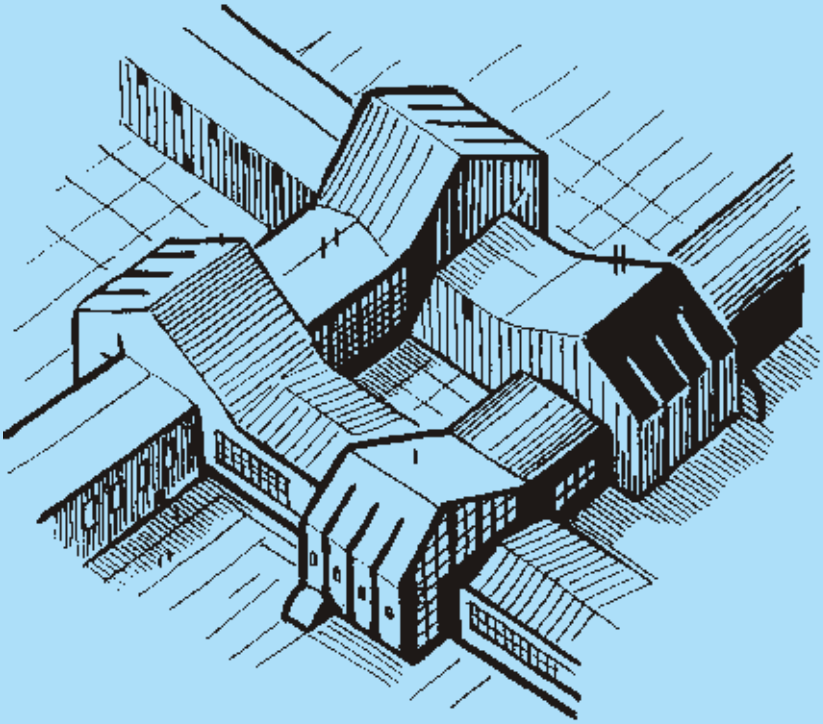


OverAchievers

Business Clusters that Work:
Prospects for Regional Development

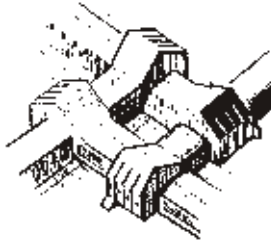


Stuart A. Rosenfeld

Regional Technology Strategies, Inc.

OverAchievers

Business Clusters that Work
Prospects for Regional Development



The Graylyn Center, Winston-Salem, North Carolina
May 10-12, 1995

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with supplementary funding from the Aspen Institute,
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and U.S. Department of Agriculture.*

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The meeting at the Graylyn Conference Center was planned by myself, RTS principal Brian Bosworth, and Amy Glasmeier, Professor at Penn State University, with advice from Federal Co-Chairman Jess White and Jeff Thompson of the Appalachian Regional Commission, Meriwether Jones and Janet Topolsky of the Aspen Institute, and Jeffrey King of the German Marshall Fund.

We are especially grateful to our colleagues from Europe, Canada, and Australia for traveling to the United States to join us, for discussing their experiences so frankly, and for expanding the boundaries of our discussions. Background papers prepared by the participants helped frame the issues and shape the discussions. Suzanne Despres-Preston was invaluable in making conference arrangements, helping with logistics, and making sure the event ran smoothly, as well as making substantive contributions to the discussion.

The organization of the resulting document was sketched out by myself, Brian Bosworth, and Janet Topolsky of the Aspen Institute. It was then reviewed by the participants and RTS staff. Nita Congress edited the final manuscript, Alice Whicker Heitchue designed the format and handled all production of the final manuscript, and the internationally renowned illustrator David Suter did the cover drawing.

Stuart Rosenfeld, January, 1996

THE GRAYLYN STATEMENT

On May 10-12, 1995, 26 practitioners, researchers, and policy makers from the United States, Canada, Europe, and Australia convened at the Graylyn Conference Center in Winston-Salem, North Carolina for a critical discussion of business clusters and their impacts on economies, with special attention paid to rural areas. The meeting was organized by Regional Technology Strategies, Inc. with the support of the Appalachian Regional Commission and supplemented by grants from the Aspen Institute, German Marshall Fund of the United States, and U.S. Department of Agriculture.

Meeting Competition through Cooperation and Collaboration

As international competition intensifies, businesses around the world are stepping up their efforts to find partners and form alliances that can establish or fortify their relative positions and advantages. This is especially true among the world's industrial giants. For instance, General Motors and Toyota joined forces to produce automobiles at the NUMMI plant in California; and Apple, IBM, and Motorola combined expertise to develop the PowerPC RISC chip. These alliances are now an accepted, and successful, business practice of many of the world's most dynamic large corporations. Corporate cooperation improves businesses' abilities to acquire and use information and innovation. This, in turn, improves national economies.

But in the race toward cooperation, the small and medium-sized enterprises (SMEs) that are the backbone of every country's industrial economy are getting left behind. SMEs—particularly those in rural areas—are neither as adept at nor as active in making connections with other firms, services and markets as are the multinationals. To create a level playing field, government has been looking for ways to encourage and expand connections among small and mid-sized companies, especially those outside major urban centers.

For example, regions have been devising schemes to help small firms

organize themselves into networks of companies that work together to increase their collective sales and profits. And—with sufficient support—these network programs are beginning to show results, in both rural and urban settings. But networks really don't look or reach far enough to be truly successful. That's because a network, no matter how carefully fashioned, is still only part of a larger regional production system.

A “system” is simply a set of components that work together for the overall objectives of the whole. If businesses are seen as the “components,” regional economies then are the production systems. These regional production systems include all of the concrete and abstract elements that take materials and ideas, transform them into products and services, and get them into the hands of customers. Such a system includes, for example, materials, services, capital equipment, skills, distribution centers, knowledge and information, as well as the formal and informal mechanisms through which the transfer of concrete goods (capital and product) and abstract goods (knowledge and ideas) occur.

Many of the businesses that constitute the components of a production system tend to locate near one another, or to “cluster.” This reflects their interdependencies and the value they place on frequent interaction. Successful clusters, however—particularly in rural areas—also maintain important connections to firms *outside* of their region. Obviously, the resulting collection of interdependent companies is quite a different entity than networked business partners.

Clusters: A Basis for Cooperation and Regional Development

Many public agencies are beginning to recognize that each local company does not stand alone but is part of a larger production system—a system that agencies need to understand better. They are reexamining economic development by looking at ways in which businesses are drawn together and the advantages that those businesses can (and often do) gain as a result of their integration in local production systems and connections to the larger global economy. For their part, businesses are beginning to pay closer attention to their own connections to one another, to recognize the common problems they face and to look for strategic alliances and collec-

tive solutions. Many regions—including those that are rural and sparsely populated—are either exploring, or already experimenting with, policies that build on this trend and strengthen the upstream and downstream linkages among their resident businesses. In so doing, these governments, businesses and regions are explicitly invoking the clusters concept.

Clusters have been recognized, studied and described by analysts for years. In fact, they are the original context in which networks were discovered and promoted as policy. A business cluster, as we came to understand it in our discussions, is quite simply:

a geographically bounded concentration of similar, related or complementary businesses, with active channels for business transactions, communications and dialogue, that share specialized infrastructure, labor markets and services, and that are faced with common opportunities and threats.

Our Task

This growing emphasis on such business clusters spurred our group of practitioners, academics, and policy analysts to meet in order to pool, explore and draw on our common interest and experience in production systems. Our goals are to review the state of knowledge about clusters, share our experiences, and—hopefully—add something new to the current stock of understanding about clusters as economic development strategies, particularly in less populated regions.

Distinctions. We agree, for example, that there is much more to a successful cluster than just a high concentration of related firms with specialized services and infrastructure. We acknowledge that groups of firms cannot simply be separated into clusters and non-clusters. A cluster is a condition of business activity, not an absolute threshold. Some are more developed and productive than others, and some are more tightly or loosely connected than others. In all cases, success is defined largely by the degree of animation and dynamism powering the cluster. This vigor in turn relies on the tightness of the social fabric that supports trust and facilitates the movement of ideas, information, innovations and business transactions. Highly developed and successful clusters feature:

- critical mass of similar, or related, economic enterprises;
- specialized services and infrastructure;
- accessible and rapid exchange of information and knowledge;
- a workforce skilled in and well-informed about the industry;
- competition to keep firms on their toes and spur innovation;
- high rates of new businesses formation to imitate and innovate, fill needs, or diversify; and
- a social infrastructure and high enough level of trust to make it easier for firms to cooperate and learn from each other.

