

The Added Value of the Industry Cluster Approach to Economic Analysis, Strategy Development, and Service Delivery

Mary Jo Waits
Arizona State University

Economic development always has been a moving target. Not surprisingly, there is growing evidence that the shape of economic policy and practice is changing significantly in many American states at the dawn of the 21st century. This new approach has public officials addressing new issues, using new tools, and beginning to experience new types of results. It is called cluster-based economic analysis and strategy development. This article reviews key literature and events that point to a new phase emerging in state economic development. Then, using Arizona as a case study, it presents practical evidence of the benefits from this new approach. For example, Arizona uses clusters as a tool for better understanding the economy, getting key industry stakeholders together to address common problems, and providing high-value specialized services to key industries.

Mary Jo Waits is associate director of the Morrison Institute for Public Policy at Arizona State University. She played a key role in the design and implementation of Arizona's cluster-based economic development strategy.

Economic development always has been a moving target. Governments have continually searched for new tools and magic policy formulas to give them greater control of their economic destinies. A series of books and articles has documented the evolutionary path of states in economic development over several decades (Atkinson, 1993; Eisinger, 1996; Ross & Friedman, 1990).

Most of these profiles view how state policies have changed in roughly three broad phases. The first phase had its roots during the 1930s, when states began to compete to attract large-scale industrial facilities by offering financial, tax, and other incentives. Then, during the early 1980s, the second phase was initiated when many states shifted resources and attention to expanding and diversifying their business assistance. The focus turned to promoting existing businesses and deemphasized new industrial plant location. However, during this period, questions surfaced about the effectiveness and quality of the bewildering variety of programs created. As the 1980s drew to a close, economic development was swept up by the whole "reinventing government" movement. In this third phase, economic policy is focused on fixing or refining strategies and programs put in place over the previous two phases to improve impact and accountability.

What is next on the economic development continuum? More of the same, that is, further sharpening of traditional approaches? Or, a new regime for a new century? Not surprisingly, research, experience, and pundits can provide support for either track.

University of Wisconsin professor Peter Eisinger, for one, is less confident that a "sea change is in the making" (Eisinger, 1996). In a 1996 report on state economic development initiatives, he concludes that many states still are pursuing strategies popular during the 1980s, and in many cases, they are returning to their older industrial recruitment practices. However, Eisinger does see state economic development at the mid-1990s in "a state of ferment." Specifically, the frenetic pace of policy innovation characteristic of the 1980s has come to an end, and some states are beginning to explore alternatives to the programs put in place during the 1980s. Eisinger even concedes that the current changes have some of the markings of a watershed, but he stresses that it is too early to

conclude whether a transformation is taking place or whether these changes are simply less fundamental adjustments.

Still, there is growing evidence (although more anecdotal than quantitative) that the shape of economic policy and practice is changing significantly in many American states at the dawn of the 21st century. This new approach has public officials addressing new issues, using new tools, and beginning to experience new types of results. Not surprisingly, it is in direct response to many states' worries about being left in the dust of a high-powered globalized economy. It is called cluster-based economic analysis and strategy development, and there seems to be a consensus emerging that "if it's done right, it can provide a foundation of useful information about how a local economy works and what can be done to make it better" (Fulton, 1997, p. 68).

This article briefly reviews key literature and events that point to a new phase emerging in state economic development. Then, using Arizona as a case study, it presents practical evidence of the benefits to this new approach. For example, Arizona has used clusters as a tool for better understanding the economy, getting key industry stakeholders together to address common problems, and providing high-value customized services to key industries. In the process, the state also has redefined its economic development customers and its economic development goals.

A NEW FOCUS ON ECONOMIC COMPETITIVENESS

Those who see a need for a new approach to economic development often cite three major forces that are affecting the economy as a rationale: globalization, rapidly changing technology, and declining living standards. Each force by itself creates significant challenges to conventional approaches to economic development. Together, they add up to a dramatic need, proponents argue, for a new competitiveness framework for state economic development.

Globalization. In general, globalization refers to the growing interdependence of economies around the world. This changed context means that now, more than ever, "competition" is not really about states competing for firms but rather is about firms, products, and people slugging it out in the global marketplace. States that hold onto the old view of competition and focus the lion's share of their resources on a "low-cost" formula that "buys" a competitive edge are likely to lose the economic development game in the future. On the other hand, states that recognize that competitive advantage has taken on a new meaning and deploy their resources accordingly can expect to be winners in the global economy.

Technological change. Technological change creates new products, new jobs, and new industries—and it transforms or destroys others. Technological innovation is one of the fundamental forces causing structural shifts in the economy. In the business world, innovation has been reduced to a simple creed: Innovate or perish. Thus, those states that organize knowledge—research and development (R&D) activities, specialized workforces, and unique business infrastructure—to support industry innovation are most likely to capture technology-driven, globally competitive industries.

Standard of living. For most of the nation's history, each generation has lived better than the preceding generation. But during recent decades, income and wage growth have slowed, and the gap between the rich and the poor is beginning to widen. The reasons for this trend are complex, but one major factor is that many of the jobs created during the past two decades are not good jobs. They do not pay enough to support a family, and they offer few benefits. As a result, the challenge for states in the future no longer is simply to create or "purchase" jobs for their current and future residents; rather, it is to make sure that the jobs they seek to create are quality jobs. To be sure, the private sector has the principal role in creating quality jobs and wealth and in raising living standards. Still, the public sector has the responsibility to assist by providing the environment and economic foundations that will support quality economic growth. Education and job training programs and policies are the major tools of states' public policies for raising the living standards of their citizens.

