have with their customers and with their suppliers?
- How many column inches of coverage did the local media devote to firms in the cluster—their activities, economic issues, prospects, and so on?

Flow of capital

- Where do firms get resources for new investments?
- Do local banks understand the cluster and its needs? Are these banks accessible to small- and medium-sized enterprises?
- How many grants are made by local foundations to firms in the cluster? How large are these grants and what are their purposes?
- Where is new or used capital equipment purchased? How much of this equipment is purchased from other firms in the region?

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Flow of goods

- Who purchases what from whom within the region, as measured by sales to or purchases from other firms?
- How many firms are engaged in interfirm collaboration—for example, purchasing cooperatives, continuous improvement user groups, group trips to trade shows, networks, joint ventures?
- Which companies are the major exporters? To what countries do they export, and how?
- Do firms collaborate on production or marketing?

Flow of people

- How mobile is the workforce within and outside of the cluster, as measured by number of skilled, technical and professional new hires from within and without the region, and by the number of workers who change jobs in a given year?
- How many graduates from the region's technical colleges and universities begin their employment in the cluster?
- Where have the local entrepreneurs acquired their skills, and where do they get their ideas? How many were originally employed by other local firms?

Flow of services

- What specialized resources or service centers for the cluster exist? What are their budgets and number of employees? Who uses them?
- What is the level of annual R&D expenditure related to the specific technologies or products of the cluster?
- Which consultants do business with firms in the cluster?
- Where are the suppliers, customers and rivals for lead firms in the cluster located?
- Does the state department of economic development have any special expertise in or programs targeted to the cluster?

Rivalry and cooperation

- Are there any existing cooperatives, such as for purchasing or marketing, serving the cluster?
- How frequently do groups of firms co-produce, co-market or share employees or resources?
- For what markets are firms competing most vigorously?

CHAPTER 3. CLUSTER-BUILDING STRATEGIES: EXAMPLES FROM PRACTICE

In the hollows and mountains of Appalachia, good jobs are scarce and new high-growth companies rare. The region's rich endowment of natural resources is probably this rural area's best chance for economic growth—if it can increase their value added and then expand its markets.

That's beginning to happen in Kentucky, as exemplified by a handful of visionary, innovative firms joined together in the Kentucky Wood Products Network. The Network's successes have convinced some astute state leaders that what happens on a small scale in the Network could, with the right support, happen on a much larger scale across the state.

In February 1994, legislative staff, key legislators and industry representatives hammered out a bill that creates a new statewide organization—the Kentucky Wood Products Corporation. The Corporation, governed by a 12-person, industry-dominated board, is empowered and funded to: (1) establish hubs that will integrate technology and training; (2) to award incentives for interfirm collaboration or networks; and (3) to provide information aimed at "increasing the product quality and productivity of Kentucky's wood products manufacturers and processors and enhancing the global competitiveness of Kentucky's secondary wood products industries."[34]

States and localities are shifting their economic development strategies toward offering multiple services to specific industries.

Kentucky's comprehensive approach to this particularly important segment of its economy is one example of how states and localities are shifting their economic development strategies *from* providing specific services to multiple industries *toward* offering multiple services to specific industries. *(Chapter 4's case studies present more examples.)*

At one time intensely challenged, state and local programs that target industry clusters now are becoming common. Compared to more

traditional strategies of recruiting business, building infrastructure and training workers, most are small in scale, constrained in part by limited resources. But most programs also are still in their infancy. With patience and persistence, support may continue long enough to determine if these cluster-focused programs will bear lasting fruit.

Even at this early stage, though, anecdotal evidence shows that some strategies are working better than others. Some programs are taking off, while others are still trying to figure out just what is expected of them and how to proceed. Each is producing lessons worth learning. This chapter describes how regions plan and build industry-focused programs and, in particular, how they select appropriate strategies.

Choosing What to Target

A region interested in pursuing focused development strategies must begin by identifying its key sectors or clusters—those that are most important to or hold the greatest potential benefit for the region.

It is relatively easy to identify key industries using one or more of the standard methodologies described in Chapter 2. Doing so leads, for example, to auto supplies and furniture in North Carolina, or to optics and electronics and biomedical products in New York. Most regional industry analyses begin with comparisons of data; the more thoughtful studies quickly move beyond the numbers to include measures or descriptions of conditions and competitive advantages and disadvantages within a sector or cluster.

A region interested in pursuing focused development strategies must begin by identifying its key sectors or clusters—those that hold the greatest potential benefit for the region.

In this process, some states have found that a single industry is of sufficient economic and strategic importance to warrant special attention. For example, legislatures in both Kentucky and Oregon created innovative programs targeted at their dominant secondary wood products industry. Other states, however, have decided to concentrate first on enterprise development, and then to select specific sectors based on new product and business potential. In one case, the Alabama Power Company

FIGURE 4. EXAMPLES OF INITIAL STATE KEY INDUSTRY SELECTIONS

ARIZONA	ALABAMA	ILLINOIS	OREGON	FLORIDA	NEW YORK
■ Information	■ Micro-electronics	■ Food Processing	■ Forest Products	■ Space Industries	■ Biomedical
■ Business Services	■ New Materials	■ Industrial Machinery	■ Agricultural Products	■ Laser/ Optics	■ Optics & Imaging
■ Aerospace	■ Biotech-nology	■ Electrical Equipment	■ High-Tech	■ Health Technology	■ Advanced Machinery
■ Health/ Biomedical	■ Telecom-munications	■ Manufactur-ing Inputs	■ Metals	■ Information Industries	■ Environ-mental Tech-nologies
■ Mineral/ Mining	■ Civilian Aircraft	■ Transporta-tion Equip-ment	■ Fisheries	■ Biomedical	■ Information Technologies
■ Agriculture/ Food Processing	■ Machine Tools	■ Electronics	■ Film & Video	■ Defense Industries	■ Business & Financial Services
■ Transporta-tion	■ Computers	■ Health/ Biomedical	■ Biotech-nology		■ Information, Media & Design
■ Tourism		■ Transporta-tion & Dis-tribution	■ Software		
■ Environ-mental Technologies		■ Export Service	■ Plastics		
■ Optics		■ Travel	■ Aerospace		
■ Software		■ Coal Mining	■ Tourism		
		■ Telecom-munications Equipment	■ Environ-mental Services		

produced a plan for the State of Alabama that strategically focused on seven technology-heavy sectors. Still other states, hoping to make that big discovery that leads to a hot new product, have invested heavily in research and venture capital programs for biotechnology.

Figure 4 shows a sample of the results of recent state and provincial industry analyses. As the table shows, these regions have rarely used categories that match SIC codes. Some are relatively narrow—for example,

Having chosen its key industries, a region must formulate a development strategy. Classifying strategies in terms of their target and function helps focus developers in the program design phase.

"machine tools" or "film and video"—others, like "manufacturing inputs" or "services," are broadly inclusive, depending on what the cluster's defining common characteristic is.

Choosing Development Strategies

Having chosen its key industries, a region must formulate a strategy. Most existing sector or cluster strategies—except for lobbying efforts for industry protection or tax relief—can be classified in terms of their *target* and *function*. These distinctions are quite loose. They are useful distinctions, however, because they help focus developers in the program design phase.

TARGET-BASED STRATEGIES are either:

- *sector specific*—distributed to address a particular industry or industries across the state as needed, with no particular emphasis on any single geographic subregion; or
- *cluster specific*—aimed at geographic areas in which specific industries tend to cluster

FUNCTION-BASED STRATEGIES, which are the actual services selected to assist the cluster, can be:

- *comprehensive/capacity-building*—intended to build capacity and improve firm performance through public incentives and private sector leadership; or
- *comprehensive/broker and catalyst services*—designed to network public or private organizations and/or independent brokers, not to provide a specialized service but rather to discover what an industry needs and where to find it; or
- *institution-based/service*—meant to stimulate public or private organizations to deliver particular services and offer specific expertise to an industry

FIGURE 5. CLASSIFYING PROGRAM TARGETS AND FUNCTIONS: SELECTED EXAMPLES

	SECTOR	CLUSTER
COMPREHENSIVE/ CAPACITY BUILDING	Oregon Wood Products Competitiveness Corporation Industrial Clusters—Arizona	Louisville-Jefferson County's Office of Economic Development—Kentucky Tri-State Manufacturers' Association—Minnesota, North and South Dakota
COMPREHENSIVE/ BROKERS AND CATALYSTS	Industrial Technology Institute—Michigan Oklahoma Alliance for Manufacturing Excellence	Northern Economic Initiatives Corporation—Michigan WoodNet—Olympic Peninsula, Washington
INSTITUTION-BASED/ SERVICES	Industrial Extension Service—Georgia Textile/Clothing Technology Center—North Carolina	Advanced Furniture Manufacturing Center—Itawamba Community College, Mississippi Machine Action Project—Massachusetts

These two classification schemes are not mutually exclusive, but contain elements and aspects of each other. Figure 5 illustrates this concept; and some of the specific examples are described further below.

Comprehensive/capacity-building strategies

Operationally, comprehensive/capacity-building strategies support industry leaders and their organizations, and provide incentives to encourage activities that strengthen such organizations and benefit the entire cluster. Government—and, in some cases, the private sector—facilitates these strategies by investing in *social capital*, that is, by providing support to the organizational infrastructure that helps firms develop a shared vision, identify collective interests and pursue new opportunities.

By investing in comprehensive capacity-building strategies, government can help firms develop a shared vision, identify collective interests and pursue new opportunities.

OREGON'S WINNING TICKET: KEY INDUSTRIES. Oregon leads the nation in innovative sector strategies. This is partly due to the fact that its state lottery proceeds are targeted to economic development, and partly to the vision of creative legislators and legislative staff. Besides its initial sector-focused effort, the Oregon Wood Products Competitiveness Corporation, described in Chapter 1, Oregon also created the Key Industries Program in 1991. Like the wood products project, the goal of the Key Industries Program is to instill a culture of cooperation in the state.

- **FIRM RELATIONSHIPS**. To start the program, the state worked closely with key industry leaders to identify appropriate strategies, and then offered them financial incentives to support activities likely to improve their industries' competitiveness. Each key industry subsequently organized roundtables of business leaders and trade association officials to discuss issues, challenges and needs—and to suggest responses.

  It is noteworthy that each key industry roundtable emphasized relationships more strongly than services, believing that strengthened interfirm ties would go a long way toward increasing competitiveness. Typical of the activities subsequently funded were the formation or expansion of sector-based business associations—notably the Oregon Biotechnology Association and Software Association of Oregon, and the Oregon Environmental Technology Association—and the creation of a newspaper for the state's film and video industry.

- **KEY INDUSTRY SUMMITS.** As a step toward developing an industry vision and refining action plans, Oregon hosted a summit meeting on key industry benchmarks that drew more than 150 industry representatives. Sector groups subsequently began developing benchmarks—including targets for company formations, training expenditures, payroll, revenues, international sales, environmental spending and the like—and presented these to the governor in June 1993.

  In April 1994, Oregon hosted its second key industries summit, this one on educational issues. Each industry studied its needs and prob-

ARIZONA'S CLUSTERS: A NEW DEVELOPMENT STRATEGY

In 1991, Arizona completed the most comprehensive planning process it had ever undertaken. Arizona Strategic Planning for Economic Development, a public-private venture supported by state government and businesses, contracted with the private consulting firm SRI International to assess the state's economy and make recommendations.

Arizona's diversity posed an interesting challenge. Its dense urban concentrations are characterized by high-tech growth, while its sparsely populated rural areas are dependent on traditional resource-based industries. Any economic development plan would have to address very different rural and urban issues.

Eleven clusters, seven "foundations"

Arizona's plan pinpointed nine key industrial clusters—aerospace, agriculture/forestry and food, business services, health/biomedicine, information, mining and minerals, optics, tourism, transportation/distribution—and seven "foundations" needed to support their growth—human resources, capital, quality of life, technology, tax and regulation, information and communications infrastructure, and physical infrastructure.

The governor appointed working groups of business leaders for each cluster. Each working group, with a core membership of 25 to 30 people, was co-chaired by the CEOs of one large and one small company. The governor also delivered a charge to the cluster groups:

- Catalog the key components of the cluster.
- Articulate a cluster vision for the next two decades.
- Identify growth opportunities for existing firms and recruitment opportunities for new firms.
- Identify opportunities for synergy.
- Determine needs—and strategies for meeting these needs—for each of the seven foundations.

Each group met three to five times during the year to agree on opportunities and map relationships, both among themselves and with key suppliers and vendors. Governor-appointed com-

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missions for each of the foundation groups—made up of service providers from the public, private and nonprofit sectors—were then asked to respond to the preliminary needs each cluster identified.

In fall 1991, the nine cluster working groups and the seven foundation groups met to establish the priorities needed to meet their collective and individual goals. Many of the 97 recommendations they agreed upon applied across sectors. Had the process stopped there, clusters probably would have ended up only an interesting planning tool, not an economic development strategy. But the cluster groups did not dissolve. They continued to meet, sometimes under the umbrella of an existing trade association, sometimes as new entities. The process also proved to be a catalyst for the formation of other clusters. In 1992, environmental technology firms became the state's tenth cluster; in the following year, 300 software firms joined as the 11th.

Activities: state-sponsored and entrepreneurial

Once the publicity subsided and the firms got down to business, two kinds of cluster activities began to take shape. The first type was initiatives organized by the state. For example, the state arranged a trade mission to federal laboratories to identify new technologies with commercial potential. To avoid any perception of preferential treatment, the state opened the tour to any Arizona high-tech firm, regardless of whether it was an official cluster member.