Therefore, we carefully distinguish among working, or “overachieving,” clusters, which have most of the specialized resources needed to support clusters plus active interactions that produce synergy; latent, or “under-achieving,” clusters, where the specialized resources exist but the connections among the players are weak; and potential, or “wannabe,” clusters, which may be designated by officials as clusters because the potential for synergy and growth exist but where many specialized resources are still missing or underdeveloped.

Issues. We attempt to anticipate some of the questions that inevitably arise when industry or sector strategies are suggested. For example, we explain the difference between “picking winners” to target sectors and supporting regional production systems. We argue that cluster strategies recognize the obvious: that individual businesses do not operate in isolation but are elements of a larger system, and that more jobs and wealth will accrue in those local economies that address the needs of the larger system. Our group suggests ways that rural areas could adopt cluster strategies; these are based on expanding the cluster definition to include satellite clusters linked to systems elsewhere and clusters based on more important but less specialized relationships among broad sets of firms.

We acknowledge the importance of service industry clusters—particularly those that bring new wealth into a region or support manufacturing. We agree that cluster market failures can be minimized by focusing on core competencies rather than products and by continually reevaluating markets and diversifying cluster strengths. We maintain that cluster approaches and diversification are not mutually exclusive, but are in fact mutually compatible: clusters can include many sub-activities of suppliers

and services that can be transferred or exported to other clusters or can form the basis on which related clusters can develop.

Actions. Finally, we recommend actions to be taken by the public sector and business associations to foster long-term economic growth.

- *Learn how businesses interact and clusters work.* Clusters are defined not just by their elements—the businesses and workers that comprise them—but by the connections among the enterprises that form them. Getting inside the cluster to understand the often-intangible mechanisms by which information, innovation, capital and people move through the system reveals ways for government to remove bottlenecks and improve flows.
- *Support clusters that qualify support because of their dominance, strategic importance, or demonstrate leadership and request recognition.* Analysis combined with judgment based on tacit knowledge of the business community will point to the clusters where investments can yield the greatest payoffs. But other groups of firms also must be given the opportunity to demonstrate the commonality that defines them as a cluster and to articulate collectively their needs and economic value to the region.
- *Focus on subsidiary systems and satellite systems in more rural areas.* Connections among businesses in smaller or more remote regions may take on different forms and therefore require smaller critical mass. For example, rural businesses can be viewed not only with respect to each other but as they collectively relate to some more distant and possibly urban-based markets, customers, or sources of expertise and knowledge.
- *Improve the technical support services.* Investments in specialized education and training, technical assistance hubs, and R&D—examples of technical support—are just some of the tailored services needed to develop an innovative and growing cluster. Smaller firms—particularly those that lack the resources and incentives to develop their own training, research, or engineering departments, depend heavily on local services.
- *Invest in social capital and social infrastructure.* Social capital is perhaps the least visible and most undervalued contributor to local development. Interventions that may build social capital include

providing incentives to active local business and civic associations or to activate new associations; requiring, or including incentives for, multiple-firm sponsorship or inter-firm collaboration in community or economic development grants; and increasing investments in cluster-based communications systems and in inter-firm collaboration.

- *Empower and listen to cluster leaders.* Only the members of a cluster can make it function as a system, and only the members can identify their most pressing needs. Regions that let the companies take charge of their efforts have the most to show for their investments.
- *Encourage cross fertilization of ideas across clusters.* Clusters must not become isolated and inward-focused. Building connections with other clusters and other regions keeps new ideas flowing into the cluster and helps it innovate, diversify, and grow stronger.
- *Recruit companies that fill gaps in cluster development.* Recruitment, and the public sector investments that accompany it, ought to be a carefully planned and managed process designed to fortify or diversify a cluster. Priority in recruitment incentives should be given to companies that add value and fill gaps in the region's production system.
- *Develop and organize supply chain associations.* Regions generally pay too little attention to the abilities of potential suppliers and the quality of the linkages between suppliers and customers and among suppliers. One solution is to develop supply chain associations and supplier certification networks that can then work in concert with two-year colleges and customers to meet local certification standards.
- *Convert local suppliers into final producers.* Many suppliers are finding that, collectively, not only can they upgrade their abilities to serve existing customers, but they can find additional customers outside the region. By diversifying, suppliers shift from functioning mainly as a set of inputs to another cluster to functioning as a self-actualized system largely independent of the original local customers.
- *Support employee/entrepreneurs* One of the most important measures of a cluster's energy is its rate of new business formation, which emanates from three sources: imitators, complementary products or services, and diversification based on existing skills and technologies. Business education, incubators, and venture capital that systematically target workers and opportunities within the cluster can be more effective than general programs.

The following sections present a more detailed summary of the results of our discussions.

The Graylyn Group

The group of practitioners, policymakers, and academicians that met in North Carolina included only a very small sample of the many experts around the world who are studying clusters, actively participating in them, or formulating policies for them. Budget constraints and size limits for face-to-face dialogue compelled us to keep our group small. The comments and writings of many other experts, however, substantially influenced our discussions and this report.

The intent of this document is to clarify the terms and issues, raise the level of attention to clusters on the policy agenda, and stimulate further discussion and debate—much as *Significant Others*, the report on networks by the Aspen Group, did three years earlier. In some places, the growing interest in networks has spilled over to clusters, and fomented interest in clusters to as a way to foster inter-firm cooperation; in some places interest in clusters has led to efforts to promote networks.

Regardless of whether clusters become adopted as legitimate units of economic development policy, we are all convinced that the location and intensity of relationships among businesses *does* matter, and that it will ultimately influence a region's growth and prosperity. The participants at the meeting were:

Bill Bishop, Kentucky
Brian Bosworth Massachusetts
Carol Conway, North Carolina
Philip Cooke, United Kingdom
Suzanne Despres-Preston, North Carolina
Michael Enright, Massachusetts
Marc Ferland, Canada
Vaughn Grisham, Mississippi
Amy Glasmeier, Pennsylvania
Robert Jastremski, Connecticut
Terry Kaufman, Pennsylvania

Alan Kendrix, Connecticut
Jeffrey King, Washington, DC
Ken Maddox, Oregon
Jane Marceau, Australia
Bibi Monsky, Kentucky
Walt Plosila, North Carolina
Peter Plougman, Denmark
Robert Putnam, Massachusetts
Stuart Rosenfeld, North Carolina
Ernest Sternberg, New York
Jeffrey Thompson, Washington, DC
Janet Topolsky, Washington, DC
Steven Waldhorn, California
Jesse White, Jr., Washington, DC
Trent Williams, North Carolina

REACTING TO REALITIES

Businesses have a tendency to cluster geographically into production systems. Firms find it advantageous to be near their suppliers, customers and other firms that produce similar goods. This proximity lets them transact business more cheaply and easily, resolve problems more quickly and efficiently, and learn earlier and first-hand about new and best practices. It is no coincidence that furniture companies cluster near their material sources, biotech firms are found around universities and federal labs with strong research programs, and metalworking firms surround large equipment manufacturers. Companies that are clustered benefit to varying degrees from what economists call “external economies” or “economies of agglomeration.” The clustering, where it is supported by community norms that engender social interaction and trust, not only fosters increased local business activity but accelerates competition, learning, and innovation and increases the value added to local products. Not surprisingly, clustered businesses are also more likely to form alliances and networks.

Business clusters have been observed and studied since the turn of the century, yet the phenomenon has been vastly underrated and undervalued in economic development policy—particularly in the United States and particularly in rural areas. As long as mass production, branch plants and industrial recruitment defined and dominated economic development policy, which they have for the last half century, public practice focused on prospecting for new companies. Interest in clustering was for the most part relegated to seeking suppliers for those branch plants.

Today, industry is restructuring, becoming leaner and more flexible. It is reorganizing its production into a carefully orchestrated set of interdependent activities rather than centrally controlled monolithic enterprises. Under these new arrangements, new interfirm and intrafirm relationships replace the old, top-down organizational charts, take on added importance, acquire new legitimacy, and are given higher priority within public policy. This provides opportunities for and presents challenges to small and rural businesses, which historically have been isolated, independent, and labor intensive, to modernize their operations and make the connections that can create advantage.

The economic successes of highly networked, small firm-based economies in northern Italy in the 1980s drew attention to the advantages of clusters and demonstrated how effectively they enabled SME-based economies to compete in the global market. In 1990 Harvard Business School Professor Michael Porter further raised the level of interest in business clusters with the publication of *The Competitive Advantage of Nations*. That book emphasizes that a region can only be as competitive as its industries and describes in detail those conditions essential to competitiveness.

Suggesting that business clusters add value to a region implies an entirely new set of public policies, one that shifts the focus of attention from an individual place or individual firm to a region and clusters of businesses. As a result, states and regions—as they become more and more interested in cluster strategies—are searching for ways to define their production systems in politically acceptable ways (avoiding the perception of favoritism, for example) and take advantage of their potential power.