Evidence of Change

In his book, *The Competitive Advantage of Nations*, Harvard Business School professor Michael Porter makes the case for a new approach for both understanding and creating economic success in a global economy (Porter, 1990). Using cases from around the world, Porter relates the competitiveness of nations and regions directly to the competitiveness of their home industries. Moreover, he argues that in advanced economies today, regional clusters of related industries (rather than individual companies or single industries) are the source of jobs, income, and export growth. These industry clusters are geographical concentrations of competitive firms in related industries that do business with each other and that share needs for common talent, technology, and infrastructure.

An example of a cluster grouping is the aerospace cluster in Arizona. Like most clusters, it is composed of three “layers” (Figure 1). The core of this cluster contains leading aerospace companies such as Allied-Signal, Goodyear, Honeywell, Hughes, ICI, Loral, McDonnell Douglas, Motorola, and Orbital Sciences. Forming a second layer of the cluster are myriad businesses that provide supplies, specialized services, investment capital, and research to these companies and others involved in aerospace. A third layer is composed of essential economic foundations (e.g., advanced infrastructure, specialized workforce training, R&D capability, the pool of risk capital available in the state) that are the building blocks of healthy clusters and a competitive economy.

Porter (1990) argues that the public sector’s role is to improve the circumstances that impinge on competitiveness. Those circumstances are not always simply cost-related factors or the availability of natural resources. Rather, he says, companies move to higher levels of competitive performance when economic foundations (e.g., labor pools, knowledge, financing, physical infrastructure, quality of life, regulations) are shaped to cluster needs.

The policy implications of this competitiveness model have made Porter a key figure in the debate over economic development strategies. Although Porter did not invent or even do the most original work on the issue of clusters, because of his reputation—and because people are willing to listen to him—he is credited with popularizing the idea and almost single-handedly stimulating an important new debate about past and future economic development strategies (Harrison & Glasmeier, 1997).

In a way, Porter and others have laid down the gauntlet to economic development professionals, policymakers, and even academic researchers to use a cluster approach to improve economic policy. Essentially, this new approach requires states, regions, cities, or countries to undertake economic base analysis for two key purposes: (a) to identify concentrations of similar or related firms that are driving the economy and (b) to assess what resources rooted in the region or state—ranging from research universities, to cultural attractions, to airports, to skilled workers—provide these firms (and clusters of firms) with a competitive advantage in responding to global markets. Questions also can be asked about defects in economic infrastructure—talent, technology, and infrastructure base—and what can be done to make it better. Information of this nature can help public officials to decide on strategies for improving the development and performance of clusters, which in turn generate economic growth for regions, states, and firms.

States and regions across America are showing remarkable interest in cluster-based economic development. States that adopted this approach early on (1990-1991) were Arizona, Florida, Massachusetts, and Illinois. Early regional adopters were Silicon Valley, California; Austin, Texas; Wichita, Kansas; Tucson, Arizona; and the mid-Hudson region, New York. Today, strategies that target industry sectors or clusters are quite common including new ones in California, Rhode Island, Colorado, Connecticut, the Twin Cities in Minnesota, Los Angeles, and the Appalachian region. Some areas focus on only one or two clusters; other areas focus on entire economic “portfolios” for their regions or states.

The federal government has taken notice as well. The U.S. Department of Commerce Economic Development Administration has a project to assess the experience of state cluster-based economic development and, from this assessment, to develop lessons for the federal government to use in

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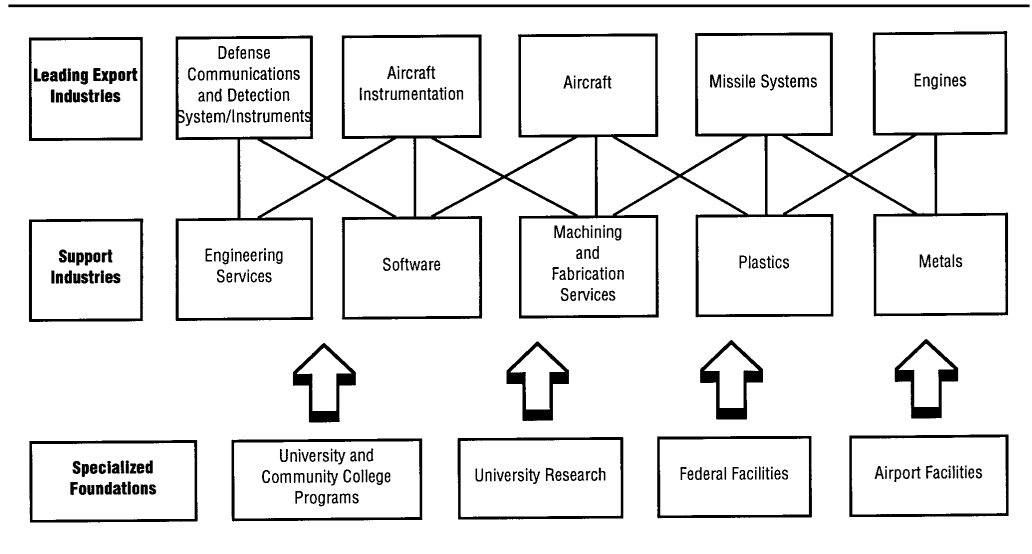


Figure 1: Aerospace Cluster Map
 SOURCE: Arizona Strategic Plan for Economic Development.

support of future efforts by states. In addition, in 1996, the U.S. Department of Housing and Urban Development (HUD) launched a new initiative, a "Metropolitan Regional Strategy," to put national resources behind an invitation to cities to define their own clusters and related economic development strategies. To kick things off, HUD completed in-depth studies of the economic dynamics of 19 metropolitan areas.