The second set of activities was more entrepreneurial, and largely cluster-led. For example, the environmental technology cluster inaugurated a new, nonprofit membership corporation with eight dues-paying members. By early 1994, the corporation had 65 members and 200 associates. One of its first tasks—to commission a targeted analysis of its industry—gave rise to two initiatives, one to set up business seminars, another to pursue new opportunities in Mexico. Members also "cross-clustered," attending meetings of other clusters that might be considering environmental problems. The environmental technology and optics clusters, for example, jointly organized a "trade mission" to National Laboratories in California and New Mexico to arrange partnerships.

Devolving the strategy

Arizona's planning process has encouraged local governments to formulate their own cluster strategies. Citizens in Gilbert, Arizona, sat down to analyze what economic factors set their town apart from other similar-sized towns, and determined that their niches were in advanced materials, information, and recreation and entertainment. They promptly formulated recommendations for degree programs and specialized training for advanced materials. Likewise, the Greater Tucson Economic Council is promoting the Arizona Optics Initiative, raising money for industry-university research, endowed professorships, venture capital and education to generate interest in optics among grades K-12 students.

Breaking with tradition

Despite its innovative nature—or perhaps because of it—Arizona's process has its problems. For one thing, promoting firms' active involvement has not been easy. For another, it's been difficult for people steeped in traditional business recruitment practices to take on new and different approaches. Consequently, to reach consensus, the clusters have had to begin with general objectives regarding training, infrastructure and marketing. Moreover, many cluster group recommendations harken back to the 70s and 80s, with calls for less regulation and more relocation incentives.

In addition, there are few standards against which the clusters can measure their success. The state's most successful clusters *have,* however, identified a few projects that generated short-term, measurable outcomes.

Nonetheless, Arizona's efforts to refocus development on existing industries are slowly reshaping public-private relationships and fostering new and exciting development practices.

lems and presented both short- and long-term action plans that covered education from pre-school through graduate school.

- **Regional offshoots**. As the Key Industries Program began to take root, Oregon's Economic Development Department devolved the idea to the regional level. With input from the counties, it orga-

nized the state into 12 development regions. Each appointed a regional strategy board to identify key industries within the region. For example, the board for the Marion, Polk and Yamhill Counties used employment trends, location quotients and shift-share analysis to designate agricultural, forest products and high-tech clusters. The board then identified opportunities, barriers and threats for each key industry, set five long-term goals, and produced a two-year action plan that served as a proposal to the state.

Clusters in the southwest. Arizona also set out to address the needs of its key industries by building internal capacity. *(See "Arizona's Clusters: A New Development Strategy" on page 77.)* After carefully analyzing its economy with particular attention to rural development issues, the state targeted 11 key clusters, as noted in Figure 4. As in Oregon, state officials worked with industry leaders in each cluster to identify issues, problems and needs. Each cluster subsequently established a strategic plan, and is now beginning to tackle high-priority mutual problems.

In Oregon and Arizona, state officials worked with industry leaders in each cluster to identify issues, problems and needs. Each cluster subsequently established a strategic plan, and began to tackle high-priority mutual problems.

Bottom-up policies. In other states, communities too impatient to wait for government action and fortunate enough to have entrepreneurial and forward-thinking leadership have begun to experiment with cluster strategies. Large urban centers like Los Angeles, smaller urban areas like Louisville, Kentucky, and Tupelo, Mississippi, and rural enclaves such as Minnesota's Elbow Lake and Maryland's Eastern Shore are forming organizations aimed at making their industries more competitive.

The catalysts for such action vary widely. In Los Angeles, the mayor's office and local university took the lead; in Louisville, the county Office for Economic Development *(see "Louisville's Industry Networks," facing page)*; in Tupelo, a private community foundation; in Minnesota, a small group of manufacturers organized as the Tri-State Manufacturers Association *(see "Tri-State Manufacturers Association" on page 80)* to secure substantial foundation support; and in Maryland, a state-created and -supported regional technology council.

LOUISVILLE'S INDUSTRY NETWORKS

As cities throughout the nation vie with one another for new businesses and more tourists, Louisville, Kentucky, has embarked on a very different path. By attending more aggressively to its existing industrial base, it is setting the pace for the state and the region.

OED: THE CATALYST FOR INTERFIRM COLLABORATION

The Louisville-Jefferson County Office for Economic Development (OED), with the support of Mayor Jerry E. Abramson, announced that it would reach out to and organize its leading clusters and help them develop collective approaches to modernization. In September 1993, the city launched Industry Networks, a program aimed at helping companies in similar market clusters share resources and expertise.

The individual who championed this initiative, Kathy Slay, an OED staff person, proposed the strategy of interfirm cooperation after participating in a series of regional workshops on industrial modernization and networks supported by the Appalachian Regional Commission and The Aspen Institute. The OED effort was crafted to meet dual objectives—first, to learn directly from business and, second, to choose target clusters carefully so as to avoid fragmenting resources.

NARROWING THE TARGETS

Using the 1987 *Census of Manufactures*, OED analyzed local concentrations of business by SIC code, and selected eight promising sectors as central to their clusters: food processing, fabricated metals, miscellaneous plastics, printing, nonelectrical machinery, electrical machinery, motor vehicles and supplies, and chemicals. Further study reduced OED's targets to four specific SIC-code-based sectors—food industry, metal and plastic fabrication, nonelectrical machinery and electrical machinery—and one not drawn from standard classifications, that is, suppliers to General Electric, a leading producer and employer.

Next, OED identified the highest-priority clusters, carefully scanned the competitive environment, and solicited firms' views of specific opportunities within each sector. Because it had regularly surveyed local manufacturers, OED already knew what the firms did and had some idea about their vertical relationships. Although its knowledge

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base could not detail information about other kinds of activity flows among the firms, the program aimed to influence those flows by building trust and closer linkages among firms.

Organization and kick-off

By February 1994, two industry clusters—food processing and metalworking—had officially organized under OED leadership and begun regular meetings. A third cluster, plastics, was just forming, with nonelectrical machinery and printing soon to follow.

Each cluster was inaugurated with a kickoff meeting in which the mayor and a county executive encouraged the constituent firms to work together for their mutual benefit. To prepare for the first food processing cluster meeting in November 1993, OED surveyed 50 companies about their investments, modernization plans and views on the strengths and weaknesses of the city's infrastructure and business climate.

OED learned that more than 70 percent of the companies had made capital investments in the past three years, and together had added 514 new jobs (net) in the prior year.

To better understand the cluster, OED disaggregated the industry into nine separate groupings of four-digit (SIC) industries that included, for example, meat and poultry, dairy products, confectionery products and processed fishery products. Using government data, it highlighted the long-term prospects for each and organized focus groups to introduce the idea of interfirm collaboration. At the first meeting, cluster representatives resolved to address three common issues: total quality management and vendor certification, continued training of the existing workforce, and team-building techniques.

Food processing cluster membership is about 20 active firms, but 6 to 8 core members generate much of the activity. Some members—particularly the larger companies—had met previously, but none had worked together in any capacity. Thus, the initial cluster meeting was the first opportunity most had to meet their peers.

Each group decides when, how often and where it meets. Food processing products has chosen to meet regularly, usually at one of the member's plants, with an OED employee facilitating. Although members set the agenda, specialized services providers—for example,

University of Louisville's business and engineering schools, Louisville Gas & Electric, and the Department of Agriculture—often attend.

Betting on prosperity

The challenge to the clusters is to build membership and expand the core group of active firms. Word is spreading quickly. Nearby firms from adjacent counties and even across state lines are inquiring about membership. One Rhode Island firm even decided to open a plant in the area, citing the presence of the food products cluster and the opportunity for learning and interaction as an important factor in its decision.

It probably hasn't hurt that local media supports the effort. As one *Lexington Herald-Leader* commentary notes: "What the Louisville economic developers are doing is smart. The agency is building on the region's strengths... If you want to bet on prosperity, put your money on Louisville."

TRI-STATE MANUFACTURERS ASSOCIATION

In 1988, a small group of local metalworking manufacturers in western Minnesota wanted to meet their peers, talk about business issues and improve access to information. They organized the Tri-State Manufacturers Association.

Although the region's once strong agricultural economy had fostered a tradition of cooperation, it had never extended to the industrial base. As a result, the region's manufacturers remained isolated and suspicious of one another.

Tri-State's founders quickly found that the region was home to far more manufacturers than they had imagined. Observed one member: "I get around, and thought I knew every [manufacturer] in the area. But I learned I didn't know even 25 percent in a 50-mile radius."

From social network to business services

The association soon expanded to more than 100 members,

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some traveling from as far as eastern North and South Dakota. Finding many problems in common, their social talk turned to business issues—a new experience for many. Monthly meetings were set, rotating throughout the region, sometimes held in conjunction with plant tours.

As the association developed, it began looking for ways to directly help its members. After learning about interfirm collaborative activities in Italy and Denmark, it applied for and received grants from the West Central Minnesota Initiative Fund and Northwest Area Foundation to:

- maximize regional manufacturing potential by identifying complementary capabilities and bringing firms together in networks
- catalyze both service and production networks
- organize market-driven or sector-specific services to respond to firms' needs
- increase economic viability of the region as an "area factory" to expand export margins and increase wages and employment

In addition to encouraging the formation of co-marketing and co-production networks, Tri-State has become a central broker for services to member firms, both individually and collectively. Among these services are:

- upgrading firms' quality systems, including collaborative ISO 9000 certification
- a volume purchasing agreement that nets members 30 to 40 percent discounts on tools
- joint training programs and workshops
- matching firms that have special problems with Minnesota Technology, Inc., home to the state's manufacturing technology center.

In 1992, Tri-State formed for-profit collaborative ventures to develop and market cooperative products. (The first product produced by member firms was a rocker-wheelchair.) As the organization continues to mature and its grants expire, its members are becoming increasingly active and self-sufficient. Tri-State promises to continue to be the hub of activity for western Minnesota's metals industry.

Comprehensive/broker and catalyst services

Some states and communities create *systems* that focus on identifying and meeting cluster needs, first, by brokering needed services and, second, by encouraging changes in a firm's behavior—in both its internal organization and management and its external relationships with other firms.

Some regions have developed comprehensive, sector-based programs that operate through extension agents, brokers, hubs and centers independently managed and funded by various public-private agencies and institutions. Such programs typically provide applied research, training, marketing and business assistance; they tend to be more customer-driven and sometimes compete with one another for customers.

Some regions have developed comprehensive, sector-based programs that operate through independent extension agents, brokers and centers funded by various public-private agencies.

Oklahoma alliance: change brokers. The most effective service-oriented initiatives employ independent brokers or agents to help firms identify, access and coordinate available services.

Oklahoma established its Alliance for Manufacturing Excellence for just that purpose. Through the Alliance:

- Regionally situated broker/agents, hosted by a variety of organizations, are the first line of communication between firms and resources.
- Service agencies and experts provide in-depth support.
- Industry sector specialists help firms and brokers analyze key market and technology trends, inform them of industry trends, help them develop diagnostic tools, and generally encourage collaboration and the formation of statewide cluster or sector associations.

The sector specialists, employed by the Oklahoma Department of Commerce through a memorandum of understanding with the Alliance, have considerable industry experience and work hand-in-hand with the

broker/agents. Sector specialists attend monthly brokers' meetings, respond to requests for information and publish industry newsletters. But this hardly represents their full potential. According to Alliance president Ed Farrell, "The SMEs lack a sensing mechanism to keep up with markets and technologies. The sector specialists function as antennas for SMEs to provide industry-specific information."

To start, the Alliance has targeted four sectors for service—aviation-aerospace, electronics, advanced materials and plastics, and food processing—with two more to be added by the end of 1995.

Indiana's plastics industry: a regional hub. The Business Modernization and Technology Corporation, created by the Indiana legislature in 1991, provides extension services to manufacturers through regional offices scattered across the state. The Corporation's analyses of industry concentrations and customer locations revealed a preponderance of small and medium-sized plastics firms, about 1,200 in all, many clustered in five locations, with more in rural areas. It also discovered that relationships among these firms did not stop at the state's borders; some clusters included firms in Michigan, Ohio and Kentucky.

The most effective service-oriented initiatives employ independent brokers or agents to help firms identify, access and coordinate available services.

Consequently, the state decided to establish a Center for Plastics Competitiveness to serve as a hub for information and assistance. The center's core will be situated in Indianapolis. Regional field agents with plastics expertise will work to link plastics firms to resources, information sources and specialized technology deployment centers, and to help establish local alliances and networks.

Indiana's effort differs from Oklahoma's in two important respects. Its field agents are sector specialists; and the Center is regional, with support from neighboring states. Indiana's plastics initiative is still on the drawing boards, but the strong statewide support it has thus far received suggests that it will become a regional priority.

Michigan's multi-industry regional hub. In Michigan's Upper Peninsula—a poor, depressed, remote region that depends on the wood

products industry and government for much of its employment—the Northern Economics Initiatives Corporation (NEICorp) has developed what may be the nation's most exemplary rural sector strategies.

In Michigan's Upper Peninsula—a depressed, remote region that depends on wood products and government for much of its employment—NEICorp has developed what may be the nation's most exemplary rural strategies.