Because the term “cluster” is new to many public officials, it is still somewhat ambiguous. It has come to include a vast array of definitions and classification schemes and has spawned a variety of strategies for relating clusters to economic development. It was within this context that our group of international experts and practitioners met to try to sort out the definitions, clarify the terminology, review the progress of public sector interventions and suggest ways to improve upon economic development practices. The group positioned itself at the intersection of theory and experience in order to establish some common terms and definitions, summarize the lessons of fledgling programs and long-time practice and to establish some principles and practical strategies for increasing the efficiencies and value of clusters.

SETTING THE RECORD STRAIGHT

Through our discussions, we arrived at a fairly simple definition of a business cluster. A business cluster, we agreed, is a “geographically bounded concentration of similar, related or complementary businesses, with active channels for business transactions, communications and dialogue, that share specialized infrastructure, labor markets and services, and that are faced with common opportunities and threats.”

Do You Mean a Network or a Cluster?

The participants emphasized that the recent focus on networks has led to considerable confusion in policy circles between the definition of a business cluster and a business network. (See Figure 1.) Like a cluster, a business network is based on inter-firm linkages. But the term generally refers to a group of firms with restricted membership and specific, and often contractual, business objectives likely to result in mutual financial gains. The members of a network choose each other, for a variety of reasons; they agree explicitly to cooperate in some way and to depend on each other to some extent. Networks develop more readily within clusters than not, particularly where multiple business transactions have created familiarity and built trust.

In contrast, clusters have no formal membership requirements, attract specialized services to a region, are based on trust and the custom of reciprocating for the deeds and favors of others, foster implicit cooperation, and have a collective vision as opposed to common goals. Clusters generally are defined by the following criteria.

- *Size:* Clusters meet some set of threshold numeric conditions in terms of geographic size and concentration; they could be measured, for example, by the number of employees and companies within a specific geographic area. Rural clusters such as furniture and apparel in North Carolina and wood products in Oregon, as well as the more urbanized auto industry in southern Michigan would meet most numeric criteria. But more often, this criterion proves restrictive and

troublesome for rural areas and small cities, since their “clusters” rarely have the requisite scale—unless regional boundaries or cluster focuses are sufficiently expanded, which will be discussed later.

- *Economic or Strategic Importance:* Clusters are usually a relatively important component of their regional economies. They may represent a substantial proportion of a region’s industrial base, such as the aerospace industry in Seattle or wood crafts around Port Angeles, Washington. They may provide an essential input to another key cluster, such as machine tools used by the automotive industry in Michigan. They may offer the promise of long-term employment growth, such as environmental technologies in Massachusetts or software in Oregon. It could be a critical element in a region’s strategic future, such as surface transportation equipment in Quebec; or a distribution hub, such as Global TransPark which is now being planned for rural Kinston, North Carolina. They may solve a common problem, such as the pollution resulting from decades of coal and steel production in Germany’s Ruhr Valley, which provoked an environmental technologies cluster to respond. Or they could generate entrepreneurial energy, such as electronics does in Silicon Valley. Measures of relative economic importance are an equalizer for rural areas that may not meet scale criteria.
- *Products and Services:* Clusters, since they are in fact production systems, necessarily embody a range of products and services. A cluster may sometimes be defined by a narrow product, such as hosiery, which is well down the standard industrial classification scheme (fourth level). Or a cluster can be defined broadly, as in the case of southern New England’s Connecticut River Valley where a large group of metalworking firms supplies the region’s large final equipment producers. These companies—whose antecedents date back to the mid-19th century—are bound together by their metal-forming skills, not by specific products or customers, and they cut across several two-digit standard industrial classification categories. Or it could be a natural resource, such as timber in the U.S. Northwest. Each of these clusters include producers and service companies with a wide array of seemingly unrelated industrial classifications.

- *Vertical Connections:* As production systems, clusters include companies connected to one another vertically through value-added chains that include suppliers of suppliers of suppliers, etc., all the way to the completely finished product. Regional firms provide processes, materials, parts, components and subsystems to each other, represented in aggregate by the input-output relationships compiled by the government that describe the relative sales and purchases among industries. Clusters generate opportunities for business transactions, and set times and places for business people to meet and interact. The manufacturers of yarns, needles, packaging and materials in North Carolina's hosiery cluster, for example, comprise important parts of a production system; the Welch automotive components cluster has organized itself into "supplier chain associations" that include firms at each level of the production hierarchy.
- *Common Inputs:* Clusters may be defined by the common need for some critical input, which can be a raw material, a core technology, or a set of skills. The former is particularly true in rural areas, where firms cluster to take advantage of wood supply or agricultural products. Cheese processing in Wisconsin and secondary wood products in Oregon are examples of input-related clusters. The roots of a cluster may be a core technology emanating out of research labs, such as the optics and imaging companies in and around Rochester, New York. Or the cluster may form about a set of skills. The furniture cluster in Tupelo, Mississippi grew out of the skills acquired by of the employees of a single company that moved there in the later 1940s and passed down to future entrepreneurs.

These characteristics are requisite conditions that qualify a group of firms to be designated as a cluster. Nevertheless, they neither ensure a well-functioning production system nor produce synergy. Regions with companies with these attributes may truly operate optimally as a system—or they may not. The characteristics that separate an effective, working cluster from raw concentrations of similar firms are those that define rates of activity, not quantities of input. An effective cluster embodies groups of firms that frequently meet, interact and conduct business; and that have developed high levels of mutual trust, hold a shared vision and learn from each other—all of which produce dynamism and synergy.

Figure 1. Networks or Clusters?

Networks	Clusters
Networks allow firms access to specialized services at lower costs	Clusters attract needed specialized services to a region
Networks have restricted membership	Clusters have open membership
Networks are based on formal or informal contractual agreements	Clusters are based on social values that foster trust and encourage reciprocity
Networks make it easier for firms to engage in complex business	Clusters generate demand for other firms with a variety of similar and related capabilities
Networks are based on cooperation	Clusters take both cooperation and competition
Networks have common business goals	Clusters have collective visions

“Go with the Flow”

The higher the intensity of interaction among an area’s firms—the frequency and ease of social, civic and business activity—the greater the economic benefits to the region. The presence of clustered firms both demands and generates specialized skills, knowledge, innovation, competition and cooperation; tailored infrastructure; and specialized support services and other related businesses. While scale and relative importance may be prerequisites for clusters, it is the interactions and connections that most vividly shape the cluster and define its power. The efficiency of the current flowing through the circuits of a cluster depends, in turn, on local norms of reciprocity and networks of civic and economic engagement. This level of animation varies from cluster to cluster in several ways:

- *Form*: Interactions may take the form of sales and purchases of goods and services; cooperation networks that market or produce jointly; shared activities in membership associations; or simply informal

exchanges during breaks at formal business meetings, golf outings arranged by vendors, in pubs or bars after work, or over the Internet.

- *Quantity*: Interactions may vary in the frequency of contacts and the number of businesses or people involved, or the number of organizations with active membership and the number of members.
- *Quality*: Interactions may differ in length of commitment, degree of formality of interfirm contacts and contracts, levels of trust, scope of relationships and the energy of the business leadership.

Overachievers, Underachievers, and Wannabes

The fact that all concentrations of related firms do not act and interact as a mature and active cluster, and are therefore unable to realize many of the benefits of clusters, is most often due to weaknesses and gaps in social infrastructure. At the meeting, Michael Enright of the Harvard Business School differentiated clusters according to the intensity of activity among firms in a cluster. Taking some liberty with his terminology, the categories are as follows:

- working, or “overachieving,” clusters that are self-aware and able to realize their full potential and produce more than the sum of their parts;
- latent, or “underachieving,” clusters where opportunities exist but are not exploited and synergies are not yet realized; and
- potential, or “wannabe,” clusters where some of the requirements are in place but critical mass and/or key conditions or inputs are missing.