Another sign of change is the steady growth in the number of conferences, experts, and "how to" books on this subject. Within the past 5 years, there have been dozens of state, national, and international conferences on clusters. Many major economic consulting firms and university research bureaus have added cluster analysis and strategy development to their portfolios as well. Contrary to early pursuers of this new approach, who relied entirely on Porter's research and SRI International's consulting experience, states considering shifts in strategy today have a whole host of guidebooks and case studies on which to rely. These publications include *Joint Venture Way: Lessons for Regional Rejuvenation* (Joint Venture: Silicon Valley, 1995), *Grassroots Leaders for a New Economy* (Henton, Melville, & Walesh, 1997), *OverAchievers: Business Clusters That Work* (Rosenfeld, 1995b), *Industrial-Strength Strategies, Regional Business Clusters, and Public Policy* (Rosenfeld, 1995a), and *Understanding State Economies Through Industry Studies* (Redman, 1994). All of these publications are intended as guides for policymakers and practitioners who want to embark on industry- and cluster-specific policies.

ARIZONA'S PRACTICE OF CLUSTER-BASED ECONOMIC DEVELOPMENT

Eight years after Porter (1990) published his seminal book relating industry clusters to state and regional competitiveness, enough states and regions had adopted cluster-focused economic development strategies to begin to identify common experiences and best practices. Although most of these strategies still are new, as several researchers have pointed out, there are a few that have been in place long enough to bear fruit (Rosenfeld, 1995a). For example, the accomplishments of Silicon Valley as a result of this type of strategy are becoming legendary (Joint Venture: Silicon Valley Network, 1995). In addition, an article by Waits and Howard (1996) in *Economic Development Commentary* describes Arizona's success in using the cluster model to analyze, organize, and serve

key industries. The present article continues to explore how Arizona has used clusters in the following ways:

- *as an analytical tool*: to better understand the economy and define the economic development customer;
- *as an organizational tool*: to engage industry leaders in a regional strategy and to foster communication, networking, and improvement among the companies within and across clusters; and
- *as a service delivery tool*: to provide high-value specialized services to key industries.

Toward the end of the 1980s, Arizona, like most of the country, experienced an economic slowdown. To address fundamental questions about the state's economy, a statewide public-private partnership was initiated to develop a comprehensive economic plan for guiding the state into the 21st century. The partnership contracted with SRI International and Arizona State University's Morrison Institute for Public Policy to provide consulting support and assigned their first task: to better understand how regional economies create quality jobs. The consulting team produced the strategic framework that is the source of the cluster and economic foundations concepts used to build the Arizona Strategic Plan for Economic Development (ASPED) (SRI International, 1991). More than 1,000 Arizonans took part in developing the 1992 strategy as members of the following:

- ASPED Coalition, an executive board composed of members who represented five sponsor organizations including the Arizona Department of Commerce, the Greater Phoenix Economic Council, and the entrepreneurial-supporting Enterprise Network;
- 9 industry cluster advisory groups: information, biomedical, tourism, business services, transportation, aerospace, mining, agriculture, and optics;
- 6 foundation working groups: human resources, technology, capital, tax and regulatory, physical infrastructure, and information infrastructure;
- 18 regional town halls and 6 public forums held around the state; and
- a statewide town hall.

Arizona took about a year to analyze its economy in a global context or, more specifically, to understand how its industries fit into the new world order. The assessment process included both quantitative and qualitative methods. The quantitative analyses examined regional patterns of employment and business to determine leading industries based on size, concentration, exports, employment, and productivity. The qualitative part involved business interviews, panel discussions, and cluster working groups.

By most accounts, a best practice to emerge from Arizona's experience with cluster analysis is the use of cluster working groups to help policymakers better understand an industry, the challenges it faces, and the most valuable assistance government can provide. More important, as a result of this new knowledge, the state has honed its definition of the economic development customer and economic success. The state also has started to direct more and more of its programs and interactions toward key clusters rather than toward individual businesses.

A TOOL TO BETTER UNDERSTAND THE ECONOMY AND THE ECONOMIC DEVELOPMENT CUSTOMER

As part of the ASPED project, nine cluster working groups were convened. Each one represented a separate industry cluster determined to be driving the state economy. Arizona Governor Fife Symington appointed the chairs for each group and then asked the chairs to select members reflective of the diversity in their clusters—large and small companies, final goods manufacturers, and suppliers. Each cluster group had representatives from universities (usually college deans) as well as other auxiliary members from economic development groups, chambers of commerce, law

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firms, and marketing firms. The auxiliary members provided a way for interested parties to hear firsthand about special needs and opportunities facing different industries.

The charge to each cluster group was fivefold:

- catalog the key components of the cluster and map interrelationships among firms (Figure 1);
- articulate an achievable vision of what the cluster can become over the next 10 to 20 years;
- identify opportunities for growing the cluster in the desired direction by expanding existing companies, starting new companies, and attracting outside companies;
- identify opportunities for more synergy within the cluster; and
- identify needs for specific economic foundations and proposed strategies.

Each group met for 3 to 4 months to answer these questions and to complete its cluster map.

The concept of industry clusters has helped Arizona politicians, educators, and economic development professionals to be more “intelligent” about the economic development process and customer. With the aid of analytical tools, such as those depicted in Figures 1 and 2, they have a better understanding of how the economy works, how some businesses add more to the state’s economic strength and well-being than do others, and how businesses are interrelated. In looking at Figure 2, for example, policymakers can easily see that some businesses add more to the state’s economic base than do others. Some firms sell their products globally and bring outside dollars into the region. Some businesses pay more than do others. Some industries have dramatically better growth prospects than do others, and some will produce technologies or services that have important influences on the performances of other industries.