Under Richard Anderson's leadership, and with support from private foundations and the state, NEICorp has systematically planned and crafted a three-pronged program that meets the multiple needs of the region's industries. Influenced by study tours in Europe, its elements include technical assistance; industry-specific activities, innovation and alliances; and business financing. For example, NEICorp organized the furniture industry into a membership alliance that, with support from a NEICorp broker:

- meets regularly as a continuous improvement user group
- sent representatives to Europe to study and learn to use improved design techniques
- cooperates in the areas of marketing, sales and training

NEICorp is now working to organize networks in the less concentrated but locally important fabricated metals and fine arts and crafts sectors.

Institution-based/services

It is not unusual for a government-supported center to specialize in a particular industry, even if it was not originally designed to do so. Specialization often occurs naturally, sparked by demand or opportunity.

Institutions have been created for many sectors. Itawamba Community College in Tupelo, Mississippi, operates an Advanced Manufacturing Technology Center for furniture upholstery. Catawba Valley Community College, in North Carolina, has a Furniture Technology Division geared to

It is not unusual for a government-supported center to specialize in a particular industry, even if it was not originally designed to do so.

its furniture industry—detailed in Chapter 4. Northwestern Pennsylvania has The Plastics Technical Center. Another example, the Industrial Technology Institute in Michigan, was created by the state and two large foundations to help the auto and related industries upgrade their production processes. And the Textile/Clothing Technology Center in North Carolina demonstrates and provides training on the latest technologies and management techniques in the apparel industry.

Pennsylvania's industrial resource centers. Pennsylvania's Industrial Resource Centers, regional service centers located across the state, each take a sectoral focus—apparel and textiles in the Lehigh Valley; plastics in Erie; machining and tooling in the Pittsburgh, Erie and Lancaster areas; and foundries in Pittsburgh. These centers, launched in 1988, were designed to be industry-led and to build relationships among businesses and with labor and the public sector. Each is in a heavily populated area, but is charged with reaching outlying rural areas as well. But over the years, in order to generate the income that will enable their shift to self-sufficiency, the centers have been forced to diversify and solicit as much business as they can from a wider customer base. This has meant greater emphasis on urban—and less outreach to rural—areas.

Microelectronics center of north carolina. Many functional sector programs are aimed at state rather than geographic concentrations. Research centers are frequently designed with a state's main industry in mind. Although state officials often frame the target as a technology—thereby avoiding the "industrial policy" label—that technology is usually linked to a particular industry.

The Microelectronics Center of North Carolina (MCNC) was established and funded by the state to support the regional growth of a particular industry, electronics. The influx of new electronics firms in the Research Triangle area is clearly linked to MCNC. But MCNC's promise was always tied more to recruitment than to modernization. Responding to the criticism that it serves large multinationals and is unresponsive to the area's smaller firms, MCNC now has organized a group of small, local electronics firms into a network and is trying to help them solve common problems.

Ohio's heat treating network. Ohio's Heat Treating Network, headquartered in Cleveland, is a not-for-profit coalition of industry, government and academia. The network identifies, develops and transfers heat-treating technology to industry members across the state. Launched in 1990 with funding from the state, the network is a spin-off of and joint venture with the Ohio Edison Program's advanced technology centers.

The network sponsors applied generic research for members, maintains a hotline to address problems and provide access to information, conducts seminars and focus groups, markets member services and generally facilitates resource sharing. Like Indiana's Center for Plastics Competitiveness, the network extends across state lines to include heat treaters in Indiana and Pennsylvania.

Organizations like the Heat Treating Network are becoming more common in the United States. Both local and regional membership organizations that provide real services to member firms, and local and regional service agencies that connect firms to one another, fill critical cluster gaps. Specifically, they help small- and medium-sized manufacturers strengthen their business and technical relationships with one another and achieve the kind of synergy that characterizes the most successful clusters.

Local and regional membership organizations that provide real services to member firms, and local and regional service agencies that connect firms to one another, fill critical cluster gaps.

Massachusetts: persistence pays off. In 1985, Massachusetts created several regional sector strategies in an effort to provide the same type of support to troubled mature industries as it provided to high-tech newcomers. This effort produced the Machine Action Project (MAP) in Springfield and the Needle Trades Action Project (NTAP) in Fall River. These organizations were intended to help clusters of local industries populated by small, family-owned businesses that were no longer able to cope individually with the changing economic world. MAP and NTAP aimed to help firms assess their needs, train them for new technologies and provide information.

Although both MAP and NTAP managed to achieve some success with some firms, they failed to secure the industry support they needed

to sustain them after government funds had run out. Without state support, MAP closed shop in 1993, and NTAP, as originally conceived, is gone. Both left legacies of better-trained workforces and greater reliance on modern technologies—but also industries still in distress.

This failure illustrates the risks associated with making limited-term investments to rescue industries in distress, and with focusing on technology and training without companion investments in marketing. As MAP's director noted, it does little good to improve productivity by 25 percent if sales are off by 50 percent. No matter how innovative and visionary, programs suffer if they do not dedicate sufficient resources to industry "buy-in."

The MAP/NTAP saga is not quite over. The targeted clusters have been reincarnated as the National Textile Manufacturing Association Workforce Development/Industrial Modernization Program and MassTAC (Massachusetts Textile and Apparel Network). Funded by seed grants from the new Bay State Manufacturing Network Program, the 1994 versions of the clusters seem to have stronger support from the businesses and associations they serve. Each has staff and is working at group market development and skill upgrading. The intent is to move more and more toward industry ownership.

No matter how innovative and visionary, programs suffer if they do not dedicate sufficient resources to industry "buy-in."

Redefining "regions"

Most initiatives cited in this chapter serve either an entire state or a substate region. While the state is by far the most common unit, some programs have taken the analysis down to a regional level in order to pinpoint cluster locations more precisely. So Massachusetts' counties are divided into seven regions, Arizona's into eight, and Oregon's into twelve. Each of these states has identified the dominant clusters in each of these regions.

States are now beginning to recognize that businesses rarely concern themselves with state boundaries, and that interfirm activity frequently crosses state borders. Interstate cooperation is gaining credence as a response to the actual spatial patterns of business activity—and as a way to

realize greater economies of scale. Some states have come together to conduct multi-state industry analyses and support multi-state clusters.

Cross-state regional efforts seem to work best under certain conditions. It's best when the cooperating entities are not head-to-head competitors for a single limited resource. And it helps when there is reciprocity—for example, one state supports wood products in its neighbor state, and the latter supports the former's electronics firms.

Now the federal government, trying to increase the impact of *its* investments, is actively encouraging greater cooperation among states by making seed grants available for regional planning. The Economic Development Administration, Appalachian Regional Commission and National Institute of Standards and Technology (NIST) have all awarded grants to projects aimed at building multi-state cooperation. In fact, NIST's 1994 competition for state extension programs specifically invited regional alliances.

CHAPTER 4. CLUSTERS AT WORK: CATAWBA VALLEY, NORTH CAROLINA

As many of the initiatives cited in Chapter 3 illustrate, cluster strategies become accepted practice when:

- A sector's importance to a region is obvious.
- Demand for support is sufficient.
- The industry is directly involved in developing the cluster strategy.

Catawba Valley is home to two clusters—one in hosiery, another furniture. Each is quite narrow in scope and scale, but involves a large concentration of businesses located predominantly in small cities and rural areas.

The two case studies in this chapter explore how firms in two industries were motivated to cluster by just this set of circumstances. Catawba Valley, North Carolina, is home to both clusters—one in hosiery, the other in the furniture sectors. Each of these clusters involves a large concentration of businesses that have found ways to interact through their associations and the community. These clusters are quite narrow in scope and scale, and include firms located predominantly in small cities and rural areas. Each, moreover, is the target of innovative programs developed and implemented by the local community college.

These case studies demonstrate the benefits of industrial concentration. They further describe activities and services that can produce a cluster's advantage, and highlight how the public sector can play a contributing role.

The Catawba Valley Hosiery Cluster

Western North Carolina's hosiery industry is arguably as close to a textbook case of a struggling manufacturing cluster as can be found in the United

Both case studies in this chapter were written by Fred Broadwell.

AT A GLANCE: CATAWBA VALLEY HOSIERY CLUSTER	
Core location	Catawba River Valley
Number of firms	300 (approximate)
Number employed	20,000 (primary sector only—37,200 in state)
Major products	Basic and specialty socks
Associations	Catawba Valley Hosiery Association National Association of Hosiery Manufacturing
Centers & support programs	Hosiery Technology Center at Catawba Valley Community College Southeastern Manufacturing Technology Center Hickory Furniture Mart
Core competencies & competitive advantages	Interdependencies and cooperative nature of cluster, responsiveness, low cost

States. Driving the back roads of Hickory, Newton and Hildebran, one encounters a hosiery mill at every turn. At least 100 mills operate in those communities alone, creating a dense network of small and medium-sized businesses.

This cluster's structure is at once formal and informal. Information and ideas are as likely to be shared at a family or church outing as at meetings of the local hosiery association or at the Hosiery Technology Center run by the community college.

How did this manufacturing cluster emerge, and where is it headed?

Region and industry dynamics

History and trends. Hosiery manufacture has been part of the western North Carolina economy since the turn of the twentieth century.

Plants built in Newton along the Catawba River as early as the 1890s were joined during the 1930s and 1940s by New Jersey and Pennsylvania manufacturers migrating south in search of cheaper labor. Today, North Carolina is home to some 300 establishments that comprise 60 percent of U.S. hosiery manufacturing, produce $1.5 billion in annual sales and employ 20,000 workers. Partly due to the hosiery industry's presence, the state also boasts a large number of supplier firms, notably yarn, needle and dyestuff manufacturers.

The largest concentration of hosiery firms is in the adjoining counties of Burke, Caldwell and Catawba. Approximately 100 firms in this three-county area enjoy at least $300 million in sales annually and employ 6,000 people. Although Fruit of the Loom and Sara Lee—both based in Catawba—have controlled prices and a large share of the market for men's basic white socks, a group of smaller men's socks firms has realized steady gains in value added per worker and workers' wages over the past decade. This is consistent with a nationwide trend in hosiery: Small-firm sockmakers are becoming more productive—and, consequently, more common—than large producers. Moreover, this trend promises to accelerate since Sara Lee dropped its men's white socks line in 1994.

One development in the hosiery industry in western North Carolina is consistent with a nationwide trend: Small-firm sockmakers are becoming more productive—and so more common—than large producers.

Technology changes. Traditionally, sock knitting operations have fit into one of three types:

- **Griege mills** knit raw yarn into tubes, then sew in seams to create socks.
- **Finishing mills** dye and shape knitted socks, insert cardboard backing and package the product for the retail market.
- **Integrated mills** perform this entire set of operations under one roof.

The apparent simplicity of the hosiery manufacturing process belies the considerable craft knowledge that mill workers and managers possess. Machinery repair and dyeing skills and intelligence, for example, tend to reside only in the heads of trusted employees.

But the 1980s saw growing investment in new electronic knitting machines. This machinery, largely produced by Italian, Czech and Japanese manufacturers, can accommodate pattern changes in a few minutes, or even seconds. By comparison, although they knit a quality sock, the older British Bentley machines would require from 30 minutes to several hours to effect the same product changeover. The most sophisticated electronic machines, when linked to computer-aided design (CAD) systems that can create and feed intricate patterns in a matter of minutes, make mills incredibly versatile—able to produce socks at about three times the rate of older machines, while automatically monitoring yarn usage, output and other processes and resources.

This equipment innovation has primarily affected the large, integrated mills, which can afford the capital outlay required to fit a plant with $30,000-$40,000 machines. The smaller griege mills by and large continue to use the "Volkswagens" of the hosiery industry—the old Bentley and Scott & Williams machines that, despite running for 30 to 40 years, continue to perform as the workhorses for longer production runs. The small mills also eagerly buy up machines discarded by larger firms in the changeover, investing in Italian Lonatis and Japanese Nagatas.

New demands from the discount giants, along with a rising tide of imports, have forced greater speed, quality, and variety in the hosiery industry—at lower prices.

The dyeing process, too, is undergoing technological change. In the past, dyemakers' "back-of-the-envelope" recipes permitted wide variations in hosiery color. Today, computer-assisted spectrometers let mills analyze specific yarn or fabric colors—for example, from customer-supplied swatches—and make an exact dye formula. For integrated mills, this consistency is ample justification to invest in such costly equipment.

Market changes. Market conditions also are driving change in the hosiery industry. Until the late 1970s, New York-based agents made deals between manufacturers and the large department stores and other businesses that purchased hosiery products. These agents effectively buffered large and small firms alike from extreme or frequent market swings. In the early 1980s, major discount chains like Kmart and Wal-Mart began to bypass agents, forcing mills to negotiate directly with wholesalers and large retailers. Over time, the dis-

count giants have demanded faster delivery, better quality and pricing, and ever-greater variety.

At the same time, the industry has been hit by a rising tide of imports. Between 1983 and 1991, imports rose from $23 million to more than $300 million, while exports remained virtually flat. Imports competed—and continue to compete—primarily on price.

Local response: niches, service, cooperation. In response to these changes and increasing competition, Catawba Valley producers emphasize niche marketing and customer service. Frequently, a firm will accept orders that it cannot handle on its own; instead, firms rely extensively on subcontractors to help them fulfill such orders. For example, an integrated mill might receive an order for a week's production of specialty socks and two day's production of white athletic socks—all with a one-week turnaround; it has no choice but to job out part of the order to a smaller griege or finishing mill.