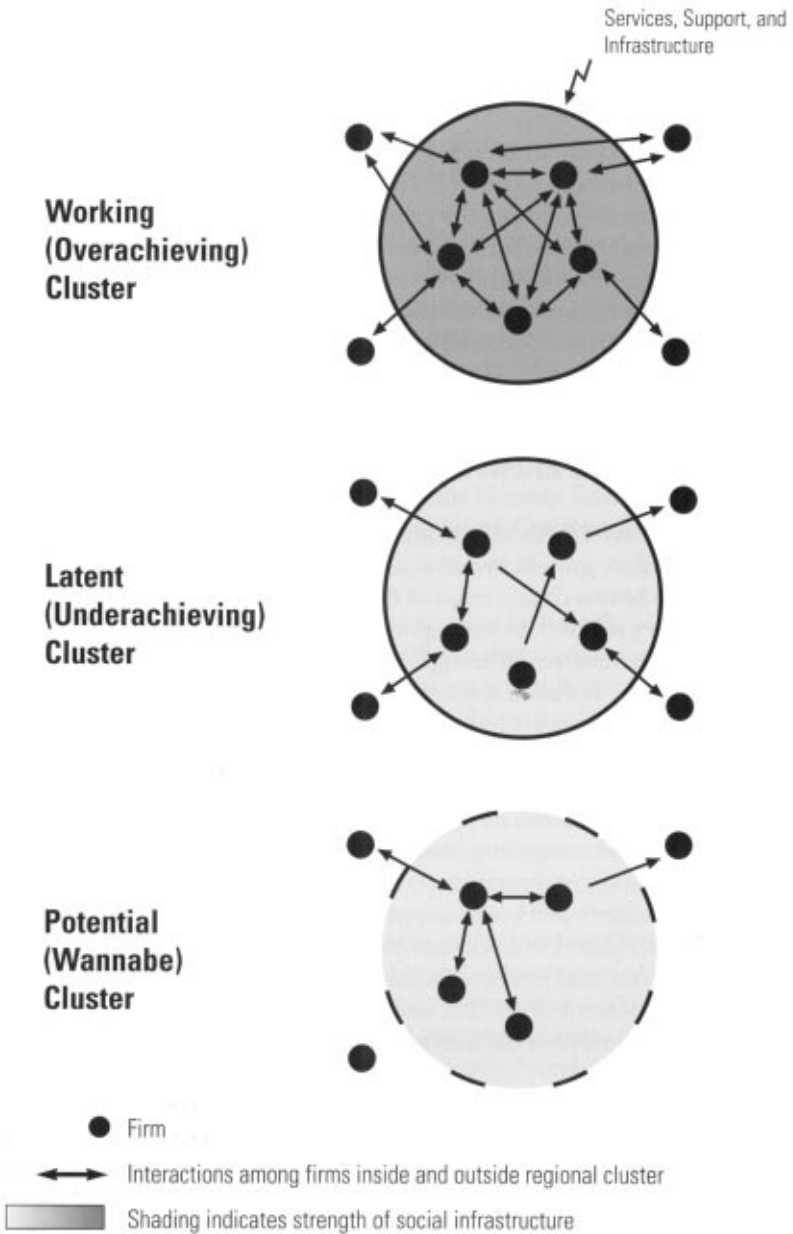
Overachieving Clusters. A working, or overachieving, cluster, is exemplified by the electronics industries in California’s Silicon Valley, hosiery in North Carolina, or flowers in the Netherlands. These industries are aware that they are, in fact, clusters and together do produce more than the sum of their individual parts. These groupings of firms have the social infrastructure and generate the networks that keep information flowing continually, spark new ideas, and encourage new firm startups. They have a

highly specialized and expansive support system, and therefore are able to realize their potential. Perhaps the greatest advantage of working clusters is the ability of their members to learn quickly from each other—and, as Philip Cooke reminded us, to forget outdated practices that can delay innovation.

Underachieving Clusters. In a latent, or underachieving, cluster, the scale and opportunities for effective clustering exist but are not fully realized—generally because the social fabric and community norms that promote interaction among workers and employers are too weak. Businesses thus may not share a vision of the future, think sufficiently about their interdependencies or want to represent themselves as a cluster. The pharmaceutical and biotechnology companies around North Carolina's Research Triangle Park, for example, employ about 24,000 people and have many of the attributes of a working cluster—scale, markets and specialized support from the universities and colleges. But, according to Annalee Saxenian (1994), these Research Triangle Park firms lack the requisite interdependencies—perhaps because the area's industry is dominated to a great extent by multinational companies. There are few state associations or mechanisms through which business people may interact.

Wannabe Clusters. Potential, or “anoint and announce,” clusters have some of the elements of working clusters but lack too many vital attributes to offer all of the advantages of clusters. These sectors are often identified and selected by states to be developed into clusters because they may already have the appropriate scale, political strength or technological base. But these potential clusters lack too many of the prerequisite conditions to produce synergy. The environmental technologies cluster in North Carolina, the software cluster in Oregon and the aerospace cluster in Arizona—all selected by state governments as key clusters—are really examples of as yet underdeveloped U.S. clusters. In rural areas, the chief challenge for potential clusters formed through local initiative is that they may not have sufficient scale initially. Some of these smaller concentrations are formed into broad-based, multifaceted networks, in an effort to sow the seeds for more complete clusters. Wood products in eastern Oklahoma, specialty kitchens in Athens, Ohio, and fiberglass boat builders in eastern North Carolina are all networks that aspire to become clusters.

Figure 2.. Types of Clusters



KNOW YOUR CLUSTERS

How do you know when firms are functioning as a system or have the potential to become a system? The most common analyses rely on measurable parameters to identify clusters. They use traditional economic development techniques, such as mapping concentrations of employment and firms, using location quotients to compare industry concentrations to national average industry concentrations, using input-output analysis to estimate business transactions and—in certain cases—developing an inventory of specialized resources.

Useful Tools; an Elusive Goal

Current analytic methods can answer an important set of questions about the location, growth patterns and purchasing needs of businesses. Does a region have a critical mass of firms in the same, closely related, or complementary sectors? In aggregate, are the businesses expanding or contracting, growing, or declining? What are they able to buy and sell within the region? Is there a specialized support structure? Many methods exist for using the answers to these questions to define and describe clusters, some quite sophisticated.

DRI/McGraw-Hill has developed sophisticated procedures for identifying and comparing clusters using four weighted variables: size (critical mass), concentration (intensity, or local relative importance), growth (dynamism), and buyer-supplier linkages (depth). That formula yielded 380 U.S. clusters in advanced manufacturing, consumer industries, service industries and resource industries. Together these clusters account for 57 percent of the U.S. workforce, 61 percent of the nation's output, and 78 percent of the nation's exports (DRI/McGraw-Hill 1995).

Michael Porter (1990) developed what has become the most popular model for describing and understanding clusters. On the basis of studies of industries in ten nations, he established four sets of conditions essential to a region's competitiveness, which he calls the "diamond." They are firm

structure and rivalry, local demand, related and support industries, and “factor conditions,” defined as skills, infrastructure, R&D, capital, and so forth. Although his model is based on national systems, Porter contends that the region or city is, in many ways, more important than the nation as a locus of competitive advantage. Many regions have applied this basic model to their own economies to describe regional clusters and to identify strengths, weaknesses, and connections of groups of firms.

Some experts focus on the specialized infrastructure available to clusters, the corner of Porter’s diamond called “factor conditions.” These analyses identify and assess structures and support services for the core firms in the cluster, such as relevant education and training programs at local schools; bankers, accountants and lawyers familiar with the cluster; industry-specific research and development (R&D) centers; design and engineering firms; and specialized technical assistance hubs. For example, the Industrial Technology Institute in Michigan was founded in support of the state’s automobile industry; and the Hosiery Technology Center at Catawba Valley Community College in North Carolina, in support of the region’s hosiery cluster.

They may measure the strength of these services in terms of size of budgets or numbers of employees. DRI/McGraw-Hill has developed a method for assessing the strength of a cluster’s regions on the basis of six factors: accessibility of technology, adaptability of human resources, advantages of physical infrastructure, availability of financing, tax and regulatory system, and quality of life.

Clusters in Motion

But not every concentration of related firms is a true local production system. Few existing models capture and describe the underlying dynamics and energy of clusters that might explain the mechanism by which they actually “work” and determine if firms interact and produce synergy. The scale—numbers of firms and employees, specialized resources, proximity of customers and competitors, and businesses supplying parts, materials and services—is only part of the reason that clusters and their regions prosper. Equally important to the circuitry of the system is the “current,” or flow of information, technological advances, innovations, skills, people and

capital into, out of and within the cluster. Are the firms embedded in a social infrastructure that fosters trust and easy interaction? Does the region regenerate itself by spawning new firms that add value or compete?

Conventional data cannot answer these questions and therefore cannot distinguish an industry concentration from a cluster. As Doeringer and Terkla (1995) point out, "Although inter-industry transactions incorporated within production channels can sometimes be detected in the input-output tables, neither the character of relationships among firms nor the benefits of clustering can be discerned in this way." The "current" of a working production system is less easily detected and is often implicit in trade practices; professional, trade and civic associations; and informal socialization patterns. This current, representing the cluster's energy, is rarely considered in the public's selection of the nation's key industries. It depends on community norms of reciprocity (mutual give and take), and sufficient levels of trust to encourage professional interaction and collaborative behavior. Such mechanisms and local customs are the major weaknesses in too many American latent and potential clusters, yet they are also the key to the best U.S. working clusters.