When Arizona started the process of developing a statewide economic strategy, most residents and policymakers thought that state growth and prosperity were due to an empire of raw materials (e.g., copper, cotton, citrus), plentiful and inexpensive real estate, and an exploding population. Many leaders joked that growth itself was the growth industry. After all, for nearly three decades, Arizona was far ahead of the nation in most traditional measures of growth and financial health such as job growth, population growth, and business start-ups. Few policymakers made a distinction between industries that sell their products globally and bring new wealth into the region and those that sell locally and simply recirculate dollars. Few understood that, largely because of an overabundance of population-driven businesses (e.g., restaurants, dry cleaners, retail stores), Arizona real wages had been growing more slowly than had the national average. Few understood that measuring economic development by the number of companies relocated, new jobs created, new units constructed, or population growth provides a limited view of economic prosperity, especially in the new economy.

After participating in ASPED, Arizona policymakers generally understood the importance of taking global competitiveness seriously and subsequently agreed that the state’s best economic development strategy for the 21st century is to focus on globally oriented industries. Consistent with this new focus, the state established a new set of goals. These goals include *quality* jobs (not simply jobs) and higher living standards for all citizens.

Furthermore, Arizona policymakers have shifted the focus of attention from individual firms/industries to clusters of related firms/industries. Before ASPED, economic development was associated with aiding individual firms, whether for recruitment, retention, or export assistance. The practice was to provide economic development services (e.g., business loans, tax breaks) to businesses on a one-on-one, one-by-one basis. Essentially, the state viewed individual firms as the economic development customer. Today, a new customer has emerged; it is generally accepted that key industry clusters driving the state economy should be the focus of economic development efforts. For their part, most urban and rural communities have adopted a cluster-focused framework and strategy modeled after that of the state. Admittedly, there still is a lot of “contact” with individual firms taking place, but it is done (more often than not) under the rubric of building clusters. For example, today it is rare to see even an announcement of a new company recruit that does not mention which cluster(s) are expected to benefit.

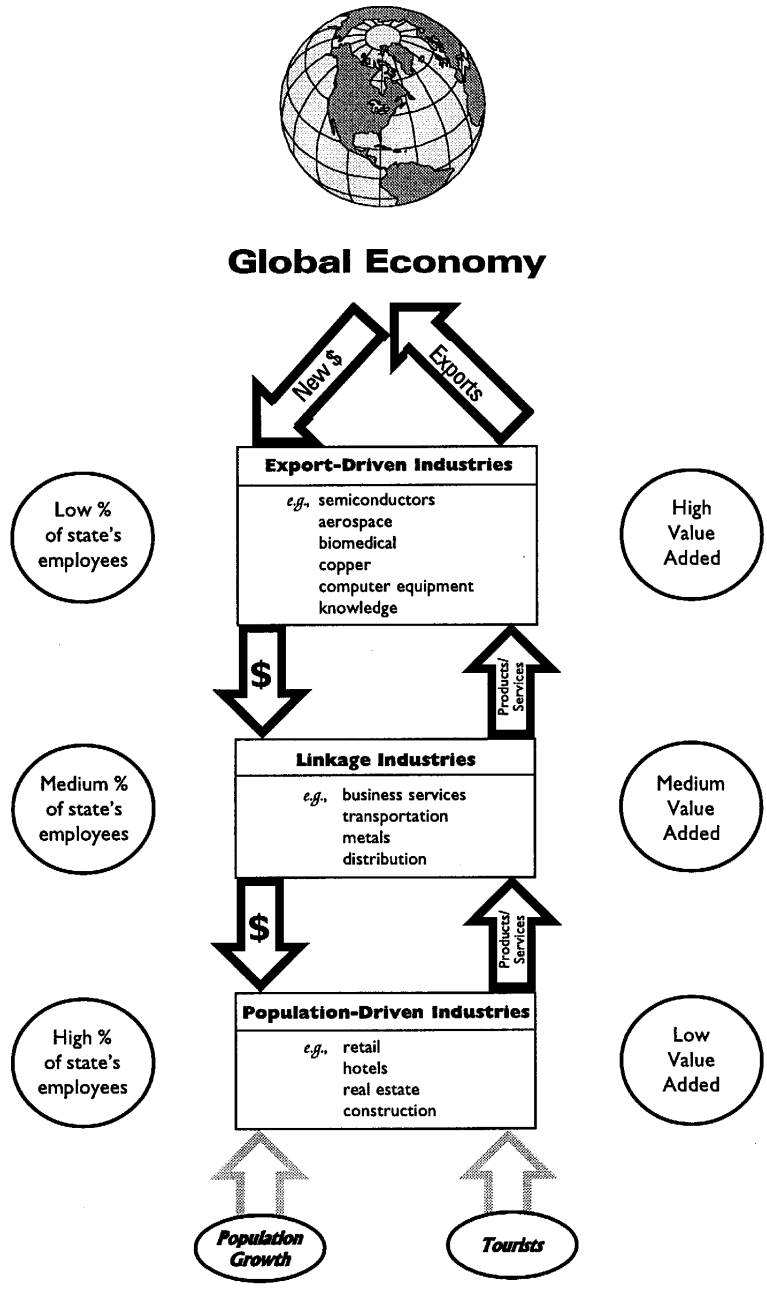


Figure 2: Creating Wealth: An Economic Development Hierarchy

After they studied cluster maps such as that in Figure 1, it was easy for Arizona policymakers to see why it is advantageous for economic development strategies to look beyond individual firms to clusters of firms. These maps depict how firms are related and connected with one another as customers, suppliers, competitors, and even cooperators to build common talent, technology, and infrastructure. They also indicate that strategies, policies, and actions to strengthen that interrelationship and specialized support base will benefit the entire cluster and, therefore, are much more likely to affect the overall competitiveness of state and regional economies than are efforts to aid single firms.