Interfirm cooperation is not entirely new to hosiery firms. Although they remained fierce competitors, one firm would lend a rival a badly needed spare part; even workers might be lent in time of need.

Such interfirm cooperation is not entirely new to hosiery firms. Over the years, many firms have developed ties through the community and family connections, and through providing each other emergency aid. Although they remained fierce competitors, one firm would lend a rival a badly needed spare part; even *workers* might be lent in time of need. A firm does this, as one local industry expert observed, with the expectation that one day, it might be the firm in need.

The Catawba Valley Hosiery Association

In Catawba Valley, the industry stakeholders believe that if local producers can continue to leverage their technological prowess and cooperative relationships to deliver high-quality, high-fashion hosiery products promptly, they might stave off the growing competition from overseas. But if they lose their one-two punch, all bets are off.

If the Catawba Valley hosiery industry does continue to thrive into the next century, credit will likely be due the local hosiery manufacturing as-

sociation. The Catawba Valley Hosiery Association (CVHA) has shown itself to be the most savvy and forward-thinking organization in the entire U.S. hosiery industry. Three factors have been critical to CVHA's success: charismatic leadership, committed member firms and outside institutional support.

Leadership and structure. Ever since its 1959 inauguration in Hickory, North Carolina, CVHA has pursued four key goals:

- to reverse the characterization of the industry as an unpleasant work environment and, thereby, to attract superior talent and discourage unionization
- to establish a forum for discussing mutual problems
- to create a way to identify and market new products collectively
- to provide training opportunities for workers and managers

If the Catawba Valley hosiery industry does continue to thrive into the next century, credit will likely be due to the Catawba Valley Hosiery Association. Three factors have been critical to CVHA's success: charismatic leadership, committed member firms and outside institutional support.

Each goal is pursued by one of four standing committees—public relations, technology, marketing or education.

To coordinate efforts, the association hired its first executive director in 1963. Paul Fogelman, who has held the position since the mid-1970s, brings to it an advertising and public relations background. Most important, he combines marketing expertise and years of hosiery industry knowledge with a visionary leadership style. Fogelman's leadership has helped foster a stronger, more sophisticated organization.

The association's committee structure has worked, producing tangible results and performing a vital intelligence-gathering function. Encouraged by Fogelman, members use committee meetings to exchange information and keep one another abreast of recent trends. Fogelman maintains that local industry data—which the association collects through member surveys—are more

reliable than data available from any published source. Local data have helped keep CVHA's ambitious agenda focused on its goals.

Fogelman credits much of the association's early success to the dedicated work of volunteers. Local firm managers spent and continue to spend countless hours planning the association's agenda, engaging in public relations activities and lobbying. The fruits of their efforts include an improved labor force image and significant strides in technological improvement. The fact that members have been able to weather the significant market shifts is largely due to the work of the association. With more than 200 member firms, including suppliers and allied businesses, CVHA has been crucial to the industry's continued health.

The fruits of early CVHA efforts include an improved labor force image and significant strides in technological improvement.

INITIAL PROJECTS AND SERVICES. In 1988, at a joint meeting of the CVHA education and technology committees, members decided to work toward the establishment of a hosiery technology center to be patterned after the existing Furniture Technology Center at the Catawba Valley Community College (CVCC). The following year, the association approached Catawba County's Board of Commissioners and Department of Community Colleges for financial support. The **HOSIERY TECHNOLOGY CENTER** opened at CVCC in April 1990, with state and county funding supplemented by a generous infusion of equipment, yarn and cash from the industry. Former textile plant production manager Dan St. Louis was hired as director. Under his enthusiastic leadership, the center has become the cornerstone of CVHA's modernization and interfirm cooperation efforts.

With the center taking shape, the association turned to other projects. Increasing membership was a primary concern. The association found the answer in a plan to *lower members' long distance telephone costs*. By negotiating a group rate with a long distance carrier in the late 1980s, CVHA has enabled many member firms to recoup the cost of their CVHA dues within a few months—an immediate payback, and an effective incentive for joining.

In addition, after much study and discussion with health insurers, the association decided to develop a *self-insured health plan*. One of the plan's

numerous benefits is that it allows members to monitor their claims. The plan, implemented in early 1990, has garnered much goodwill for the association. Even better, member subscribers are realizing as much as 40 percent savings on their insurance costs.

Learning even from failure. A fourth CVHA project, dubbed TEEMS—**textile efficiency engineering monitoring software**—produced a minor setback for the association. Intended to enhance firms' abilities to meet the demands of just-in-time and other rapid-response production and inventory systems, TEEMS targeted a crucial industry challenge. TEEMS was developed by Stephen Cowan, owner of the North Carolina software company Digital Eyes, and launched with a seed grant from the Southern Technology Council (STC) and the enthusiastic support of the CVHA technology committee.

An early, unsuccessful attempt to computerize the hosiery firms' production monitoring taught association members the wisdom of caution, but it also reinforced the value of interfirm collaboration.

Two key principles informed the TEEMS development effort. First, the software system's utility would be ensured through the serious collaboration of several firms. Second, the system would, unlike other available packages, be affordable for smaller firms.

Working with a small group of firms, Cowan was able to demonstrate a prototype system at the Hosiery Technology Center after only a few months. This system allowed plant operators to monitor seven data points automatically on each of their knitting machines, bringing new precision to production planning and inventory control.

Initially, enthusiasm for TEEMS ran very high. But, shortly after a June 1991 demonstration at the Cooksville hosiery mill attended by 16 mill representatives, excitement leveled off. The firms began to realize that implementing and debugging the new systems were time-consuming and difficult. Late in the process, for example, it became apparent that Windows would have been a more appropriate platform for the system. Then, ongoing computer support from Digital Eyes evaporated when the STC grant expired. Cowan subsequently left the state and is no longer in contact with CVHA.

Today, only one of the three manufacturers that eventually bought the system is using it successfully. Although CVHA retains ownership of the software license and plans to continue promoting computerized monitoring as a mill resource, TEEMS is, without a software company to support it, of little use. Short of going to court, Fogelman sees little hope of recouping the association's preliminary investment in TEEMS.

Ironically, this disappointing experience has had a positive impact on the Catawba cluster: The idea of production monitoring has established a firm foothold among CVHA members. The hosiery companies better understand that the challenges of just-in-time response are real, that management systems can help—and that *they* can help develop new products tailored to their particular needs and budgets. And although the TEEMS project taught the participants the wisdom of caution, it also reinforced the value of interfirm collaboration.

The hosiery technology center

Goals and facilities. The focal point of CVHA's network activity is the Hosiery Technology Center. The center's goals are to:

- help the industry compete globally in a just-in-time environment by becoming a center for R&D
- become an industry-standard testing facility
- become a state-of-the-art facility for training workers on advanced equipment under production conditions
- become a resource for in-plant training in industrial engineering and materials handling

The focal point of network activity is the local community college's state-of-the-art facility for training workers on advanced equipment.

A visit to the Hosiery Technology Center, located at Catawba Valley Community College, reveals how aggressively it is pursuing these goals. The facility is not extensive—two small offices, an exhibition room, an equipment training room and a large classroom. But these modest accommodations are fully utilized. The exhibition room is filled with socks, needles and yarn supplied by the many local firms

that support the center. Along the walls of the equipment room are two rows of knitting machines, including older Bentley Comets as well as a $30,000 Italian Lonatis. Such expensive equipment is sometimes obtained free, when mills make purchases contingent on the donation of equivalent machines to the center. The classroom is usually occupied by mill workers taking one of a broad range of courses.

Activities and services. The Hosiery Technology Center's three primary activities are to train production workers, educate mill managers and facilitate interfirm networking.

Skills training is the center's bread and butter. Instruction ranges from a basic 20-hour "Knitting Operator" course to the 120-hour "Double Cylinder Technician" course, which immerses students in the intricacies of repairing state-of-the-art machinery. For mill managers, education encompasses both formal seminars and exposure to new machinery and products. To stimulate these investments in human resource development, director St. Louis, like an industrial extension agent, routinely visits mills to encourage innovation and promote worker training.

But the center is perhaps of greatest use as "neutral territory" for competitors in the hosiery industry. All firms, large and small, are welcomed and afforded the opportunity to fulfill their training needs. St. Louis finds that when firms interact in the Center's impartial, non-combative environment, openness abounds. He has expressed amazement "at the level of detail these guys will reveal in public."

The training center is perhaps of greatest use as "neutral territory" for competitors. Openness abounds in the impartial, non-combative environment.

St. Louis guards the center's neutral status closely, intent on avoiding any perception of favoritism toward either of two trade groups or a particular firm. Indeed, St Louis was able to engineer a degree of reconciliation between CVHA and the rival National Association of Hosiery Manufacturers (NAHM). Common problems and overlapping membership helped catalyze the cooperation. After St. Louis brought them together, both on his technical committee and for National Hosiery Week, the associations moved their interaction into another field—in the first CVHA-NAHM joint softball game. Not surprisingly, Dan St. Louis threw out the first ball.

Community college affiliation: pluses and minuses. CVHA's decision to locate the Hosiery Technology Center at the Catawba Valley Community College has both positive and negative features. On the plus side, the location offers institutional neutrality and program development support. CVHA members can take advantage of the college's impressive library and Deming-influenced Quality Center. And St. Louis relies on college staff for help in designing his programs. For example, when he wanted to develop hosiery skills training modules to address the lack of written process documentation, St. Louis turned to a CVCC training expert who suggested a general system for documenting industrial processes.

On the downside, community college affiliation brings with it the frustrations of college funding intricacies. In North Carolina, state funding allocations to colleges are based on the number of students enrolled in classes, thus, North Carolina community colleges survive by generating full-time equivalent (FTE) job positions based on large classes. Because hosiery technology is best taught in small classes to allow for hands-on machine practice, the Hosiery Technology Center is *not* a significant contributor of FTEs. In short, class size makes it difficult to generate enough FTEs to support the CVCC training needs.

On the plus side, community college affiliation offers institutional neutrality and program development support. On the downside are the frustrations of college funding intricacies.

CVCC does have state funds from another program, Focus on Industry, that supports shorter-term training, but only already-employed workers may participate. And St. Louis and CVHA are most concerned about training *new* workers for the industry. New workers do qualify for support from the Department of Labor's pre-apprenticeship program, and fee payments from firms contribute another 10 percent of the training budget. But these funding sources do not make up the shortfall occasioned by the FTE problem. Consequently, the center struggles along on an $80,000 budget, when it really needs $180,000.

Community college affiliation raises other problems as well. The battle for FTEs, for example, makes community colleges highly turf-conscious. CVHA's outreach efforts suffer from pointless contests with

neighboring community colleges whenever St. Louis tries to conduct training in nearby counties.

Pay scale is another problem. In terms of faculty salaries, the North Carolina community college system is currently dead last in the United States. Because he cannot pay the $35,000 per year minimum needed to attract skilled professionals, St. Louis must staff the center with retired hosiery experts willing to work for a fraction of their former wages. Although their knowledge and dedication is exceptional—St. Louis declared one part-time teacher with 50 years of hosiery experience a "national treasure"—older workers generally are not inclined to take on the development of new programs. Thus, many ideas spawned by St. Louis and his CVHA supporters go unexploited.

Founded in 1959, the hosiery manufacturing association now has 343 member firms, committed board leadership, active committees, a visionary director and a very successful training center.

Challenges for the future

Nonetheless, with 343 member firms, committed board leadership, active committees, a visionary director and the Hosiery Technology Center, CVHA is working to position itself to tackle the challenges that face the region's hosiery industry.

Technology and higher-level training. Catawba Valley's hosiery industry must complete the transition to electronic machinery. Its firms must make wise investment decisions, procure necessary financing—and have personnel available who can repair machines in a timely manner. Most local banks, which also have become members of CVHA, increasingly understand the industry and, thus, are likely to help finance electronic machinery. The recruitment and training of repair technicians will require greater ongoing commitment from the firms. Since one local mill recently had to recruit from England to find a qualified technician, area firms are wondering if Italy, Japan and Czechoslovakia are likely soon to begin recruiting Catawba Valley residents they have trained.

Language and lower-level training. An influx of non-English-speaking workers poses another challenge to Catawba Valley's hosiery

industry. More and more production staff around Hickory are Laotian; in Troy, to the southeast, the workforce is increasingly Spanish-speaking. With the assistance of Interactive Knowledge, a consulting firm, CVHA has developed bilingual worker training videos (English-Spanish and English-Laotian), which it has shared with firms as far removed as Sheboygan, Wisconsin.

Inventory control. Firms expect inventory control to remain critical in the 1990s as they continue to maintain substantial inventories that tie up their capital and occupy badly needed workspace. Large inventories will further impair profitability as fashion becomes a more critical aspect of the hosiery industry. CVHA and the Hosiery Technology Center hope to resurrect TEEMS to help mills monitor production more cost-effectively. Linking firms via electronic bulletin board may be a logical next step, bringing the long-standing tradition of sharing orders and subcontracting on short notice into the computer age.

The environment. Environmental regulations will likely become more rigorous over time. Consequently, St. Louis has begun to work with plant operators to develop ways to clean up dye operations. If and when funding permits, he hopes to hire a full-time environmental educator and in-plant trainer for the Hosiery Technology Center.

Exports. The Catawba Valley cluster's rate of export growth has lagged considerably behind its increased production over the past decade; in fact, exports dropped during the 80s as a percentage of total production. CVHA leaders understand that the export market represents a major opportunity—particularly in the wake of the passage of the North American Free Trade Agreement (NAFTA) and the new General Agreement on Tariffs and Trade (GATT)—and expect to develop an export strategy in CVHA's next annual planning process.