A New Set of Criteria

A new and different set of descriptors to better identify clusters that produce synergy. These descriptors include the most obvious and quantifiable measures, such as number of related firms and specialized services, but also include those that are less obvious and that can only be evaluated through surveys, personal interviews or creative, unobtrusive means. Some of the less obvious measures include the mechanisms by which firms associate (social infrastructure), their entrepreneurial energy (innovation), their leadership abilities (vision), and their levels of collaborative business activity (networking). None of these criteria is disclosed in standard state or federal reporting systems. The proposed criteria let regions identify clusters not easily discernible through some "by the numbers" analysis. These criteria let regions begin with the firms themselves and trace their relationships within and outside of the region. The different levels at which the various criteria hold true for the region are indicators of the synergy of and prospects for a cluster. (See Figure 2.)

Once the circuits and transfer points of the cluster are revealed and better understood, policy makers will be able to construct strategies that take advantage of its strengths and shore up its weaknesses. The next section describes some of ways public agencies are doing this.

Figure 2.. What to Look for in Identifying Clusters?

R&D CAPACITY:

Is an R&D capability—at specialized public or private research centers or from expert individual researchers—available in and accessible to the cluster to provide cutting-edge research and solve pressing problems?

WORKFORCE SKILLS:

Do the skills of the labor force fit the needs of the cluster? Do these include not just technical skills and competencies, but general knowledge of the industry and entrepreneurial skills?

HUMAN RESOURCE DEVELOPMENT:

Are there opportunities for education and training in the cluster's major occupations? Does the cluster provide training to prepare for and adapt to technological and organizational change?

PROXIMITY OF SUPPLIERS:

Are primary and secondary suppliers and sources of raw materials located nearby? Do they have sales staff that disseminates information to customer firms? To what degree do cluster firms interact and do business with local suppliers?

CAPITAL AVAILABILITY:

How well do area banks understand the industry? Do they know the cluster's key players? Can—and do—they meet the industry's needs for working and start-up capital and access to seed and venture capital to exploit new opportunities?

ACCESS TO SPECIALIZED SERVICES:

Are there specialized public sector services available, such as technology extension services or technology centers, export assistance, or knowledgeable small business centers? Are there specialized private sector services available, such as those provided by designers, engineering consultants, accountants and lawyers?

Machine and tool builders:

Are the companies that design and build the machines, tools and software used by the members of the cluster nearby? Are there good working relationships between the tool builders and the manufacturers that foster interactive improvements?

Intensity of networking:

Do firms in the cluster cooperate? How often and to what degree? Do they share information or resources? Do they participate in joint production, marketing or problem solving? How often and to what degree?

Means for associating:

How many and what kinds of local business and civic associations or chapters of associations are in the region? How big are they? How active are their memberships? How often do they interact with each other? Are there other, informal, networks of personal business related contacts?

Entrepreneurial energy:

What's the rate for new business start-ups by workers and managers from within the cluster? How successful is the cluster in attracting new, needed firms or suppliers from outside?

Innovation:

How quickly are new and enhanced technologies conceived, developed and adopted? How quickly do products, processes and services that use these technologies and firms that produce them appear?

Shared vision and leadership:

Do firms think of themselves as a "system"? Do they plan for and share goals? Do they have a vision for the future? Do they have leaders who can maintain their collective competitiveness and keep them together?

THE UNDERPINNINGS OF SUCCESSFUL CLUSTERS

KEEPING SOCIAL CAPITAL AND TRUST

Shifting the emphasis of clusters from discrete numbers to continuous flow patterns, from counts of employers and employees to rates of movement of ideas and information, puts social capital into the mainstream of economic policy. Social capital is typically defined as the ability of people to work together for some common purpose. The notion of social capital as an asset and contributor to local wealth, long recognized in Europe, is rapidly gaining support and legitimacy in the United States. Participants agreed that this ability is the most important defining characteristic of a smoothly functioning cluster. Social capital exists in communities that value cooperation, trust, and interdependence, whose citizens reciprocate deeds and favors, and have organized networks and associations for civic engagement. Rosabeth Kantor (1995) calls this the social glue “which includes the quality of industrial interaction and quality of life.” Robert Putnam (1993) found in his comparative study of Northern and Southern Italy that the economic system does not determine the degree of social engagement, but that the stock of social capital does predict economic performance.

The Crisis of Trust

The foundation of social capital, and the underlying factor in successful industrial systems, is trust. Based on his experiences with many businesses, participant Bob Jastremski observed that, “trust can be viewed as a lubricant in the formation of clusters, a filler for the countless unknowns and uncertainties that are part of complex relationships.” Social scientist Francis Fukuyama (1995) more formally presents a similar view. He notes that trust is “the unspoken bond between fellow citizens that facilitates transactions, empowers individual creativity and justifies collective action.” Without trust, economies falter.

Putnam's research shows that both levels of trust and networks for civic engagement are declining in the United States, and that this decline may eventually be harmful for the economy. Based on a longitudinal survey, the number of Americans who said that "most people" could be trusted fell from 58 percent in 1960 to 37 percent in 1993 (Putnam 1995). Membership in parent-teacher organizations, the organization through which parents are involved in community education, dropped by more than 40 percent between 1964 and 1994, and league bowling (often sponsored by businesses) has dropped 40 percent since 1980.

One of the aims of both network and cluster strategies in the United States is to use various incentives to reestablish higher levels of trust within the local economy. This has led to efforts to build or to restructure associations so that members meet and interact, not just pay dues and receive a newsletter.

Building Associations in which Members Actually Associate

As first noted by French visitor Alexis de Tocqueville, the United States is distinguished by its willingness to associate. Americans are quick to join associations and clubs that form around a variety of interests and reasons.

This proclivity would indicate that America is rich in social capital—and indeed, it has been. Much of the past success of America's cooperative extension system, for example, can be attributed to the social foundation inherent in the Grange, the Farmers' Alliance, the Farmers Union and the Farm Cooperatives. But very few organizations today provide a similar social fabric for the industrial economy. The most common purpose of business organizations, including most U.S. trade associations and chambers of commerce, is influencing public policy by lobbying for laws and regulations that benefit their members. Their preferred territory is government offices, not factories. And civic organizations, such as the Rotary and Kiwanis Clubs, form around public service: Generally, their most active members are those service providers—accountants, lawyers, retailers—whose business success depends on their reputation within the community. Organizations that actively engage members that produce goods in

business matters—once common in agricultural society—are rare indeed.

Animated or working clusters rely on the networks and mechanisms by which business people can regularly associate with their peers. Much of a region's stock of social capital resides in its civic and professional associations, and its economic value is deeply embedded in the functions of these business associations. Consequently, most of the emerging cluster strategies in the United States begin by forming new organizations and attempting to create a shared vision and common ground for member interaction. Organizations such as the Catawba Valley Hosiery Association, the Kansas Manufacturers Association, the Arkansas Metalworking Connection and the Technology Coast Manufacturing and Engineering Network create the supportive environment—and foster the trust—that clusters need in order to function.

PRACTICAL EXPERIENCES

CREATING ADVANTAGE THROUGH CLUSTERS

In August 1995, a front-page story of the Sunday Virginia Times-Dispatch discussed the state's emerging high-tech cluster, asking, "Can high-tech sectors become cohesive whole?" In the article, state officials prophesied a new "Silicon Crescent" stretching from Hampton Roads in the southeastern corner of the Commonwealth to Herndon in the Northeast. Encouraged by Motorola's decision to locate in the Richmond area, the region is now planning to attract and develop an array of related firms and suppliers. "Synergy," the Virginia Times-Dispatch stated, "is a term much in vogue among Virginia economic development officials."

A number of states and some sub-state regions have tried or are attempting to use the fact that businesses do cluster to promote state industries and structure government incentives, programs and services. Oregon, through its Key Industries program, Arizona, through its Arizona Clusters program, and Quebec, through its cluster program are illustrative of the early efforts. North Carolina's cluster program, which began in 1994 with a few clusters but intends to expand, and Louisiana, which is just beginning the process of identifying its key clusters, are more recent efforts.

Each of these states or regions has selected some number of industry groupings that either are already clustered or have the potential to become a working cluster, because of some predetermined unique strength, resource and/or market opportunity. Most begin with groupings of firms and employment by standard industrial classification codes. The states then compare concentrations, scale and industry-wide purchasing patterns. Each has job creation as its goal and primary measure of success.

Circumstances also dictate the defining characteristics of the cluster. Where the state is the catalyst and political support is necessary, clusters tend to be defined more broadly to qualify and include large proportions of the state's businesses. Examples are business or professional services in Arizona and Oregon, information technology in Massachusetts, and manu-

factured inputs in Illinois, which encompass a vast array of businesses, some of which are only loosely linked.