Key Lessons

Arizona's experience suggests several lessons for other states. First, new analytical tools and carefully crafted visuals, such as those in Figures 1 and 2, can provide policymakers with a simple but rich picture of how the economy works, making it easier for them to recognize a new economic development customer in the process. Obviously, that customer is industry clusters, in particular, clusters that are the most important to or hold the greatest potential benefit for the state economy. Second, states can identify the industry clusters driving their economies through the following characteristics described by Collaborative Economics Inc., a consulting company based in Palo Alto, California:

- *Business interdependence:* Businesses relate to each other through the buyer-supplier "food chain" as competitors or as partners.
- *Export orientation:* Many of the companies in the cluster sell products or services to companies outside the region.
- *Concentration:* Employment in the cluster is more concentrated in the region than is shown by the national average, and the cluster is an existing or emerging area of specialization for the area.
- *Significant size or rapid growth:* The cluster is a significant size or, if new, has an above-average growth rate compared to that of the United States as a whole (Joint Venture: Silicon Valley Network, 1995).

. . . the cluster identification process should be fluid enough to accommodate new clusters that want to work through this development framework.

A third key point, however, is that the cluster identification process should be fluid enough to accommodate new clusters that want to work through this development framework. For example, the ASPED process started with 8 industry clusters: 3 emerging clusters (information, health and biomedical, and transportation and distribution), 2 expanding clusters (business services and tourism), and 3 transforming clusters (aerospace, minerals and mining, and agricultural and food processing). Today, the count is 11 (Table 1). Arizona learned that quantitative analysis alone might not capture and describe the whole dynamic picture of economic activity in a given region.

The state's original eight clusters were identified through quantitative analysis of conventional data sets, but after presenting the results to the public, the analysts quickly learned that business and industry saw a different configuration and set of relationships. As members of cluster working groups or participants in public forums, company executives told ASPED leaders that the aerospace and information clusters should be merged into one high-technology cluster; software should be its own cluster, not part of information; and environmental technology and optics, along with software, should be recognized as emerging clusters. The myriad business services firms (e.g., law firms, marketing firms, financial institutions) saw themselves more as suppliers and support industries within other clusters and never really coalesced into a cluster.

In 1994, 2 years into strategy implementation, the businesses and professions that support and serve retirees in Arizona asked to join the state economic development framework as a senior living cluster. The ASPED leadership agreed after the group presented convincing evidence of its companies' interdependence, export orientation, concentration, size, and growth. In the process, however, ASPED leaders learned that when industries are organized enough to make this request, it is politically difficult to refuse them equal status with the other clusters.

CLUSTERS AS AN ORGANIZATIONAL TOOL: TO ENGAGE INDUSTRY IN STRATEGY DEVELOPMENT AND PROBLEM SOLVING

On top of helping state business and government leaders to better understand the dynamics of their economies and particular industries, the industry cluster concept has proved to be a powerful framework for companies to organize, work together, and work with government to meet their needs and promote their interests. In Arizona, the industry groups that helped with economic analysis and diagnostics remained in place to aid with strategy development and implementation.

TABLE 1
Arizona Cluster Organizations and Activities

| <i>Cluster</i> | <i>Affiliate Organization</i> | <i>Co-inform</i> | <i>Co-learn</i> | <i>Co-market</i> | <i>Co-purchase</i> | <i>Co-produce</i> | <i>Co-build Economic Foundations</i> |
|--|--|------------------|-----------------|------------------|--------------------|-------------------|--------------------------------------|
| High technology(aerospace and information) | Arizona Association of Industries (a statewide organization of manufacturers) | • | • | | | | • |
| Food, fiber, natural products | Agri-Business Council of Arizona | • | • | | | | |
| Environmental technology | Environmental Technology Industry Cluster | • | • | • | | • | • |
| Minerals and mining | Arizona Mining Association | • | | | • | | • |
| Software | Arizona Software Association/Center for Software Excellence | • | • | • | | | |
| Tourism | Arizona Office of Tourism | • | • | • | | | |
| Health and biomedical | None | • | • | | | | |
| Optics | Arizona Optics Industry Association | • | • | • | | • | • |
| Transportation | None | • | | | | | |
| Business services | Inactive | | | | | | |
| Senior living | Office in Arizona Department of Commerce | • | • | • | | | • |

SOURCE: Morrison Institute for Public Policy, June 1995.

There is no one formula or model that governs cluster organization and enterprise collaboration; in fact, it is best to view Arizona's cluster groups on a continuum of organizational strength and collaborative activity.

The initial success and momentum of these industry groups led all the clusters to choose to stay organized and active in carrying out the state's new strategy and working to improve economic foundations to meet the specialized needs of key clusters.

As mentioned earlier, Arizona has 10 industry cluster organizations under the umbrella of the Governor's Strategic Partnership for Economic Development, the organization responsible for implementing ASPED. As Table 1 shows, the clusters involve many different purposes, operations, and types of interaction. There is no one formula or model that governs cluster organization and enterprise collaboration; in fact, it is best to view Arizona's cluster groups on a continuum of organizational strength and collaborative activity.