The association now faces decisions about how to secure its own future: Should it continue to focus primarily on its traditional territory, or should it actively recruit outside the region? If it decides to expand, will it do so at the cost of the trust and attachments that have nurtured the cluster thus far?

Industry dispersion. CVHA remains predominantly local, with roughly 90 percent of its manufacturers and suppliers located in North Carolina, 60 percent in Catawba Valley. The association's home territory

could still yield new members. Many small firms have yet to join, remaining disconnected from cluster networking. Important larger firms have also declined membership, choosing to go it alone.

So the association faces decisions about how to secure its own future: Should it continue to focus primarily on its traditional territory, or should it actively recruit outside the region? If it decides to expand its area and membership, will it do so at the cost of the trust and attachments that have nurtured the cluster thus far?

Association members are now working to convince the state legislature to create a line item in the state budget for the cluster's center.

Plans already are underway to expand the Hosiery Technology Center's mission statewide, perhaps with satellite offices and additional staff. A secondary hosiery cluster in the Troy-Montgomery County area is a specific outreach target. The association has even discussed changing its name to the "North Carolina Hosiery Association."

Local economic development respect. The attention accorded Catawba Valley's hosiery industry by local economic development officials falls far short of the cluster's economic significance. Although they praise the association's work and acknowledge hosiery's importance in terms of the jobs it provides, many local officials continue to consider hosiery a low-tech, sweatshop industry. It's hard to determine whether this perception is due to the unglamorous nature of its principal product (socks) or to the configuration of the cluster—that is, the predominance of small and very small businesses. If it is to accomplish its long-term agenda for the hosiery industry, CVHA must help educate the development establishment to "not judge the book by its cover."

Center funding. As for the financial future of the Hosiery Technology Center, Fogelman and fellow CVHA members are working to convince the North Carolina state legislature to create a line item in the state budget for the center. Their lobbying has been partially based on the notion of expanding the center's focus statewide. CVHA is also planning an annual fundraiser that could generate thousands of dollars annually for the center.

A "NO SECRETS" CLUSTER

The Catawba Valley's hosiery cluster experience demonstrates a few lessons that are becoming clear from other cluster stories as well.

- It's important to carefully choose the *institutional base* for the cluster's hub activities. Catawba Valley's community college affiliation has been both a major help and a hurdle to the hosiery cluster's development.

- Formal collaborative efforts may require a great deal of *patience from cooperating firms*, since results may be slow to materialize. TEEMS and the bulletin board concepts are taking quite a while to achieve their potential, and have required long-term financial and time commitments from government and industry.

Catawba Valley's hosiery cluster experience demonstrates the importance of the institutional base chosen and the patience that may be demanded of cooperating firms.

In Catawba Valley, friendships, family connections and mutual coping strategies have transcended the competitive nature of the industry. Indeed, a local saying holds that "There are no secrets in hosiery." On this foundation, an energetic manufacturing cluster continues working to build a better future for the hosiery sector and the region's economy.

Largely due to the strength of the institutional base, the state has "discovered" the economic development potential of this cluster. The new North Carolina Alliance for Competitive Technologies selected hosiery as one of its key clusters, and is working with industry leadership to identify unmet needs and leverage resources to help address them, which ought to give the cluster an added boost.

The Catawba Valley Furniture Cluster

As Hollywood, California is to movies, so Hickory, North Carolina is to furniture. The city long has been synonymous with high-quality, low-cost home furnishings, ranging from handmade wooden rockers to mass-produced La-Z-Boy recliners. Year-round, in the shade of the Blue Ridge Mountains,

AT A GLANCE: CATAWBA VALLEY FURNITURE CLUSTER	
Core location	Catawba River Valley
Number of firms	250 (approximate)
Number employed	33,500 (primary sector only)
Major products	Chairs, including rockers and recliners
Associations	American Furniture Manufacturing Association Furniture Design Society Home Furnishings Council Appalachian Lumberman's Club Institute for Woodworking Education
Centers & support programs	Furniture Technology Division at Catawba Valley Community College Furniture Manufacturing & Management Center & Industrial Extension at NC State University Small Business & Technology Development Center
Core competencies & competitive advantages	High quality, low cost, skilled workforce

furniture shoppers from around the country descend on the Hickory Furniture Mart, the 12th most popular tourist attraction in the state.

What attracts these shoppers, along with the attention of economic development officials, is the high concentration of large, medium and small furniture firms in the Hickory-Newton-Lenois area. Indeed, 60 percent of all U.S.-made furniture is produced within a 200-mile radius of Hickory. The four-county rural region, nestled in and around the Catawba Valley, is home to at least 250 furniture firms, whose annual aggregate sales approach $2 billion. In this region of fewer than 300,000 residents, furniture employs *33,500!*

Forces for change

Setting the challenge: new markets and technology. Familiar forces drive change in today's furniture industry: consumer demand for customized designs and fabrics, prompt delivery, impeccable quality and low cost. One way firms satisfy these demands is to import lower-priced furniture that helps them customize and fill out their product lines. In fact, furniture imports have reached the $3 billion per year level nationally, and Catawba Valley firms do their share of the importing. As one industry executive recently remarked, "It seems as if half of Hickory is on a plane to Taiwan."

Despite the powerful lure of importing, many industry insiders realize that if their companies' strength and U.S. jobs are to be preserved, quality production must be maintained in the United States. Local firms believe that by becoming capital-intensive and investing in their workers they will be able to compete favorably with imports from Taiwan, Canada and Italy.

Local firms believe that by becoming capital-intensive and investing in their workers they will be able to compete favorably with imports from Taiwan, Canada and Italy.

This investment process, already underway, will continue to be long and difficult.

To start with, the price of state-of-the-art furniture-making equipment dwarfs old-style machinery costs. A computerized sewing machine used for upholstery retails for $8,000; a German- or Italian-made electronic router as much as $200,000. It doesn't help that nearly all this production machinery is imported. Although some North Carolina manufacturers are beginning to customize and modify their imported machines—a move that could prefigure the growth of a local machine-manufacturing capability—the modernization process continues to depend on outside technology. Finally, even if they do get the machinery, firms face the daunting task of finding enough skilled operators and repair personnel to utilize the investment.

Meeting the challenge: local service institutions. The healthy mass of furniture firms in the Catawba Valley facing these challenges has helped generate strong public and private support for the industry. Influenced both by the Catawba Valley furniture cluster and the

Influenced by the regional clusters, local institutions—the community college, economic development commission, state development agencies and various associations—have become service hubs for the furniture industry.

neighboring (and linked) High Point furniture cluster, local institutions have become service hubs for the industry.

It is these institutions—the community college, economic development commission, state development agencies and various associations—that are driving furniture manufacturers' efforts to upgrade their training, marketing and technological capabilities. Of course, this is exactly the type of constant innovation needed if the industry is to remain vital, and to meet the challenges of an ever-competitive global marketplace—in short, to keep those furniture shoppers coming.

Furniture Technology Division, Catawba Valley Community College

At the center of the Catawba Valley furniture cluster is the Furniture Technology Division at Catawba Valley Community College. Thirty years ago, when the community college was founded, furniture already was the major industry in the region, and the college established the Furniture Technology Division as one of its original departments. Today, one key to the college's working relationship with the cluster is the fact that the division's director, Ken Eckard, has embraced the technological revolution that is sweeping furniture manufacturing toward modernization. The industry, in turn, has embraced Eckard.

Hands-on training for state-of-the-art production. The division emphasizes preparing workers—and their firms—for high-volume production. In the 1970s, the college constructed its own working furniture factory to provide students with hands-on furniture-making experience—from wood-drying to finished product. Today, the Furniture Technology Division's million-dollar training facility is critical to the cluster's ability to meet its modernization goals.

With help from government, private interests and the division's active, industry-led advisory board, Eckard and his staff work continuously to acquire specialized state-of-the-art equipment. State subsidies, indus-

try donations and manufacturer discounts all have helped fill the division's production room. Recently, for example, the division was given a computer by Trade Shows, Inc. and a computerized measuring device by an industrial supply firm, and it purchased a $100,000 router at half-price from a European manufacturer.

Today, with access to state-of-the-art production machinery capable of reproducing CAD-generated designs with a precision measured in thousandths of an inch, division students are as likely to work with computer terminals and digitizers as with saws and lathes.

Curriculum: cluster-focused. The Furniture Technology Division's two-year degree program offers specialization in either Furniture Production Management or Furniture Design and Development. The management concentration emphasizes inventory control and plant layout issues; the design curriculum focuses on how to capitalize on the trend toward rapid fashion changes.

Students pursuing either course of study are expected to learn both the overall production process and how to integrate pricing decisions into their furniture projects—a direct response to companies' expressed need for employees who can design attractive pieces within specified price constraints. Students in the design curriculum can transfer to Michigan's Kendall School of Design, one of the leading furniture design programs in the country.

As in the hosiery industry, the community college is at the center of the region's furniture cluster. The college provides hands-on training, a cluster-focused curriculum, and considerable company-student interaction.

In response to the specific needs of the upholstered furniture sector, which accounts for approximately 30 percent of the home furnishing industry, the division also offers two certificate programs in upholstering. Although they offer good wages, local firms experience a chronic shortage of trained upholsterers. The computerization of upholstering, moreover, continues to make skills upgrading essential for the existing workforce.

In addition, the division offers specialized short courses and in-plant training on topics ranging from the high-tech to the traditional—for example, AutoCAD, lum-

ber inspection and machine repair. However, the division's extension services—both technical and training assistance—to firms are limited, operating with only one full-time staff person and severe funding constraints. As a result, many smaller firms go unserved by extension, since in-plant training is restricted to groups of at least 15 employees.

Students: working for success. The Division currently enrolls almost 40 degree-level students, the largest number since its inception. Although 90 percent of the division's students are North Carolinians, enrollees come from all over the United States and as far away as Italy and China.

Despite the valued services and considerable success of the college's furniture division, supplies, materials, equipment, funding—and full-time staff—are in short supply.

Eckard attributes the division's growing enrollment to the combination of scholarships and work-study programs. Every year, leading industry firms like Lane, Hickory White, Hammary and Cochrane fund $2,500 scholarships for 25 students. Many scholarship recipients are employed by the sponsoring companies and, typically, work half-time while attending school, In fact, every student is required to work at least part-time in a furniture factory to gain firsthand experience.

The considerable company-student interaction largely accounts for the division's excellent post-graduation placement rate: 90 percent of its graduates are placed immediately, most with North Carolina companies. Even students who transfer to the Kendall School tend to return to the state. Starting salaries range from $16,000 to $25,000, but because rapid advancement is common, much higher salaries can be expected within a few years.

Current resources: too scarce. Despite the valued services and considerable success, Eckard finds himself constantly scrounging for supplies, materials and funding. New equipment is always needed. Advertising funds are scarce. The division has yet to build the capacity to hire a staff person who can work exclusively with smaller firms.

One ongoing challenge is critical to the division's mission: finding and keeping qualified teachers who understand traditional furniture skills but can work with the newer technologies. The division currently em-

ploys 12 full-time and 12 part-time staff. All have industry experience, and a few boast an almost encyclopedic knowledge of the furniture business. The highly committed staff frequently donate their own time and personal resources to keep current with industry developments.

But Eckard is frustrated in maintaining such a staff. Just as with the Hosiery Technology Center, the small class sizes necessary for hands-on instruction hurt the division's FTE allocation. Moreover, a community college system policy prohibits him from offering salaries that approach what the industry itself will pay. Indeed, the system's salaries rank at the bottom for such institutions nationally—a circumstance that may threaten the division's instructional quality in the future.

An aggressive strategic plan calls for a high-tech training lab incorporating the latest CAD and robotics capabilities, expanded outreach to local schools, and training at remote sites using video.

The strategic plan: building for the future. During a recent trip to Italy paid for by the Italian Trade Association, Eckard saw, in the heart of Italy's furniture district, machinery that put the division's own equipment to shame. Specifically, he saw robotics—the way of the future—applied to furniture manufacturing. He also found 900 of 1,200 local high school students enrolled in a furniture curriculum.

Eckard and his advisory board took these indicators to heart. They are now crafting an aggressive strategic plan that calls for, among other things, a high-tech training lab incorporating the latest CAD and robotics capabilities. Eckard wants to tie this lab into the information highway, to offer training at remote sites using video. Eckard and the board plan to mount a strong lobbying effort to pursue funding for these improvements.

To further increase enrollment, the advisory board plans to expand outreach to local schools. In this effort, the division has prepared a video—*To Build a Future*—targeted specifically at younger students, which counters the characterization of furniture industry employment as unpleasant, low-paying work.

The division also plans to press forward on the environmental quality front. Industry officials expect increasingly tough environmental standards, and eagerly seek employees with relevant expertise.

The modernization efforts of the furniture cluster stand to benefit enormously if the division can secure the funding and other resources needed to achieve these goals.

Furniture manufacturing and management center, north carolina state university

The Catawba Valley furniture cluster acknowledges the assistance of another higher-education-based, state-funded resource: the Furniture Manufacturing and Management Center at North Carolina State University. Although it is located in Raleigh, two to three hours away from the heart of the industry, the university retains strong ties with western North Carolina firms.

Unlike the community college, the university's program targets top management and R&D departments of larger firms. The two centers work cooperatively, each having carved out a complementary niche.

