cluster monitor

By Heike Mayer, Ph.D.

The Urban Center houses Portland State University's Institute of Portland Metropolitan Studies (IMS). IMS conducted industry cluster studies and followed the model outlined in this article.

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A GUIDE FOR ANALYZING INDUSTRY CLUSTERS IN REGIONAL ECONOMIES

Economic development practitioners are increasingly interested in conducting industry cluster studies. This article outlines a framework for analyzing industry clusters and will guide practitioners step by step. In addition to providing an analytical framework, the article discusses the importance of early grassroots involvement by industry representatives in the cluster study. It stresses that the concept of industry clusters is not just a method to analyze the economy, but also a way to organize and conduct policies and programs that involve certain principles for cluster-based economic development.

INTRODUCTION

The purpose of this article is to provide economic development practitioners with the information they need to understand the nature and performance of specific industry clusters in a metropolitan economy, the relative economic performance of a region compared to its primary competitor metropolitan regions, and the links between public and private decisionmaking and the overall regional competitiveness.

Regular assessment of industry cluster performance is important because clusters are the building blocks of today's regional economies.

The concept of industry clusters is frequently mentioned in the local economic development planning literature and in planning practice. While most economic development plans mention clusters, their definitions vary greatly and there is only minimal knowledge about identifying established and emerging clusters as well as target industries. The literature on this topic – both the academic as well as the practice literature – typically provides descriptive statistics of industry clusters in a certain region. A detailed discussion about how to identify, analyze, and observe industry clusters is, however, missing.

This article describes the methods and products of what should be an ongoing effort to monitor the economy, clusters, and cluster competitiveness in metropolitan areas. It serves as a "recipe" for economic developers about how to do an assessment of a regional economy, and for linking the findings of that assessment to local, regional, and state economic development efforts. In this article, local economic development practitioners will find the ingredients they need to analyze their industry clusters. It also provides a list of principles that can guide cluster-based economic development. Taking on a cluster-based approach to economic development can prove to be very useful because the concept represents both a method to analyze an economy as well as a new approach to practicing economic development.

WHAT ARE INDUSTRY CLUSTERS?

An industry cluster is a group of firms that, through their interactions with each other and with their customers and suppliers, develop innovative, cutting-edge products and processes that distinguish them in the market place from firms in the same industry found in other places. The term "cluster" is used specifically to focus on the activities within an industry in a specific geographic location, usually a metropolitan region, that result in economic activities and the creation of new knowledge. It is that new knowledge that confers a competitive advantage on the firms and in turn on the region.

Harvard business professor and cluster expert Michael Porter defines industry clusters as follows:

> A cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. The geographic scope of clusters ranges from a region, a state, or even a single city to span nearby or neighboring countries […] More than single industries, clusters encompass an array of linked industries and other entities important to competition. They include, for example, suppliers of specialized inputs such as components, machinery, and services as well as providers of specialized infrastructure. Clusters also often extend downstream to channels or customers and laterally to manufacturers of complementary products or companies related by skills, technologies, or common inputs. Many clusters include governmental and other institutions […] that provide specialized training, education, information, research and technical support. Many clusters include trade associations and other collective bodies involving cluster members. (Porter, 2000, p. 16-17)

Michael Porter's industry cluster model is summarized in the "Diamond of Competitive Advantage." The four components to the diamond are: firm strategy and rivalry, demand conditions, related and supporting industries, and factor conditions. For some industries, certain locations provide a better combination of these four elements than do other locations in the state or the nation.

It is important to keep in mind that a cluster is not simply the result of the presence of a large firm, or of multiple firms in the same industry. Rather, identifying the presence of a cluster in a community refers specifically to the ability of the firms in an industry to interact in ways that create competitive advantages through the creation and incorporation of new knowledge into products and processes.

Therefore, cluster strategies focus on the relationships among firms, not just on the individual businesses themselves. A cluster strategy is based on the assumption that creating new knowledge confers advantages on all firms in that industry in the same geographic location, even if those firms are, in fact, competitors within their industries.