Some clusters have been extremely active and others less so. The busiest clusters have been the "up-starts," that is, the emerging ones that do not yet represent a significant concentration of economic activity within the state. A few cluster organizations, on the other hand, still struggle with membership and projects, leaving them with less of a track record. The keys to staying organized and active appear to be strong leaders (i.e., dynamic, entrepreneurial cluster chairs), connectivity (i.e., members are businesses that are tightly linked), and vision (i.e., clearness about the goal). It also helps for cluster groups to find a set of projects that immediately show results and create the glue that binds the members together until they develop a collective identity.

Table 1 shows the continuum of collaborative activity. At one end of the spectrum are collective efforts at information gathering and sharing; at the other end are more complex types of partnerships needed for joint R&D and production efforts. Somewhere in the middle, there are sales and purchase relationships and collective marketing projects. No cluster organization is engaging in only one type of activity, but so far, most seem to place greater emphasis on either informing or learning, which are activities on the low end of the collaboration continuum.

Examples of cluster projects within each of six collaborative categories include the following:

Co-inform: actions to identify cluster members and impacts, promote a heightened awareness of the industry, and improve communications among firms in the cluster. Nearly all cluster groups have projects to improve communication among firms. A cluster newsletter is the most common undertaking, but at least two clusters have electronically "linked" their members. Five clusters (optics, environmental technology, biomedical, high technology, and minerals and mining) have commissioned Arizona universities to complete in-depth cluster analyses to provide insights into the structure, dynamics, and (in some cases) impacts of their industries. Cluster directories, or comprehensive guides to related firms and support organizations, have been produced for the optics, environmental technology, software, high-technology, biomedical, and senior living clusters.

Co-learn: educational and training programs sponsored by the cluster. All cluster organizations have held seminars or conferences for purposes of learning where and how to acquire resources and services, training for total quality management, or strategic planning exercises to build the vision of business owners and managers.

Co-market: collective activities that promote the cluster's products or services abroad or domestically. Nearly all the clusters have organized or participated in joint trade missions or trade shows and have developed some types of industry brochures and newspaper articles. Three clusters (optics, software, and environmental technology), with assistance from Arizona State University, received a U.S. Department of Commerce grant to prepare export and international trade strategies for their industries.

Co-purchase: activities to strengthen buyer-supplier linkages within the cluster or to jointly buy equipment that firms could otherwise not afford. Arizona's large high-technology cluster has served as an agent to introduce smaller optics and software firms into the broader high-technology buyer-supplier chain. As a result, a number of optics and software firms realized anywhere from \$50,000 to \$200,000 in new sales.

Co-produce: alliances to make a product together or conduct R&D together. A survey of cluster organizations to identify firms that have entered into formal agreements with others to develop products is forthcoming. Today, only a couple of such projects are obvious. Four optics cluster

members, for example, jointly received funds to build a mobile lidar system that none of them could have undertaken individually. Another innovative project involves technology transfer “missions” to national laboratory facilities in both California and New Mexico. Together, the optics, environmental technology, high-technology, and software clusters orchestrated five such visits. As a result, more than two dozen firms received either free technical advice, new sales leads into the labs, or agreements with the labs to develop technology-based products.

Co-build economic foundations: collective activities to build stronger educational, financial, and governmental institutions that enable them to compete better. In general, Arizona’s clusters have provided one of the strongest constituencies in support of economic development legislation. During the past 6 years, cluster groups have instigated or actively supported new programs such as an industry job training fund and both the Arizona Technology Development Authority and Small Business Innovation Research program, whose purposes are to help Arizona businesses tap into federal R&D dollars. All the high-technology-oriented clusters joined the Advanced Information and Communication Foundation Group to push for creating the Governor’s Commission for the Study of the Telecommunication and Information Industry. A number of the commission’s recommendations were adopted by the legislature and governor in 1995 including the creation of the Governor’s Office of Telecommunication Policy. In another example, the optics cluster spearheaded an Arizona Optics Initiative to raise money for things such as industry-university research projects and endowed professorships for university optics programs.

Arizona’s experience suggests that, if a state creates the opportunity for businesses to organize and participate in the process of identifying and solving common problems, then such businesses will.

The Power of Collaboration

The story of Arizona’s optics industry is a prime example of the power of the cluster framework for collaborative action. Arizona companies—in fields as diverse as optical components; optical design software; lasers for medical, industrial, and graphics application; optical telescopes; and digital electronic camera systems—for the first time began thinking of themselves as an industry. They researched the size of their industry and discussed common problems. They involved other organizations that could help or hinder their industry’s development such as universities, national laboratories, and financial institutions. Many began to firmly believe that, by contributing time to developing the state’s capacity to support optics companies, they could turn Arizona into an international center of excellence in optics technology, which would benefit all of them (Waits & Howard, 1996).

In 1992, the optics cluster companies (approximately 145 firms) incorporated as the Arizona Optics Industry Association (AOIA). Soon after, the AOIA landed a cover story in *Business Week* that dubbed Tucson “Optics Valley.” In addition, over a 3-year period, cluster companies bid together and successfully won a large contract (which they could not even have bid on individually), worked jointly with the University of Arizona to create two centers of excellence in optical manufacturing technology, put assistants in eight local schools to promote careers in science, and developed specialized curricula for community colleges. More recently, the cluster, in partnership with the state’s major international service providers, has focused on building long-term export capacity for its member firms. The results already are significant—\$5 million in immediate sales, establishment of an annual industry show in Arizona that draws more than 700 domestic and international firms, and a joint Arizona-Mexico university research agreement.

Individual firms, the industry, and the state’s economy have benefited from AOIA efforts. The markets for optics-related firms generally have grown through the cluster activities. One optics chief executive officer, for example, calculates that his 3 years spent on cluster activities and networking, which cost his company \$50,000, has resulted in more than \$700,000 in new business for a \$3 million company. Moreover, a number of optics-related firms have chosen to relocate to Arizona as a result of the growing recognition of this industry in the state.