Mission: R&D and executive training. A recognized leader in furniture industry R&D, the center offers executive training seminars and a bachelor of science degree program in furniture-related fields through North Carolina State's Industrial Engineering Department. The program curriculum is in transition, with an industrial design component being added.

Unlike the community college's Furniture Technology Division, the center's program targets the industry's top management and the R&D departments of larger firms. Typically, 25 students enroll each year, funded through a combination of state support and aid from the Furniture Foundation, a private entity established by the furniture industry.

In keeping with its mission, North Carolina State's center recently established what it calls a furniture production systems lab. The lab houses the center's collection of the latest furniture-making machinery, including a recently acquired, state-of-the-art computerized router.

An extension service operated by the center regularly sends trainers to work on-site with firms in the Hickory area. One trainer specializes in upholstered products, another in case goods (mainly wooden furniture), a third in the industry's environmental problems.

Institutional cooperation: niches and shadows. Despite its distance, the center works cooperatively with the Furniture Technology Division in Hickory, each having carved out a complementary niche. The only complaint that industry leaders cite about the North Carolina State program is that it tends to cast a shadow on CVCC's Furniture Technology Division. Governor Jim Hunt's recent address to the American Furniture Manufacturers Association in Raleigh, for example, seemed—to executives of Catawba Valley firms—to lavish attention on the North Carolina State program and scarcely acknowledge CVCC's own.

Industry leaders worry that this disparity might translate into future budget problems for the CVCC's program. This is important because many furniture officials think that the need for executive training pales in comparison to the need for skilled production workers. Cluster firms are anxious that North Carolina State maintain its strong extension and R&D role without jeopardizing CVCC's unique program.

Small business and technology development center, university of north carolina

One of the furniture cluster's key strengths is its dense network of small firms and individual craftspeople. Within the four-county area, an estimated 100 furniture firms employ 20 or fewer people, and an even greater number of artisan firms are owner-operated.

Besides producing their own complete end-products, larger firms subcontract to these enterprising operations. For example, basement and backyard artisan operations routinely and rapidly manufacture bedposts and table legs of very high quality on demand for large-firm customers that assemble and sell the finished products. By doing so, the flexibility of the larger producers is greatly increased.

Mission: serving the entrepreneur. CVCC assists these microfirms and craftspeople through seminars and its Small Business Center, but it is not set up to address the technical assistance needs of entrepreneurs. For such

For technical assistance, small firms and individuals can turn to yet another state-supported institution, the local Small Business and Technology Development Center.

assistance, small firms and individuals can turn to yet another state-supported institution, the local Small Business and Technology Development Center (SBTDC).

Organized as a component of the University of North Carolina, the SBTDC maintains a dozen offices statewide. The Hickory office, owing to the density of the clustered firms and craftspeople, has developed considerable expertise in the needs of furniture makers and retailers.

Often, the assistance involves simple encouragement to nurture promising entrepreneurs—for example, a craftsperson who needs advice on how to get started in his own furniture shop. SBTDC staff goes further to help entrepreneurs prepare business plans, locate sources of capital and consulting services, and handle perplexing management problems. They also help larger firms develop marketing plans and econometric models.

To help increase export opportunities, the North Carolina Department of Commerce opened a furniture export office in 1993, offering the industry assistance with international marketing.

GROWTH: GOING FOR EXPORTS. The Hickory SBTDC also is positioning itself to take advantage of rapid export growth through its active support for export marketing. It plans to hire a staff person devoted exclusively to international issues. This staffer will be available to walk firms through the entire export process, saving smaller firms in particular much of the expense of hiring costly export consultants.

FURNITURE EXPORT OFFICE, NORTH CAROLINA DEPARTMENT OF COMMERCE

As the Hickory SBTDC efforts indicate, the rapid growth of exports in the furniture industry—which exceeded the $1 billion mark in 1992—is pressuring furniture manufacturers to expand their export base. The share of national furniture sales derived from exports has increased from less than 1 percent in the 1980s to more than 6 percent today. This figure is likely to rise under NAFTA: Canada already accounts for half of the U.S. furniture export market, and Mexico 15 percent; the removal of trade restrictions under NAFTA is only making it easier to export to these neighboring nation's markets.

To help increase export opportunities, the North Carolina Department of Commerce's International Division opened a furniture export office in High Point in November 1993. With a two-year budget of $250,000 and a staff of two, the office is tailoring export services to the state's furniture industry.

To date, the office has focused most on coordinating trade show activity, but with some interesting twists. It has purchased booth space at international trade shows in order to host its "North Carolina Furniture Pavilion," which sells furniture makers exhibit space at a 25 percent discount. It also provides free interpreters at foreign shows, along with other logistical support.

Cluster firms do take advantage of these opportunities: One February 1994 trade show effort in Guadalajara turned out an impressive 22 North Carolina furniture firms together. The office will coordinate forthcoming shows in Japan, the Middle East and Germany.

Local and state economic development offices

Some development organizations in the state, despite their concern for the furniture cluster, could do more to innovate and push its modernization. In North Carolina, the established economic development authorities—both at the county level and in the state-funded regional office—recognize the importance of furniture to the local and state economies. Naturally, they assist firms with all the traditional concerns: site selection, environmental permits, and lobbying for better training and financing programs. Particularly in the Catawba Valley area, development offices try to go a bit further, working to tailor their assistance to cluster firms' needs. Even so, their achievements are limited, by both bureaucratic rules and their own narrow grasp of the industry.

One example of tailoring local assistance deals with state-supported business financing—specifically, the state's industrial development bonds. Local officials complained that the state's practice of targeting these bonds only to the

State and local economic development authorities assist firms with all the traditional concerns: site selection, environmental permits, and lobbying for better training and financing programs. But their achievements are limited by both bureaucratic rules and their own narrow grasp of the industry.

poorest counties was shortsighted. Ken Atkins, director of the Catawba County Economic Development Commission, pointed out that his county has no access to this type of financing—which he was working to rectify.

Still, with the industry changing so rapidly, most traditional economic developers tend to be unacquainted with the latest technology issues that face the cluster firms. Some officials continue to characterize furniture-making as "non-high-tech" and "non-capital-intensive," because they are unaware of the influx of CAD-linked machinery and robotics applications. Ironically, these same officials view fiber optics, Catawba Valley's third-ranked industry, as the key to the region's economic future. Cluster leaders clearly have their work cut out for them to convince local and state authorities that furniture is not just "traditional manufacturing," but more and more will rival other industrial sectors in technologies employed, skills required and wages earned.

A set of related trade organizations, associations and groups provide social infrastructure options for cluster firms—and a forum for organized cooperation within a cluster characterized by fierce internal competition.

Industry associations: social networks, industry advances

The Catawba Valley area hosts a set of furniture-related trade organizations, associations and groups, each of which provides social infrastructure options for cluster firms: the American Furniture Manufacturing Association, the American Manufacturers Association, the Home Furnishings Council, the Furniture Design Society, the Society of Furniture Industrial Engineers, the Appalachian Lumberman's Club and the Institute for Woodworking Education.

These groups provide a forum for organized cooperation within a cluster that is characterized by fierce internal competition. Though limited by a lack of coordination, they help speed information exchange. Interfirm networking, if only informal, has evolved within these organizations. It is notable for several reasons.

One is the absence of a single dominant organization, despite the fact that North Carolina firms account for more than one-third of the member-

ship of the American Furniture Manufacturing Association (AFMA). The nation's largest furniture association, AFMA provides extensive services to its 650-firm membership, including a full array of seminars, a major trade show and lobbying support. Fourteen percent of its member firms are located in the Catawba Valley region and another 18 percent—and its headquarters—are in the High Point area. Even so, the association maintains a national focus and does not cater to the needs of any one cluster.

A second noteworthy characteristic is that association participation may be related to the industry's corporate structure. A high-ranking AFMA official noted that participation in its events is consistently and significantly higher in the Hickory than in the High Point area—a circumstance he attributes to the decline in owner-operated furniture companies in High Point.

His hypothesis may be correct. Recent industry data show that 12 of the top 20 upholsterers in the Hickory area are privately owned. Among wood furniture manufacturers—the sector associated with High Point—only three of the top 20 firms and none of the top 5 are private. This phenomenon raises an interesting question: Are *locally owned* firms more likely to network locally, perhaps because they have more hands-on, or more regionally committed, top management?

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Another possible explanation for this disproportionate participation might be firm size. Compared to High Point, Hickory has fewer very small firms, a large number of medium-sized firms and no very large firms. Medium-sized firms might be expected to possess both the resources and incentives to network more vigorously.

Finally, the networking structure lacks a single coordinating entity. A number of representatives of Hickory-based businesses indicated that they relied on associations based outside the area for their network opportunities. CVCC's Furniture Technology Center serves to draw local firms together, but is underdeveloped as a networking hub. By and large, local furniture makers rely on informal contacts with one another for opportunities to discuss issues of mutual concern.

Fighting complacency

The furniture cluster in the Catawba Valley region of North Carolina is so well-established and expansive that it takes little to convince the public sector of its importance. The scale of demand has brought to the region an array of world-class public- and private-sector services, ranging from basic and applied research to training. These in turn have attracted even more furniture businesses, suppliers and services.

Thus, the market generated by the furniture companies has already influenced some cluster strategies in North Carolina. Further, the cluster is embedded in a social infrastructure that is undergirded by the sector's rich history. As a result, the industry has an elevated status in local society, which makes it much easier to attract youth into industry training programs.

Could cluster strategies do even more to enhance North Carolina's already world-renowned furniture sectors? Perhaps. Paradoxically, the cluster's strength may be the cause of some complacency.

Could cluster strategies do even more to enhance North Carolina's already world-renowned furniture sectors? Perhaps. Paradoxically, the cluster's strength may be the cause of some complacency. The college's furniture program, for example, has to struggle to find funds to keep up with technological changes. Refocusing attention on the cluster—which the newly formed North Carolina Alliance for Competitive Technologies intends to do—will help pinpoint needs and gaps.

The support system also is slanted toward the larger companies, which are more likely than smaller firms to take advantage of existing services such as R&D. The region could do more to meet the technology and marketing needs of SMEs.

Further, given the new emphasis on exports, fostering collaboration would make it easier for smaller companies to identify and exploit foreign markets. Interdependencies and alliances exist but are not part of any strategies, and interfirm collaboration is not yet actively encouraged. Policies that accelerate the flow of ideas, capital and business transactions within and outside the cluster might take it to greater heights.

CHAPTER 5. NURTURING CLUSTERS: GUIDELINES FOR GOVERNMENT

Government agencies charged with economic development are clearly looking for ways to improve the lot of their area's businesses. Although they continue to rely heavily on recruitment, most realize that the odds are against them. There are simply too many communities competing for too few plants. Likewise, supporting entrepreneurial efforts in manufacturing is a long-term endeavor, sometimes even less promising than recruitment. Those businesses that make it and grow are the exceptions, not the rule.

Government agencies, therefore, increasingly are looking for ways to expand their region's *existing* economic base by adding value and increasing productivity. These are the considerations that underlie the move toward industrial modernization.

Government agencies increasingly look for ways to expand their region's existing economic base by adding value and increasing productivity.

Throughout this guide, we have argued that:

- Manufacturers are part of larger, more complex production systems.
- Collectively, they are stronger than the sum of their individual capabilities.
- For many business activities, close proximity makes for greater efficiency and effectiveness.

The first two propositions are not new or even contested. The last, while called into question by the increasing accessibility and sophistication of telecommunications, is nevertheless generally presumed to be true, and can be particularly relevant for industries that pursue innovation and improvement.

In fact, many states and communities already are acting to help firms achieve more advantages from proximity. But they have taken many dif-

ferent paths, have generally committed few resources and, based on preliminary evidence, are achieving mixed results at best. This is at least partly due to inadequate tools, experience and organizational structure.

In many states, development priorities, as we observed earlier, still tend to focus attention on locations and individual businesses rather than on industries or clusters, and on large or start-up companies rather than small and/or existing ones. The data that states and communities gather and analyze and the services they deliver are organized around these priorities. Moreover, the way they tally establishments, employment, sales and services presumes that businesses' needs are homogeneous.

Examples from overseas have sparked the imagination of U.S. policymakers and led to the creation and implementation of highly innovative industry- and cluster-specific programs and practices.

The states and communities that *are* moving instead toward cluster-focused development programs are forging new paths for public policy. These paths often have been influenced by experience abroad, whether directly through state legislators' and administrators' study tours, or indirectly through the work of U.S. experts who have studied economic development practice in other countries. Examples from overseas have sparked the imagination of U.S. policymakers and led to the creation and implementation of highly innovative industry- and cluster-specific programs and practices. These efforts have variously aimed at building capacity, providing information, establishing a modernization process, creating incentives for expansion and measuring outcomes.

The remainder of this chapter presents specific guidelines as to how, when and where the public sector can be involved in cluster-focused program development. It assumes that government can:

- serve as a catalyst
- be results-oriented
- be customer-driven
- be responsible for ensuring equitable access to services

The public development policy selected may be bottom-up capacity building or top-down gap filling. Generally, the public sector designs, develops and implements cluster-focused policy to stimulate improvement and investment where markets are imperfect or where benefits cannot be captured by individual firms.

Local, state and federal government can each play a role. States typically take the lead public responsibility for economic development and investments. The federal government plays a catalytic role, investing in start-up firms, but less often in continuing operations. Local governments invest smaller sums; they consume state and federal services and act as brokers for state and federal initiatives. Guidelines for cluster-focused activities and roles for each level of government are described further below.