It is important to differentiate between existing and emerging clusters:

- **Existing or established clusters** show evidence that the industry segment is well established in a region versus nationally. The cluster is capable of generating new knowledge and creates internationally competitive products. For these existing clusters, there is strong evidence of formal and informal interactions among firms.
- **Emerging clusters** can be detected using national industry metrics and qualitative data. They show some evidence of knowledge creation and links to existing regional knowledge strengths. Firm interactions, however, are not as developed as in existing clusters. Often emerging technologies and industrial strengths are not easily detectable from outside the region.

The concept of industry clusters is frequently mentioned in the local economic development planning literature and in planning practice. While most economic development plans mention clusters, their definitions vary greatly and there is only minimal knowledge about identifying established and emerging clusters as well as target industries. The literature on this topic – both the academic as well as the practice literature – typically provides descriptive statistics of industry clusters in a certain region. A detailed discussion about how to identify, analyze, and observe industry clusters is, however, missing.

Economic developers often focus on certain industries that are prominent in their regional economies. These sectors, however, may not exhibit systemic cluster dynamics. In contrast to existing and emerging clusters, these sectors can be described as **target or support industries**, and most often they do not exhibit cluster characteristics. Target or support industries emerge through economic development efforts that, from time to time, identify opportunities for firm retention or attraction that may or may not ultimately emerge as a cluster or part of a cluster. Downtown retail can sometimes be a target industry because shops, restaurants, etc. are seen as important for

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the vitality of the central city. An example of a target or support industry is the venture capital sector. Some economic developers have identified venture capitalists as targets and want to attract them to their jurisdiction. They can be part of a high technology cluster, but by themselves they do not constitute a cluster. For target or support industries, there is typically little to no evidence for inter-industry linkages and resulting knowledge creation in the region.

CLUSTER METHODOLOGY AND DATA SOURCES

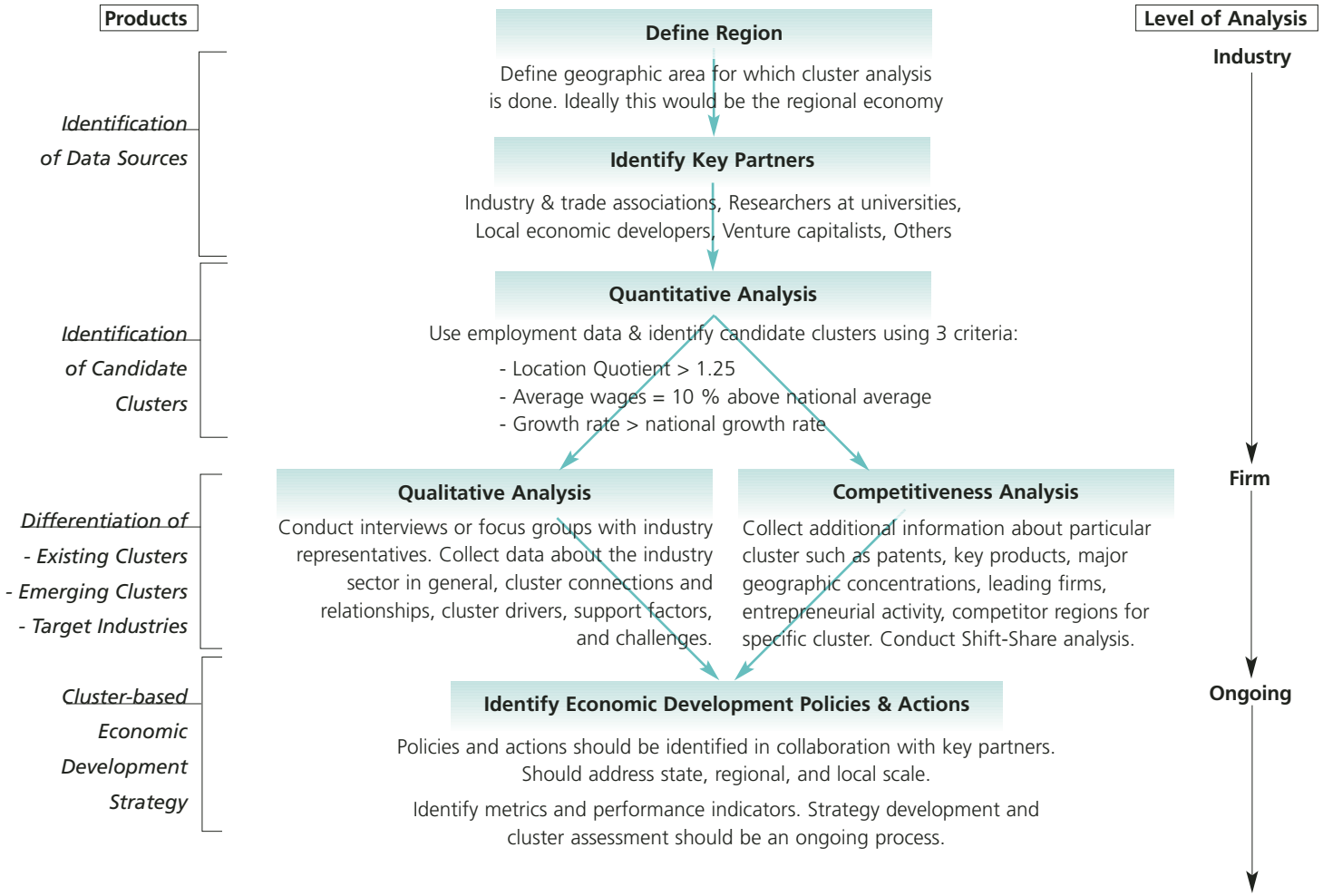
An industry cluster study provides important data about a region's economic structure and serves as a powerful tool to develop cluster-based economic development strategies. By involving key partners such as industry representatives, cluster analysis informs policymakers and economic developers about the needs and challenges of a particular set of firms.