CLUSTERS AS A SERVICE DELIVERY TOOL: TO PROVIDE HIGH-VALUE SPECIALIZED SERVICES TO KEY INDUSTRIES

Although a number of states and regions are using the cluster model to analyze their economies and organize key industries, only a few are beginning to show fundamental changes in the provision of economic services based on clusters.

Although a number of states and regions are using the cluster model to analyze their economies and organize key industries, only a few are beginning to show fundamental changes in the provision of economic services based on clusters. Perhaps this is because most cluster strategies still are new and implementation is at an early stage. Arizona's experience certainly demonstrates that it takes time to shift resources and programs in a new direction. Only within the past 3 years has Arizona started the task of restructuring specific government incentives, programs, and services around clusters. During this period, the state has overhauled two programs critical to economic competitiveness—export promotion and workforce development—to make them more responsive to the specialized needs of key clusters.

During the early years of strategy implementation, the focus was on keeping the cluster organizations together, connected to each other, and visible to economic development organizations and the broader community. That focus had three purposes. First, implementation leaders strongly believed that the state's new approach to economic development was about Arizona companies working together to improve industry productivity and competitiveness, not about creating new government programs. Second, because the plan was to establish industry clusters as the economic development customer, one of the best ways in which to do that was to keep cluster groups organized, active, and visible. Third, if the state's goal is to help businesses win in an increasingly global economy, then what matters most are the needs of firms; the ASPED leaders envisioned cluster organizations to be an ongoing source of information and intelligence.

ASPED leaders soon learned, however, that such intelligence might be moot without the ability to modify services accordingly, provide them in a timely holistic manner, and reach enough firms to make an impact. In other words, the full formula to help firms compete in global markets is the identification of their needs *plus* development of an effective system for meeting their needs.

Not surprisingly, that system is difficult to develop. The story of fragmented, unresponsive, resistant-to-change, and ineffective government is all too familiar (Osborne & Gaebler, 1992). But Arizona is learning that clusters can help agencies to strengthen their performances and better connect resources with business needs.

In fact, clusters are a natural ally in meeting the challenges of customer input, responsiveness, accessibility, coordination, and scale. For one thing, as a collection of similar or related businesses, clusters provide a critical mass of customers, thereby making it easier for agencies and private consultants to justify spending time and resources to develop special expertise and programs tailored to fit their industries' particular needs. Likewise, cluster organizations provide easy and systematic access to a large pool of customers for purposes of involving them in the design of programs and policies. In addition, with a roster of 200 to 2,000 firms, these organizations increase the odds that agencies will be able to reach enough businesses with their programs to make an impact. Finally, clusters can be an incentive for various "supplier" organizations—public agencies and private consultants—to integrate and coordinate their services, or even bring them to the cluster, rather than requiring businesses to seek them out.

The practice of listening to and involving clusters in economic development activities is now quite common in Arizona. State, regional, and local development agencies have various mechanisms to promote this tenet of quality service and high performance. As the following examples show, a number of state and regional organizations have added cluster representatives to their boards and held special summits with clusters:

- The Greater Tucson Economic Council, Arizona World Trade Center, and Governor's Workforce Development Council (to name a few) added cluster representatives to their boards. In each case, it was the first time that emerging clusters such as optics, software, environmental technology, and biomedical had specific permanent seats at the tables.
- The 20-year-old Arizona-Mexico Commission reorganized its committee structure to better parallel Arizona's clusters and economic foundations, and it developed a unique binational

integrated regional strategic plan for the states of Arizona and Sonora, Mexico, using Arizona's clusters.

- In 1998, Governor Hull and the Greater Phoenix Economic Council hosted two different summits recently to learn about workforce and other competitiveness concerns and needs for each cluster.

The practice of structuring government incentives, programs, and services around clusters is gaining ground, although it is not yet a common occurrence. Examples of developments in this area include the following:

- The Arizona Department of Commerce, the Greater Tucson Economic Council, and an organization of 13 rural communities all have developed marketing and recruitment materials based on state and regional clusters.
- Cluster firms have priority access to industry job training funds administered by the Arizona Department of Commerce.
- The Arizona legislature allocated \$200,000 to create an office within the Department of Commerce to support the senior living cluster. Although this cluster is of special interest to a key legislative leader, some view this as having opened the door to state funds for other clusters.

Few agencies have taken the challenge of organizing and carrying out cluster-focused programs as seriously as has the Arizona Department of Commerce. Within that department, two divisions in particular are reorganizing their services to correspond with and fit the needs of clusters: the International Trade and Investment division and the Office of Workforce Development. Although very different in their specific missions (i.e., trade development vs. workforce development), these two divisions have several things in common. Obviously, they serve the same customer—businesses—but they also share a constant struggle to deliver services that businesses need, value, and actually use. In fact, reports of program flaws and customer dissatisfaction largely prompted the two divisions to seek out and work with cluster organizations to rethink and redesign their programs and services.

Structuring an Export Program Around Clusters

A 1993 study of Arizona's export assistance efforts found that, although the availability of export services in Arizona was adequate, a wider scope and sophistication of services was needed; that would be exporters were unfamiliar with the export process; and that, even though companies that used the services available were pleased with them, would be exporters were unfamiliar with assistance. In short, Arizona's research found what surveys of small and medium-sized firms typically find: Programs are hard to find, fragmented, and lacking in awareness of the problems of their industry.