The states and communities that are moving toward cluster-focused development programs—and away from the traditional focus on locations and individual businesses—are forging new paths for public policy.

State Activities

1. GATHER THE FACTS.

Two distinct varieties of facts are needed to strengthen the collective competitive advantages of clusters of firms:

- Data on businesses, sales and employment by sector help to understand economies and formulate policies. These data are generally collected by the federal government.

- Reliable information on markets, technologies and innovations can help businesses identify opportunities, plan and make investment decisions. These data are often most efficiently collected by trade associations and consulting firms.

With this data in hand, states can take the following steps to forge new cluster-based economic strategies:

DETERMINE WHICH SECTORS ARE MOST IMPORTANT TO THE ECONOMY. The first step, using the methods and tools described in Chapter 2,

is to determine which sectors or clusters, if any, are of special significance to the region. Independently contracted studies can avoid bias, but key people representing business, labor and government in the region must participate in determining the criteria for targeting sectors for development.

Identify cluster needs and map relationships among firms. Conventional data sources such as input-output tables must be supplemented by information gathered directly from businesses and those who work with them—information on how they operate; their strengths, weaknesses and needs; their suppliers and patrons; their sources of information about production methods and markets; and their major barriers to modernization. The private sector is often the best source of this information. Business service professionals such as distributors, engineering firms, equipment producers and market researchers can contribute valuable guidance and data.

Conventional data sources such as input-output tables must be supplemented by information gathered directly from businesses and those who work with them—information on how they operate; their strengths, weaknesses and needs; their sources of information about production methods and markets; and their major barriers to modernization.

To simplify this labor-intensive exercise, concentrate on surveying larger firms and a sample of smaller supplier firms; this ought to provide a sufficiently accurate picture. Develop a roadmap of the sources of parts, components, equipment and services that the region's companies use.

This assessment provides a basis for determining which sectors would add the most value locally if they were made more efficient.

Inventory existing services and resources by cluster. The mosaic of business services in most states is overwhelming, often involving dozens to hundreds of agencies and institutions that are trying to meet some element of customer demand. Inventories of these services are seldom maintained and, when they are, rarely specify a program's particular expertise or experience by industry or cluster. A matrix of services by industry and service area would not only help states determine how to allocate resources, but also be extremely valuable to emerging industry organizations and individual firms.

Identify business leaders in each of the key sectors. Who are the innovators, the exporters, the experimenters and the advocates in the industry? It is these people who are responsible for keeping the cluster ahead of its competition, and it is their efforts that spur laggard firms to change in order to keep up. They may be employed by large firms that demand more of their suppliers, by SMEs that have occupied or carved out niche markets, or by exporters that are generating new incomes for local businesses and building bridges to the outside world.

Identify and plan around the region's assets—the skills and capabilities that make it competitive. Robert Hayes and Gary Pisano of Harvard Business School describe a competitive company as one that can stake out a position and define a strategy that emphasizes improvement to defend that position. They call this approach "strategic flexibility."[35] The same concept can be applied to a production system or cluster. Concentrating on assets rather than output, on what the region's workers do well rather than on its particular products and the tools used to produce them, enhances a region's flexibility and minimizes the risks of single-market dependency.

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2. Invest in social capital

If cluster firms have no means to associate, provide incentives to create a means. An active social infrastructure is vital to a competitive cluster. Robert Putnam argues, "the social capital embodied in norms and networks of civic engagement seems to be a precondition for economic development."[36]

SMEs, particularly in rural areas, tend to be isolated from one another and lack settings for interacting on a professional basis and thereby building trust. Because chambers of commerce and other civic associations are generally dominated by consumer services rather than industry, the state or community should provide incentives to create appropriately focused alternative organizations of manufacturers and should subsidize activities that have regionwide implications.

The objective is not to extend government programs, but to encourage private support for new business associations through a start-up period. To some extent, national efforts at stimulating the formation of flexible manufacturing networks are attempting to fill this gap; many networks are organizing themselves as local, membership-based business associations. States can do likewise.

Stimulate interfirm learning throughout clusters. Learning from other members of the cluster—suppliers, customers, collaborators and competitors—ultimately may be the most important aspect of competitiveness. Just as the learning organization is fundamental to a high-performance business, a learning system of firms is basic to a high-performance cluster or region. Learning must become second nature to the firms that participate in cluster activity—an unfamiliar and difficult task for companies that traditionally have operated independently of one another.

Just as the learning organization is fundamental to a high-performance business, a learning system of firms is basic to a high-performance cluster or region.

The public sector can facilitate such learning. Scandinavian nations have successfully operated "knowledge groups" of eight to twelve firms to accelerate learning. The United States has recently adopted similar practices. In Michigan, small groups of firms meet regularly as "continuous improvement user groups" to help one another solve problems. Similar groups operate in Wisconsin, Oregon and Mississippi.

At each of these locations, SMEs systematically study each others' production systems and share advice concerning difficult individual or common problems. Once initiated, groups of this type accelerate learning as they reach an ever-widening circle of firms.

3. Invest in improvements

Build multifunctional centers for key clusters. The concept of "one-stop shopping" for government programs is particularly appealing with regard to services and sources of information for SMEs. SMEs' problems are multidimensional, and call for a wide variety of available public

and private services. A central hub that dispenses information or can point to the location of specific services is essential.

One-stop centers that have been created so far generally do not have the expertise needed to understand or be accepted by a particular cluster. This is because these information centers tend to be organized around a particular mission—for example, R&D, training, capital acquisition, or export or business assistance.

Multifunctional centers or hubs must be established outside the current system, or existing centers must be given the latitude to expand their mission and encouraged to employ people with solid industry experience. Community and technical colleges have demonstrated that they can be quite effective as centers or hubs, particularly in rural areas where other sources of information are less accessible. Whatever their venue, such centers should be planned and designed in partnership with the firms likely to use them.

A central hub that dispenses information or can point to the location of specific services is essential. It should be planned and designed in partnership with the firms that are likely to use it.

Offer a steady stream of incentives to firms willing to risk change. Government, if it is to be an effective catalyst, must back up rhetoric with resources. It must constantly provide incentives to businesses to stimulate change and improvements. It must not assume that businesses will invest on their own in a new idea—even an idea whose value seems self-evident. Firms are cautious, and change is continual. There is always a new and better way that is not yet well understood and the outcomes of which are still unclear. It is for precisely the new and most innovative ideas, in which businesses are hesitant to invest, that incentives are necessary.

Further, for all but the largest businesses, investment in technologies, techniques and training is difficult without public sector incentives such as challenge grants—that is, those matched by recipients. Governments that are serious about change—particularly about developing interfirm relationships within clusters—might award grants, either exclusively or preferentially, to groups or firms by reducing match requirements for groups or by adding points when scoring proposals received from groups.

HELP SKILLED FORMER EMPLOYEES START BUSINESSES RELATED TO THE REGION'S KEY INDUSTRY. Many suppliers to large corporations are former corporate divisions or small firms run by skilled employees that have "spun off" with management's blessing. Both the parent company and the region benefit when such a firm can reduce costs for its former employer or bring new business into the region.

So common is this practice in some regions that departed employees view their former employer as an "alma mater": Former employees of Tupelo's Futorian Furniture call themselves graduates of "Futorian University"; former Fairchild Semiconductor employees call themselves graduates of "Fairchild University."[37]

The education system needs to ask industries that are already in the county or that might consider locating there about the skills that are needed.

Start-up capital, brokering arrangements and technical assistance from government all help minimize the risk of this type of entrepreneurism failing. Government's most important but perhaps most challenging role in this effort, however, is to help make business failure socially acceptable—as it is in northern Italy and Silicon Valley. By discouraging the arbitrary association of business failure with personal failure and incompetence, government frees would-be entrepreneurs to take the necessary risks.

PROVIDE APPROPRIATE EDUCATION AND TRAINING. State vocational education programs are typically matched to occupational projections rather than to the core competencies of a region's key sectors. Consequently, these programs often do not meet local needs. The dearth of educational programs appropriate to the Northwest's wood products sector is an example. And rural communities have complained for decades about an education system that not only does not match their needs, but encourages outmigration.

A recent U.S. General Accounting Office report notes that the wrong things are being taught in the schools and that "the education system needs to ask industries that are already in the county or that might consider locating there about the skills that are needed."[38] The state's chal-

lenge is to build an education system that will be flexible enough to sustain the core competencies of a region's clusters and not focus narrowly on occupations.

Encourage employers to collaborate on school-to-work programs. A cluster's long-term survival depends on the availability of an appropriately skilled labor force. Many regions, however, pay too little attention to their future needs or fail to make the necessary investments to ensure this workforce. Consequently, they lose potential workers to newer, more glamorous, high-growth industries.

Emerging school-to-work and youth apprenticeship programs afford opportunities to overcome this problem and to ensure continuity and innovation in clusters. Cluster approaches to workplace education—such as the partnerships among schools, groups of businesses and the National Tooling and Machining Association—also offer promising models.

5. Line up support

Involve industry from the earliest planning stages. Government is much more likely to see its services used if industry members are invited to participate—as full partners, rather than just advisors—in their design. This arrangement ensures that technologies, techniques and programs truly needed by industry are developed, that limited capital is invested wisely, and that program staff do not need to "sell" products and services to industry.

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Work with labor. In the most successful European programs, organized labor is a full partner in the implementation of advanced technologies and techniques. U.S. programs, on the other hand, tend to solicit labor's input only in connection with issues related to education and training—rather than with regard to overall program design and implementation. Labor's full understanding and participation are essential when changes are made affecting the organization of work—particularly since tomorrow's owners often are today's front-line employees.

6. MEASURE RESULTS

USE APPROPRIATE MEASURES. Traditionally, economic development is measured simply by counting the numbers of new jobs recruited or created or the numbers of new businesses started. But measuring the success of cluster-focused economic development strategies to improve competitive advantage is much more difficult. The effects are harder to separate and quantify. Higher levels of average performance within a cluster—increased sales, profits, productivity, wages and employment—might indicate positive outcomes. Or they might not. Modernizing cluster firms could improve their sales, profits and productivity—with little effect on employment or wages. Furthermore, an action by a single large employer—like automation, outsourcing or reduction in force—can distort the effects of targeted modernization policies.

The true value of cluster-focused development policies can be established only by identifying changes in business relationships—both internal and external to the industry—and by assessing how these changes have affected the performance of individual member firms.

The true value of cluster-focused development policies can be established only by identifying changes in business relationships—both internal and external to the industry—and by assessing how these changes have affected the performance of individual member firms. Progress toward long-term goals can be measured only by proxies—such as changes in investments in training, technologies and management, in associative behavior, and in access to information and services.

FOCUS ON REGIONAL ECONOMIES. In measuring results, remember that the the unit of analysis is the *cluster*, not individual firms or the community. A cluster's success can be measured—using aggregate sales, productivity, profitability and wage data—only over a reasonable period of time. New initiatives are unlikely to produce measurable results in fewer than three years, because it generally takes a year to develop a program, another year to work out the kinks, and a third year to build capacity. Even three years may be too short: If future funding is in question, much of a program's third-year resources may be expended searching for fourth-year support instead of furthering the program's mission.

Pay attention to effects on the workers. Too often, outcomes are measured only in terms of changes in the economic performance of firms. Public policy must also be concerned with the individuals employed by firms. Have modernization efforts improved wages and working conditions? Are workers involved in, and do they benefit from, the modernization process? Surveys of worker views and opinions can answer these questions.

Federal Activities

Economic development, although predominantly a state activity, can benefit from federal involvement, particularly in the areas of leadership, leveraging state investments, catalyzing new services, support for basic and generic R&D, and the collection and aggregation of nationally based information.

1. Provide leadership

Many who remain skeptical about government's ability to help industry oppose all competitiveness policies. But there is a clear distinction between policies aimed at building capacity from within and those aimed at protecting industries from competition—and between policies that promote modernization and improvement and those that merely subsidize current or non-productive practices, like the subsidies and tariffs that have supported the tobacco and other nondurable goods industries. Federal leadership encourages state and local governments to support enabling policies that provide industry clusters with incentives and opportunities to compete.

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2. Collect and report information

Some of the information needed to create and foster cluster development policies is best collected at the national level to ensure comparability and comprehensiveness and because clusters cross political boundaries. Further, because much of what is measured as economic devel-

opment within states is actually only a change in location of a fixed number of jobs, net growth can only be measured at the national level.

Unfortunately, structural changes in industry have rendered the federal government's present SIC codes increasingly irrelevant. Although developing a new national data system would be a major undertaking, the federal government could at least create a national commission on industrial information to set the process in motion.

3. CONDUCT CLUSTER STUDIES

Cluster studies highlight business groupings, strengths, opportunities and needs. Conducting cluster studies nationally enables regions to be defined in terms of the locations of cluster members, which may transcend state boundaries. National studies could serve both as a model for state studies and as a source of valuable information for regions developing industry strategies.

Because clusters cross political boundaries, some of the information needed to create and foster cluster development policies is best collected at the national level.

4. REQUIRE GRANTSEEKERS TO CONDUCT PRELIMINARY INDUSTRY ANALYSES

As a source of development funds for the states, the federal government is in a position to ensure that states engaged in industrial modernization exhibit an understanding of the companies they target as clusters in regional economies, not as collections of companies with individual needs. The federal government can advance development efforts by requiring every project to incorporate a regional development component that takes into account the impact of federal funds not just on individual companies, but on the inner workings of a cluster and a region, and that indicates how the project is likely to affect industry relationships and dynamics.