If the initiator is a sub-state region and the support is local or private, the clusters are more narrowly defined, such as secondary wood products, in the Olympic Peninsula of Washington or knitwear in New York City. A less densely populated region unable to meet the criteria of scale and concentration may still try to gain some of the advantages of clustering by using broader definitions but reducing expectations and focusing on more generic problems and issues. The Northeast Oklahoma Manufacturers' Council is an example of a group of somewhat diverse and rural manufacturing companies attempting to act like a cluster wherever possible. They work toward building linkages among members and identifying and meeting common needs—although neither can be as narrowly specialized as a better-defined cluster.

States in the Lead

A small number of states have begun to experiment with cluster strategies, based on low investments but high hopes. These state-led cluster strategies nearly always begin by engaging key members of leading businesses in identifying the boundaries of the cluster, identifying the most pressing issues, and finding a set of projects to create the glue that binds the members together until they develop a collective identity. This serves two purposes.

- It immediately empowers members and demonstrates the state's willingness to listen to the customer and relinquish control.
- It quickly identifies the capabilities of firms working in collaboration rather than in isolation. Firms begin to become familiar with each other, to seek ways to organize and to build trust.

States inevitably begin with their own analyses of their economies. Using the methods previously described, governments select the clusters and set out to strengthen them. In Arizona, remarked program architect Mary Jo Waits, the cluster building process began when the governor invited industry leaders to participate in working groups that would profile

their members, identify common problems and challenges and develop their own strategies. Once their plans were completed, they again met with the governor to decide how they would continue and what they would do. Even though the clusters are industry led, government was crucial as motivator, organizing agent, link to other service agencies and institutions, as publicist of the cluster's accomplishments and as promoter of the advantages of collective actions.

The experiences in Oregon and Arizona suggest that this approach is popular because once the state makes its choices and clusters become known, other industries request recognition. As Waits noted, if they are organized enough to make this request, it is politically difficult to refuse them equal status with the other clusters. In Arizona, for example, three industries—software, optics and environmental technologies—were added to the original nine selected by the state. In contrast, some clusters flounder because they lack leadership, connectivity, or vision. They remain “clusters” in name only.

Oregon had a similar experience. In 1991, the state enacted legislation authorizing a key industries programs, with twelve industries designated as “key.” Senate Bill 997 states that, “It is the policy of the State of Oregon, working with private firms, industry associations and others, to encourage cooperative sector-based strategies to promote industrial competitiveness.” Like Arizona, the state began by inviting industry leaders to working groups that were then encouraged to formalize if no formal association already existed. The identification of sets of issues of mutual interest was the next step. Oregon also attempted to keep these associations connected to each other, and organized meetings around common issues, such as human resource development needs and benchmarks.

Each state recognized that although firms do not honor political boundaries in their relationships and frequently do business across state lines, the core of most clusters are concentrated in specific sub-regions within their respective states. Oregon carried its key industries approach to the next logical step, decentralizing its programs and asking each of its twelve economic sub-regions to select and strengthen the organizations of its three most important clusters. This was done largely to address the needs of rural businesses that were largely underrepresented in the original statewide program. Most of the regions, however, used urban-based meth-

ods for defining clusters that were based on scale factors and, therefore, were dominated by traditional rural industries such as agriculture, tourism, forest products. Among the emerging industries, only software made more than two regions' lists. In September 1995, the governor announced \$11 million in regional strategies awards to the 12 regions for further planning of cluster activities.

In Canada, the Province of Quebec also chose to focus on clusters. Based on advice and analysis by Michael Porter, the regional government selected five "competitive" clusters and eight "strategic" clusters. The government brought together business leaders of these clusters and asked them to identify ways to add value to their industry and their existing relationships. The electric equipment group, for instance, wanted to identify and access new export markets and agreed to work more closely with their suppliers and "coach" them in new methods. The aerospace cluster initially questioned the cluster efforts, asserting that their business was making planes, not economic development. But after meeting, they began to see connections and advantages, and eventually its 13 major producers chose to work together to standardize their previously individualized supplier certification requirements and cooperate on employee qualifications. Other clusters, however, such as environmental technologies (which had no large lead companies) and forest products (which was more suspicious of government intervention) made less progress. Quebec's Marc Ferland warned that the process of building production systems takes time and there is no recipe for instant success. It comes in small increments. The government's role is to maintain communication and momentum.

Each of these innovative efforts has made considerable progress in trying to redirect public policy towards clusters. They have analyzed their economies as clusters of related firms, engaged industry leaders in defining needs and setting agendas, helped to create, strengthen or build industry associations as long-term social infrastructure and encouraged clusters to set establish their own identifies.

Budding Local Efforts

Local and rural development efforts to develop clusters have taken different forms. Local development officials rarely require sophisticated

analysis to identify their clusters; they are transparent to anyone in the community. Instead, local cluster strategies have been directed at strengthening relationships within the cluster and identifying and acquiring missing elements of its support system. Many of the local strategies have begun by building social infrastructure and initiating new and better ways for the related firms to associate with one another in ways that will produce economies of scale and synergy and increase local value added. These initiatives often call themselves networks, in part as a way to attract resources, but in effect they are cluster strategies.

One of the first rural areas to mobilize as a cluster was the metal-forming sector in Southwest Arkansas. In 1990, with support from then-Governor Bill Clinton and the Southern Technology Council, an economic development agency located at a regional university established the Metalworking Connection, Inc. In the five years since inception, the group has grown to 80 members, administers the Youth Apprenticeship program for the region, offers benefits, marketing assistance and generally serves as a central location for members to build trust and relationships.

Likewise, grants made to local development agencies by the Northwest Area Foundation led to the development of the wood products cluster in the Olympic Peninsula of Washington (WoodNet), and the metals firms in western Minnesota and eastern North and South Dakota (Tri-State Manufacturers Association), which was mentioned previously. In both cases, the local development agency was the catalyst in organizing the related companies, their suppliers and specialized services, and helping them to recognize their common problems, develop a strategic vision and rely more on each other more for subcontracts. In rural Oklahoma, regions are adopting a more generic approach that is more inclusive in order to reach sufficient scale. The Northwest Oklahoma Manufacturers Council includes a wide range of manufacturers, who collectively address common issues such as skill shortages and access to information but individually build system-based relationships around joint production and marketing. Based on the early success of that council, in 1995 manufacturers in the Southwest established the Southwest Oklahoma Manufacturers Council.

Most of these local and rural initiatives are first and foremost investments in social capital so that firms can learn more about each others' capabilities thereby retaining more work in the community, accelerate

learning and create a common vision for the economy. They also are ways for local firms to afford and use more specialized services and improve their access to information about technology and markets. But the people behind the efforts described set out to create discrete and measurable networks that would enhance their economies, not to strengthen local production systems—which was what they were expected by their sponsors to do. Their actions, however, were clearly aimed at the latter and, not surprisingly, they proved to be more successful in strengthening their clusters and making the more effective than in starting large numbers of networks.

COUNTERING COMMON CRITICISMS

If businesses cluster, then why haven't governments been more aggressive in developing their economies into more efficient production systems? The benefits of businesses organizing themselves into production systems are basic to any market economy. But few states have structured their economic development programs around clusters. Even those that have accepted clustering have left their development organized around discrete functions such as recruitment, exporting, training, and business assistance. The resistance to clusters is fierce.

Participants were each asked to address one or more of the many controversies and criticisms that shape debates about clusters and public interventions. For example, strengthening clusters is often confused with picking winners and losers, where the track records of most nations are quite poor and therefore rejected. Other concerns are whether enough rural areas have the scale to benefit from broad policies; whether, in the face of declining manufacturing employment, services fit the production system model; whether the dominance of branch plants and remoteness of decision making undercuts clusters; whether specialized economies are more prone to cause a recession if the market fails, whether clusters attach too much importance to the enterprise and too little to the worker, and whether expanded telecommunications will replace the need for clustering altogether. The group grappled with each of these issues and arrived at the following conclusions.

We Aren't Very Good at Picking Winners and Losers

The most persistent criticism of identifying and supporting clusters is that government is notoriously bad at picking "winners and losers." A cluster strategy, however, is not about choosing and targeting industries based on their potential. It is about understanding that individual businesses do not operate in isolation but as parts of larger systems. It is appreciating that local, interconnected systems will mean more jobs and wealth to regional economies than businesses linked to distant systems, and that government can help the system function more smoothly and

effectively. Further, the criteria that classify clusters are sufficiently diverse to allow groups of firms to present themselves to government as a cluster, defined by their mutual interests and demonstrated by their connections. They do not have to wait to be noticed. The businesses, in effect, can develop and demonstrate their connections, social capital, and leadership, and thereby qualify for recognition and support.