Armed with this information, a federal grant, voluntary assistance from Arizona State University, and (most important) the full participation of firms from three clusters, the state designed a pilot export development program built around the optics, software, and environmental technology clusters. Key features of the program include the following. Cluster companies design their own 2-year work plan to reflect the specific needs of the cluster. A team of Arizona international service providers (the Arizona Department of Commerce, the Arizona World Trade Center, Arizona State University, the University of Arizona, Phoenix's Sister Cities Commission, the City of Tucson, and the U.S. Department of Commerce Foreign and Commercial Office in Phoenix) sees that services are coordinated, tailored to the cluster, and delivered to the businesses as a comprehensive package. Combined, the three clusters include more than 850 firms, all of which receive information on cluster-specific activities through each cluster's communications channels. Work plan elements focus on long-term, sustainable export strategies rather than relying on one-shot participation in trade shows or missions. Finally, cluster organizations, as well as individual companies, provide matching financial support for the program.

Today, Arizona has strong evidence that its program to build exports through clusters is successful. In addition to generating millions of dollars in new sales for firms in the three clusters, the International Trade and Investment division now assigns staff and develops its work plans based on clusters rather than on the traditional assignments by foreign country. Other international organizations—the state’s largest public universities and the City of Tucson’s international trade division—also have reoriented export services around the clusters. Perhaps the best mark of success, however, is that the clusters continue to “buy the services.” Each time they are asked, the cluster companies readily make contributions in the range of \$500 to \$2,000 for individual companies and \$20,000 to \$50,000 for cluster organizations.

The success of the pilot program practically ensures that export development in Arizona will be a nonstop interactive process between businesses in an industry cluster and service providers. This interaction will (a) jointly determine the issues and markets of greatest interest to Arizona’s clusters, (b) jointly identify the best strategies for addressing those issues, and (c) use the combined public and private resources to internationalize businesses’ outlook.

Structuring a Workforce Development System Around Clusters

Another major initiative to structure policies and programs around Arizona’s industry clusters is the state’s new comprehensive plan for workforce development. Released in 1998, this plan states clearly that

it is built on the platform originally set forth in [ASPED] and implemented through the Governor’s Strategic Partnership for Economic Development (GSPED). The overriding purpose of the goals and tasks outlined herein is to enhance the economic growth and competitiveness of the GSPED clusters by developing the state’s human resources via improved information, education, and training programs and services. (Arizona Department of Commerce, 1998, p. 2)

Specifically, the plan provides for forecasting worker demand for Arizona’s clusters, identifying training programs that do not currently prepare adults and youths for occupations in industry clusters, and integrating cluster-identified occupational competencies into all training programs in the future.

This shifting of \$167 million to meet cluster needs was preceded by two other important steps aimed at linking workforce development programs with industry clusters. First, the Office of Workforce Development Policy, with its divisions of Workforce Development and School to Work, was transferred from the governor’s office to unite it with the office coordinating the state’s cluster strategy. Second, the Department of Commerce completed a major reworking of the state’s School to Work program to give it an industry cluster focus. The state’s 13 regional public-private partnerships between schools and businesses are now required to target some of their activities toward career awareness and preparation in one of the state’s 10 clusters; otherwise, their grant funds will be cut. Most of the partnerships have, in response, submitted proposals in conjunction with 1 of the 10 cluster organizations (e.g., environmental technology, high technology, bioindustry, software).

In addition to the underlying pressures for policymakers to address worker shortages and quality issues, the push to align School to Work activities specifically with key industry clusters came from two sources. First, School to Work partnerships historically have had difficulty in recruiting businesses to participate. Second, the businesses that did participate often were in construction, retail, and tourism sectors. As a result, students were not being exposed to or prepared for high-skilled, high-wage occupations. Connections to clusters potentially could resolve both of these problems by providing schools with easy access to businesses with high-paying jobs of the future.

Big Payoff for Industry

Each of these efforts has made just enough progress, in trying to redirect public policy and programs toward clusters, to show its potential. The payoff can be big for industry. Clear winners in Arizona, for example, are the environmental technology, software, and optics industries. The

ASPED project prompted the first meeting ever of firms in Arizona's three emerging clusters. Prior to that, few people even knew these industries existed in any concentration in the state (especially optics). Not surprisingly, there were few government programs aimed at developing these three industries. They did not even have seats at the economic development "tables"; those seats went mostly to well-established industries, big banks, real estate firms, and utilities. Today, these three emerging clusters have seats at the tables. The Arizona Department of Commerce, the state's two largest public universities, and the World Trade Center Arizona, among others, have developed strategies and allocated resources to build and strengthen these three emerging clusters along with other, more established clusters.

CONCLUSION

As a result of an increasingly competitive economy, state governments must constantly be alert to opportunities to improve the effectiveness of their economic development efforts. On the other hand, there is no "formula" for determining the right combination of policy tools and strategies appropriate for all states at all times.

There do, however, appear to be several guidelines evolving, based on academic research, common state experiences, and best practices, that can help states to understand the right set of economic development tasks for enhancing their future competitiveness. First, clusters of world-class firms in related industries are the most important economic development customers in the global economy. These clusters, rather than individual companies or simple industries, are the source of jobs, income, and export growth. Second, effective economic policy must be grounded in the realities of the industries at which it is targeted. Rather than presume to know what businesses and workers need from government, public policymaking needs to be structured in a way that permits businesses and workers to define these needs themselves based on the signals and pressures they face in the marketplace. Finally, direct industry participation in program design will lead to higher program quality in addition to ensuring a constituency for the service.

This certainly is what Arizona has found to be the case. As the result of cluster-focused economic analysis and strategy development, Arizona has a much better understanding of its economy and economic development clusters. The state also has a viable approach—cluster working groups and organizations—for putting industry together to design policies, address common problems, and implement initiatives.

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