5. TARGET ECONOMIC CLUSTERS, NOT POLITICAL JURISDICTIONS

If political boundaries are largely irrelevant to businesses, they are the same to strategies that target cohesive groupings of firms. It is neither

effective nor efficient to establish multiple, independent state programs for individual clusters that cross state lines. Manufacturing technology centers and extension programs should be required to submit plans that identify target clusters or industries—without regard to state boundaries. The federal government and the national interest can provide the rationale, encouragement and incentives for interstate cooperation, to keep political bodies from feeling they are dispatching resources outside their jurisdictions.

It is neither effective nor efficient to establish multiple, independent state programs for individual clusters that cross state lines.

6. GUARANTEE SERVICES TO RURAL CLUSTERS

The level of demand for services in rural areas—even where industries are clustered—is often too low to support a private-sector supplier. Governments can fill the most vital market gaps by underwriting some of the costs of such services. Cooperative extension programs and cooperative services for agricultural "clusters" provide models. With sufficient state and federal encouragement, a similar cadre of agents and service providers—skilled and experienced in industry—could enormously benefit rural industrial clusters.

Local Government Activities

Local government agencies and institutions can also play a role in industrial modernization. Such agencies typically offer one service—such as training or small business incubation—to a variety of firms across many industries. By offering a wider range of services, with a narrower industry focus, these local government organizations can shift their focus from individual firm needs to regional cluster support. These local organizations would then become one-stop shops, staffed by "merchants" who know and understand their customers, to perform the following roles.

1. INTEGRATE FUNCTIONS AND SPECIALIZE BY CLUSTER

Since local organizations often are mandated to serve a community rather than an individual sector, the existence of a cluster has implica-

tions for an organization's staffing and investment. Recruiting staff with industry experience and connections, who can offer a more targeted set of services, can help a local agency enhance a cluster's capabilities—and thus the local economy. Cluster-specific but broad-based expertise will eventually establish firms' confidence in the agency as a true partner. Some institutions or agencies already do this, but most still seek to accommodate any potential business investor, not to strengthen a cluster.

2. HELP COMPANIES LEARN ABOUT ONE ANOTHER

Local organizations can become a cluster's "hub," facilitating interaction among key industry members and serving as a source of information and linkage to other state and national organizations. This role tends to be particularly important in rural areas. The Grange, Farmers Alliance, Future Farmers of America Alumni Associations, and a host of other organizations did this for agriculture. A similar set of organizations might give manufacturers the same advantage.

3. LEARN ABOUT LOCAL INDUSTRIES FIRST HAND

An institution or hub must be sufficiently familiar with the industry it serves to earn the confidence and trust of that industry's leaders. Local organizations can get to know local firms by offering programs of interest or collective services, by conducting surveys—or simply by knocking on doors.

Because most local government agencies deliver a single or relatively narrow range of services—and most clusters have multiple needs—partnerships are essential.

4. PARTNER WHERE POSSIBLE

Because most local government agencies deliver a single or relatively narrow range of services—and most clusters have multiple needs—partnerships are essential. Local development agencies can expand to fill the gaps in services, as long as they avoid competing with other institutions. In rural areas, for example, community colleges functioning as sector hubs can, and often

do, work hand-in-hand with other institutions to provide services beyond education and training, sometimes co-locating personnel to simplify coordination.

Cautions and Caveats

Many things can sabotage new and innovative approaches to economic development before they are fully tested. All too often, a program implemented on a shoestring or as a pilot is held to the same standards as larger-scale, better-funded projects. Even the best program can be thwarted by expecting too much, too soon, for too little investment.

Even the best economic development program can be thwarted by expecting too much, too soon, for too little investment.

These, then, are some of the pitfalls to avoid in launching new economic programs.

Underfunding. While consumers tend to realize that in general "you get what you pay for," the public sector as a rule seems to expect more. Appropriations for most of the programs described in this book have been marginal at best. Compared to the millions of dollars expended on large-scale cluster-focused development programs in Europe and the Pacific Rim, state programs are relatively small-scale. Nevertheless, expectations for these programs run extraordinarily high.

Lack of continuity. Industry programs that are tied to government risk arbitrary termination—regardless of their merit or outcomes. Far too many modernization programs are abandoned or reduced in scale to give a new administration or ascendant political party its own "signature" programs, or simply to demonstrate austerity. Unless programs can be established in ways that protect them from the winds and whims of political change, they may never have the chance to fulfill their missions.

Impatience for results. Programs aimed at making a cluster or industry more competitive will not see overnight results. Building capacity, changing culture and establishing trust all are long-term endeavors, and their economic outcomes cannot be measured after only one or two

years. Requesting indications of progress after a short period is reasonable; requesting counts of the numbers of jobs or firms created is not.

Use of the wrong measures. Job creation is the ultimate development goal of state governing bodies, and understandably so. This encourages local and state governments to use cluster strategies as company recruitment devices; indeed, many existing sector strategies explicitly cite recruitment as a goal. But job retention and indirect job creation (in support, supplier or partnering companies) are also important—and much more difficult to demonstrate because they depend on assumptions about what would have occurred in the absence of the strategies.

Self-sufficiency requirements tend to shift program emphasis away from complex services and rural areas and toward services that yield quick results. Ultimately, then, demands for self-sufficiency actually undermine competitiveness .

Expectations of self-sufficiency. Many government programs that support industry are given too little time to spin off government funding and become self-sufficient. Consequently, most end up looking for other funding. These fundraising efforts detract from the program's ability to fulfill its mission.

Self-sufficiency requirements also tend to shift program emphasis away from complex services and rural areas and toward services that yield quick results. While businesses ought to pay for the services they need, demands for complete self-sufficiency actually undermine competitiveness. If government is to be the catalyst and the support for business modernization and improvement—particularly in less populated areas—it will have to take on some share of the costs.

Moving Forward

Governments can help identify clusters, and devise and implement strategies to enhance them—particularly in rural areas where like and linked firms are fewer and farther from one another and where clusters are therefore less obvious. Even in rural areas, however, there are often more common needs, interdependencies and cooperative business opportunities than meet the eye. Helping these clustered regional produc-

tion systems, large and small, exploit their commonalities, address their mutual concerns, and increase their synergy can do much to strengthen rural and urban economies.

This book is intended as a guide for policymakers and practitioners who are interested in targeting production systems. Slowly, public policy is shifting *away* from locations and *toward* clusters and sectors. Marking a change from industrial policies of the past, governments are now carefully considering—and increasingly supporting—industry- and cluster-specific policies. We hope this book enhances and advances such practices.

APPENDIX A. SOPHISTICATED TECHNIQUES FOR REGIONAL INDUSTRY ANALYSIS

Techniques and approaches for comparing and analyzing industry data range from simply plotting trends and comparing location and industries to employing sophisticated econometric models. Data are readily available on numbers of establishments and employees, wages, payrolls, exports, value added and other measures of performance.

These data—which can be analyzed by industry as defined by primary product, and by geographic region—are useful for simple comparisons and rankings of industry scale, output and production within state or county boundaries. Time-series data can reveal trends and patterns, which become still more evident when graphics and mapping software is used. All of these data can also be used as inputs to the more sophisticated analyses described below.

Techniques for analyzing industry data range from simply plotting trends and comparing location and industries to employing sophisticated econometric models.

Measuring industry specialization

Industry specialization can be gauged by using the **LOCATION QUOTIENT**, which is the *region's* ratio of employees or number of establishments in an industry compared to the *nation's* ratio of total employees or number of establishments in the same industry. Increments in excess of 1.0 indicate increasing specialization.

For example, location quotients are 7.8 for aircraft in Washington, 3.0 for aerospace in California and 2.4 for pharmaceuticals in New York. Other measures of concentration that can be compared as location quotients include proportions of establishments, employment, shipments and value added among the nation's largest firms as reported by the Census Bureau.

Measuring sector growth

Sector growth is one indicator of competitiveness, and is commonly measured by **shift-share**—the incremental difference between sector growth in a state or nation and growth in a particular region. Using this technique, New York's Department of Economic Development was able to determine that the information technology industry in the mid-Hudson region gained, on its own merits, 5,424 jobs between 1983 and 1990—an incremental gain beyond that reflected in national trends.

Measuring industry concentration

Industry concentration can be measured using **Gini coefficients**. A state's regions are ranked in terms of fractional shares of a sector and manufacturing as a whole, and the cumulative fractions are plotted on a graph. Any deviation or "bowing" from a straight line suggests that employment in a particular sector in a region is either under- or overrepresented as compared to national employment in this sector. The difficulty of explaining this factor precludes wider use of this technique.

Calculating Gini coefficients for states yields both obvious and not-so-obvious findings. Weaving and synthetics (SIC 222) are shown—as suspected—to be concentrated within the states of Georgia and North and South Carolina, which are widely known for their textile and apparel industries. Leather gloves and mittens (SIC 315) are even more concentrated, mainly in Wisconsin, New York and Wyoming. Photographic equipment and supplies (SIC 386) are also concentrated, primarily in Colorado, Minnesota and Oklahoma. The most overrepresented sector in the states is reclaimed rubber (SIC 303), which has disproportionate concentrations in Wyoming, Wisconsin and West Virginia.

Delineating cluster boundaries

The ability to analyze standard data is constrained by the geographical units for which it is collected. Most studies assume the state or county as the base geographical unit, but the practical geographic boundaries of a cluster may not conform to a state or even substate area. Textile equip-

ment manufacturers, for example, are clustered across the North Carolina-South Carolina-Tennessee borders; plastics manufacturers across the Indiana-Kentucky and western Massachusetts-Connecticut borders.

Disjoint cluster analysis is one technique for delineating cluster boundaries and aggregating data for the area of concern. Originally developed to aid the National Institute of Standards and Technology in locating its manufacturing technology centers, disjoint cluster analysis uses a mathematical trial-and-error model to locate the geographic concentrations of the manufacturing establishments.

The process assumes centers of concentrations of industries (termed "cluster seeds"), assigns each establishment to a seed and analyzes the resulting concentrations in terms of average driving time to the center. Each center is then replaced by its mean, establishments are reassigned and new mean driving times are calculated. Clusters are established when no further changes occur. The centers of the clusters identified by this method are, not surprisingly, in heavily populated areas of the Northeast and Midwest.

APPENDIX B. NOTES

Chapter 1

[1] Porter, *The Competitive Advantage of Nations*.

[2] Shapira, Roesner, and Barke.

[3] Porter, "The Competitive Advantage of Nations."

[4] Best.

[5] Marshall.

[6] Brusco and Sabel; Russo; and Gertler.

[7] Marshall.

[8] Brusco and Sabel.

[9] Camagni.

[10] Saxenian.

[11] Saxenian.

[12] Harrison.

[13] Boucher.

[14] This case study is based largely on Nylander.

[15] Saxenian.

[16] Norton.

[17] Enright.

[18] Glasmeier, Kays and Thompson.

[19] Harrison.

[20] *The Economist*.

[21] Sabel.

[22] Porter, *The Competitive Advantage of Nations*.

Chapter 2

[23] John Redman, formerly of the U.S. Department of Agriculture and now with the National Institute of Standards and Technology, has written an excellent analysis of industry data and studies; see Redman, *Understanding State Economies Through Industry Studies*.

[24] Another conceptual approach that extends beyond the usual business transactions is suggested by Harrison and Storper. It includes relationships that influence the very structure of a cluster. For example, they add governance and hierarchy, which leads them to a scheme with four levels of clusters: (1) all ring—large numbers of firms with no obvious dominant firm and no hierarchy; (2) core/ring with coordinating firms—lead agent that cannot function independently and needs local suppliers; (3) core/ring with a lead firm with ultimate power over suppliers; (4) all core, with large firms that are vertically integrated or do all their purchasing out of the region. This model also organizes clusters according to the type of system in it, such as small artisan firms, networks of small firms, networks of small and large firms, and dispersed networks.

[25] Bergman and Sumbal.

[26] Powell, as quoted in Harrison.

[27] Sternberg.

[28] Office of the Governor of Massachusetts.

[29] All dollar values in this case study are in Canadian dollars.

[30] Kaufman *et al.*

[31] Manufacturing Studies Board.

[32] Von Hipple.

[33] Putnam.

Chapter 3

[34] House Bill No. 561. General Assembly, Commonwealth of Kentucky. March 8, 1994.

Chapter 5

[35] Hayes and Pisano, "Beyond World-Class."

[36] Putnam, "The Prosperous Community," p. 37.

[37] Saxenian, in *Regional Networks*, describes a 1969 Sunnyvale, California, semiconductor industry conference at which only about two dozen of the 400 attendees had never worked for Fairchild.

[38] U.S. General Accounting Office, *Rural Development*.

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Originally established at The Aspen Institute in 1985 as the Rural Economic Policy Program, and renamed Community Strategies Group in 2000, CSG strives to have a positive impact on communities by -designing, facilitating and participating in ongoing peer-learning and networking opportunities that enhance the efforts of organizations and practitioners working to achieve more widely shared and lasting prosperity in communities, and that sustain the impact of funders' investment in them. CSG's core business focuses on the fields of community and economic development, civic capacity, family and regional livelihood, and community-based philanthropy. CSG also designs and convenes occasional one-time gatherings of foundation or community practitioners working on issues critical to the collective learning of a larger field. In addition, CSG analyzes and packages guiding lessons and strategies from its various learning initiatives.

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