Rural Areas Lack the Scale for Clusters

At first blush, it might seem that it is difficult in less densely populated areas to generate the critical mass of business concentration needed to attract services and achieve the classification of “cluster.” But as Michael Enright pointed out, there are many examples of tight-knit communities in rural and semi-rural areas that feature the trust and ease of communication and cooperation that lie at the heart of a cluster. Further, focusing on the systemic rather than aggregative features of businesses opens the door to a looser definition of clusters—one that may better suit many rural areas. Typical forms of rural clustering include the following:

- Small concentrations of firms that can establish a collective identity and that operate as a system and develop some forms of specialized resources. Food processing firms in Athens, Ohio, consider themselves a cluster even though their numbers are not large.
- Sub-clusters, which are groupings of similar or related firms but whose needs for specialized services may be met in an urban cluster elsewhere in the region. The hosiery firms in Randolph County, North Carolina are linked to the Catawba Valley but have their own identity and produce their own synergy.
- Clusters that stretch out across larger geographic regions, including rural areas. Such clusters require management willingness to travel longer distances to gain the benefits of interaction and collaboration. Managers of the metals firms in western Minnesota and eastern North and South Dakota have proven willing to travel in order to maintain connections.
- Regions that include a more dissimilar businesses but having enough connections and common needs and interests to justify being classi-

fied and treated as a cluster. The companies in northeastern Oklahoma have organized into a manufacturers council to address their common needs, even though they include a wide range of producers—not all of whom are linked by business transactions.

Most Jobs Are in the Service Sector

Clustering does not have to—and should not—be limited to the manufacturing sector. Many service businesses also have reason to cluster. There are numerous examples of services that have done so: financial markets in New York; banks in Charlotte, North Carolina; insurance in Nashville, Tennessee; the entertainment industry in Southern California; and gambling casinos in Tunica, Mississippi. Each of these enterprises brings new dollars to its region, and each depends on some manufacturing sectors, such as computers and automated teller machines for banking, slot machines and lottery tickets for gambling, and sound stages and computer graphics for entertainment. The traded services sector turns the manufacturer into the a supplier. Moreover, all clusters, by definition, include services. The services that support industrial clusters are integral parts of those clusters, and a cluster would be hard-pressed to advance without a well-developed set of services.

Most states recognize the increasing value of service sectors and include them in their cluster approaches. Illinois names business and personal travel, export services, and health services and biomedical among its 11 clusters. Massachusetts includes financial services, insurance, and knowledge creation services among its regional clusters. And nearly all states that identify clusters include tourism.

We Can Buy Our Machines and Tools from Abroad

One of the strengths of some European industrial districts is the close link that exists between machine and tool builders—the companies that produce advanced equipment and software—and the firms that purchase these goods. This relationship often enables local firms to obtain early access to the new technologies soon after they are developed and thereby find ways to adapt them to their operations before they hit the market. In

the ceramics district of Emilia-Romagna, for example, companies work hand in hand with the major equipment firms and gain access to the new machines before they are exported. On the other hand, according to a recent study by the RAND Corporation, “Relations between U.S. machine-tool makers and users are generally through arm’s length transactions, with heavy emphasis on price. This relationship is not conducive to an easy flow of technology . . . [and] stands in stark contrast to Europe and Japan (Finegold, et al, 1994).” Despite the growing concern in industry over the competitiveness of the tool-building industry in the United States, the problem is viewed as a national issue, not a weakness of particular regional clusters, and there are few efforts to connect the machining and tooling industry to its user industries.

Branch Plants Subject to Remote Decisions Are Antithetical to Clusters

Many U.S. regions are dominated by branch plants, whose scale—especially in rural areas—gives them so much prominence relative to other employment, that they emerge from analyses as clusters. These plants have external ownership, depend heavily on services provided through the organization’s headquarters, and are subject to strategic decisions made at some distance from the core of the cluster and community. Too, they may purchase supplies from far removed corporations: The average distance between a General Motors plant and its American suppliers is 350 miles; the average distance to suppliers is 427 miles (Dyer, 1994).

Finally, in the worst case scenario, branch plants leave their community and cluster for regions with lower costs, often leaving a gap at the core of the cluster. Restructuring, downsizing, and reengineering have greatly reduced this corporate dependency by shifting increased decision-making to the branch plant, intensifying buyer-supplier relationships in ways that require closer proximity, and encouraging large plants to act more like small, independent companies. Further, the key employees of branch plants are often more committed to a region than the owners and possess the skills to rebuild a cluster that has become dependent on a branch plant. The powerful hosiery cluster in northern Italy, for instance, survived the shutdown of the large German company Noemi because its labor force used its collective skills to establish new companies.

When the Cluster Fails, the Region Fails

Clusters, like products, have life cycles, and regions, like companies, must recognize changes that mark the end and be able to shift competencies into new areas. Regions worry about new technologies or styles making products obsolete, or product maturation moving production to lower cost regions. If a cluster is very highly specialized and inward in orientation, clustering may be of short-term advantage only to the region. The economic history of regions is fraught with examples of regions in which industrial specialization promoted rapid growth but led to rapid decline when new technology became available or market conditions shifted abruptly, and the region was too inbred. The depressed neighborhoods of Bethlehem, Pennsylvania are stark reminders of the dangers of depending on too narrowly specialized sectors. When steel was king, Bethlehem's firms operated and interacted as a fully developed cluster. But its narrow base and myopic, inward focus led to rapid decline when other producers found better ways to make higher quality steel for less. Milwaukee, once the beer capital of America, now has only one major brewery, in part because of increased competition from microbreweries (but which have generated a new cluster in Oregon).

If, on the other hand, clusters promote learning and technology transfer relationships among firms with different and complementary knowledge of technology and markets, threats and opportunities can be spotted more accurately and more quickly. Rosabeth Kantor (1995) notes that clusters are "concrete manifestations of more generic skills that cut across industries and outlast them." Clusters that emphasize complementary qualities, competencies, and diversity rather than only products and similarities are better positioned to survive and prosper.

As Philip Cooke (1995) notes, regional industrial policy can be said to be successful if, over an extended period of time, it can show that it learns and is able to move forward—from the framework of opportunities offered within declining industries—into new industries and new processes. Silicon Valley's semiconductor industry shifted into the personal computer and equipment industry. The steel industry of the Ruhr Valley of Germany was able to take advantage of the expertise in the heavily polluting traditional steel industry to build a new cluster around environmental technologies. Encouraging people to innovate, maintain contacts outside

of their cluster, and apply ideas from other clusters will lead to new industries replacing old ones.

Production Systems Focus Too Much on Enterprises, Too Little on People

What happens to the individual who works in a cluster? Theoretically, more integrated and modern production systems ought to result not only in more competitive businesses but also in higher levels of employment, better work and higher incomes. In the United States and Australia, however, even as the ratio of skilled to unskilled jobs is increasing, the real wages and purchasing power of workers in manufacturing are declining. Jane Marceau noted, in our discussions of clusters, that the owner, not the workforce, is assumed to represent the enterprise. Labor unions and other forms of worker organizations in the United States are weak, growing weaker and are weakest in small and mid-sized firms.

In the United States, in contrast to the other nations represented at our meeting, labor is rarely an active player in any formal cluster planning or management activities; further, it represents a diminishing conduit for information flow and innovation. There is, however, new evidence that workers in plants that adopt advanced technologies earn more and are more productive than in those that do not. To the extent that production systems encourage modernization, some positive outcomes for workers might be expected. The earliest plans of newly organized clusters typically highlight human resource development needs. But, to the best of our knowledge, no research has been done on the relationship between production systems and worker outcomes.

Telecommunications and the Internet Can Substitute for Proximity

As more and more people travel the information highway, and as more business is conducted electronically, the importance of physical proximity is thrown into question. Certainly, electronic exchange is having a huge effect on business relationships, and it is becoming possible for firms to work more easily with global partners. But will the Internet replace face-

to-face communication? Or will the development of sophisticated visual distance exchanges—in which parties can see each other—obviate the need for personal meetings and interactions?

Most evidence suggests that electronic interchange is not likely to replace the importance of in-person communication. Japanese auto manufacturers, for example, still expect their suppliers' engineers to be on-site a good deal of the time because they find they can't get the results they want without face-to-face interaction. Trust is established through the kind of informal business and social exchanges that take place at barbecues and golf events, not videoconferences. There is no doubt that the Internet will improve and accelerate inter-firm relationships—and should particularly benefit rural businesses—but proximity is likely to remain an important factor in production systems.

UNCONVENTIONAL PUBLIC POLICY

HOW TO NURTURE CLUSTERS

In the 1960s and '70s, systems analysis dominated business management practice, and simulation models became popular tools for understanding how all the facets of a corporation interacted. These models helped management to understand how each element of the production process affected the whole—and often revealed unanticipated outcomes and synergies. In the late 1960s, General Electric Company would not accept a division's request for expansion capital without such a model. Some creative management scientists have tried to apply these methods to public policies to optimize public policy outcomes. But their impact on practice was too often overshadowed by interest in the intricacy of often incomprehensible mathematical formulas, thus discouraging widespread understanding and application. Economic development continued to focus on the pieces, not the whole.

But today the need to address global economies and market complexities makes systems more important than ever. And just as manufacturers have learned to treat separate organizational functions as a system to better understand their operations and gain advantage, economic development officials now have the opportunity to do the same for their regions by treating clustered, interdependent firms as production systems. This does not require sophisticated mathematical formulas or models; it does require a solid understanding of how local firms do business and a common sense approach. It *does*, however, depend on government officials who themselves are connected and committed to the cluster and who have much of the same tacit knowledge of the cluster that the industry leaders have. The following suggestions will help shift the targets of policy from the individual pieces to the larger systems in which they act.

Learn how businesses interact and clusters work

Systems are defined not just by their elements—the businesses and workers that comprise them—but by the linkages among the enterprises that

form them. Scale, concentration and input-output relationships are necessary but insufficient factors for understanding the circuitry and dynamics of the system. Getting inside the cluster to understand the often-intangible mechanisms by which information, innovation, capital and people move through the system reveals ways for government to remove bottlenecks and improve flows. In rural areas, this also means learning about longer linkages that may extend outside the geographic region. Government should focus not just on products but on the many interdependent competencies and capabilities within the cluster that, if motivated, can be redirected to a wide range of opportunities. A cluster of automobile suppliers, for example, could transfer its metal-forming skills to many other types of customers.

Support clusters that qualify support because of their dominance, strategic importance, or that demonstrate leadership and request recognition

Analysis combined with judgment based on tacit knowledge of the community will point to those clusters where investments can yield the greatest payoffs. Those that dominate a local economy will be obvious; other, less dominant or more obscurely connected, clusters, less so. But sometimes analysis and knowledge fail to detect clusters potentially valuable to an economy. The experiences in Arizona and Oregon demonstrate that clusters can be self-selecting as well as selected. Arizona's software industry for example, was not selected formal analysis, but instead made a convincing case for its attention. Groups of firms must be given the opportunity to demonstrate the commonality that defines them as a cluster and to articulate collectively their needs and economic value to the region. Clusters depend on strong internal leadership to take advantage of government policy. The metals cluster in western Minnesota and eastern North and South Dakota, for example, would never have been identified by standard analysis; it emerged as a result of local initiative.

Focus on subsidiary systems and satellite systems in less populated areas

Michael Enright observed at the meeting that critical masses of interaction and expertise can be found in many rural and semi-rural areas, and that the tight-knit communities found in many rural areas provide the social infrastructure and trust that foster cluster development. Public sector agencies that use only employment or establishment counts to identify clusters will overlook many smaller but potentially valuable satellite systems and subsystems whose core or roots may lie elsewhere. Businesses in smaller or more remote regions have the same need as firms in cities to be connected, but those connections may take on different forms—greater reliance on telecommunications, weekend events to accommodate travel constraints, and more generic associations that must work hard and be creative to find common interests.

Improve technical support services

Investments in specialized education and training, technical assistance hubs, and R&D—examples of technical support—are just part of the tailored services needed to develop an innovative and growing cluster. Smaller firms, particularly those that lack the resources and incentives to develop their own training, research, or engineering departments, depend heavily on local services. But too frequently, the institutions that deliver these services reflect the interests and expertise of those who work in them rather than the needs of the firms in the cluster. Technical support services are much more valuable if they are industry- or technology-focused and if management and staffs understand, listen to and work with the member firms of the cluster.

Invest in social capital and social infrastructure

Social capital is perhaps the least visible and most undervalued contributor to local development. As Amy Glasmeier noted, failures of markets are often failures of coordination caused by lack of social capital. Robert Putnam's comparisons of northern and southern Italy clearly demonstrate

the value of social capital to regional economies. Yet there are few proven policy mechanisms for investments in social capital, and the development of creative interventions to increase social capital remains a fertile area for experimentation and evaluation. A few examples of such intervention, are to provide incentives to active local business and civic associations or to activate new associations; to require, or include incentives for, multiple-firm sponsorship or inter-firm collaboration in community or economic development grants; and to increase investments in cluster-based communications systems and in inter-firm collaboration.

Empower and listen to cluster leaders

Only the members of a cluster can make it function as a system, and only the members can identify their most pressing needs. As Steve Waldhorn pointed out at the meeting, “strategic planning works best when private sector driven.” When Oregon’s legislature authorized the Wood Products Competitive Council, it turned over all responsibility and authority to its seven-member private sector board to make sure it was responsive to its constituents. The Catawba Valley Hosiery Association, with state assistance, led the industry’s strategic planning process and governs the hosiery technology center. Regions that let the companies take charge of their efforts have the most to show for their investments.

Encourage cross fertilization of ideas across clusters

Clusters must not become isolated and inward-focused, a sure road to stagnation. Building connections with other clusters and other regions keeps new ideas flowing into the cluster and helps it innovate, diversify, and grow stronger. Tools and techniques for cross fertilization include establishing technology and market observatories that track trends and innovations in other places, encouraging and supporting study tours to other regions, creating cross-cluster working groups, building multidisciplinary associations that foster technical information exchange, and establishing user-friendly telecommunications linkages.

Recruit companies that fill gaps in cluster development

Recruitment and the public sector investments that accompany it ought to be a carefully planned and managed process designed to fortify or diversify a cluster. Priority should be given to companies that add value and fill gaps in the region's production system. The efforts of the textile industry in Greenville-Spartanburg, South Carolina, to attract German machine and tool builders, for example, both strengthened the position of the region's textile industry and created a foundation for a later emergence of a new machine industry cluster. The 1995 strategic plan for South Carolina, for example, suggests that the state "carry out proactive targeted recruiting to develop and strengthen clusters" rather than taking an unrestricted approach.

Develop and organize supply chain associations

No region wants to house only the final assembly of products when the better jobs and the higher value added so often reside in the supply chains. Even though regions already encourage their largest producers to source locally whenever possible—and even make the necessary introductions—this is not enough. Regions generally pay too little attention to the abilities of the potential suppliers and the quality of the linkages between suppliers and customers and among suppliers. They don't provide sufficient help and assistance to SMEs so that they can meet increasingly rigorous supplier certification standards. Supplier associations and supplier certification networks often work in concert with two-year colleges to meet the certification standards of local customers. For example, members of an electronic supplier cluster in northwestern Florida jointly went through supplier certification training—organized by their association—for a local aircraft company in order to become qualified as suppliers and supplier networks.

Convert local suppliers into final producers

Many suppliers are finding that working collectively not only can they upgrade their skills levels for their existing customers but they can find additional customers outside the region. By developing their collective

competencies, suppliers shift from functioning mainly as a set of inputs to another cluster to functioning as a self-actualized system largely independent of the original local customers. For example, DRI/McGraw-Hill developed a powerful strategy for its work in Malaysia. Suppliers in the region developed their own export markets by creating new products. And in Wales, there is a large number of automotive components manufacturers, a group of suppliers that is treated as—and indeed considers itself—a full-fledged, self-contained cluster. It is accorded this status because, although the region has automobile manufacturing, the cluster is not supplying local producers but exports to multiple customers throughout Europe. A supplier-based cluster with such diversified markets is one that guards against the failure or migration of local branch plants.

Support employee/entrepreneurs

One of the most important measures of a cluster's energy is its rate of new business formation. Expansion emanates from three sources: imitators, complementary products or services, and diversification based on existing skills and technologies. For example, a working cluster will spawn imitators, many of who are employees of the company with ideas for improving upon existing uses of technology or processes. This increases local competition but also improves the region's competitive advantage. A working cluster increases the rates at which employees see and seize opportunities to fill needs of the system or find new applications and markets for their skills or technologies. Typical entrepreneurial programs do not focus on the cluster or on the employee. Business education, incubators, and venture capital that systematically target workers and opportunities within the cluster can be more effective than general programs.

SUMMING UP

The economic development of regions—and the economic opportunities of their inhabitants—will be greatly enhanced by thinking about, planning for and conducting economic development in terms of integrated regional production systems, where each business relies on its connections to other businesses and to nonprofit and government agencies for work, information and ideas. The tighter the connections, the more apt the economy is to learn, expand and prosper.

Local and state governments must of course continue to pay attention to its companies and communities, as well as to its people as individuals, but it must always do so with an eye toward how they interact and communicate with each other. Social infrastructure is a vitally important economic factor of production; it is the means through which clusters can achieve synergy. Because business clusters represent a new arena for public policy, we urge regions to understand and respond to their economies as systems and, especially, to explore ways to build or strengthen the linkages that let clusters operate efficiently.

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