The analysis of industry clusters requires several different modes of data gathering. Figure 1 describes the methodological framework of an industry cluster analysis. Such an analysis is a dynamic, iterative, and ongoing process that involves a variety of key partners. The partners are instrumental in gaining access to data sources and as a sounding board for the interpretation of results.

Moreover, the active involvement of firm representatives in focus groups, for example, contributes to networking and relationship building among cluster firms. It is often the case that firm representatives do not know each other and that their participation in cluster research might lead to doing business with each other. By incorporating networking and relationship building as components for the analysis, cluster studies serve not only as a mode of inquiry but also as an organizing tool.

Often cluster studies stop with the quantitative analysis of employment data. This is an important shortcoming that should be avoided. The most valuable insights into a region's clusters are obtained through qualitative and competitiveness analyses. Qualitative analysis at the firm level will shed light on cluster dynamics such as the mechanisms of buyer-supplier relationships, the importance of crucial support factors, and the challenges that a clus-

Figure 1: Methodological framework for analyzing industry clusters



ter faces in a certain locale. These insights will help differentiate existing clusters from emerging clusters and target industries.

The competitiveness analysis is necessary because it allows for comparison to other regions. Careful analysis of the "economic fingerprint" for the region is an essential building block for the development of strategy. The following sections describe the steps needed to fully assess existing and emerging clusters. Figure 1 provides a schematic diagram for this process.

IMPORTANT STEPS IN ANALYZING CLUSTERS

This section describes the major components of an industry cluster analysis. Practitioners interested in analyzing clusters should follow these six steps:

- Step 1: Define the region
- Step 2: Identify key partners for the endeavor
- Step 3: Conduct a quantitative analysis
- Step 4: Conduct a qualitative analysis
- Step 5: Conduct a competitiveness analysis
- Step 6: Identify economic development policies and actions

Step 1: Define the Region

Industry clusters are part of the regional economic fabric. Clusters typically do not stop at jurisdictional boundaries and their economic activity can be distributed across the whole metropolitan area. Today, metropolitan regions represent the relevant economic geography for most cities (Barnes & Ledebur, 1998). The easiest approximation of a regional economy is the metropolitan statistical area that the U.S. Census defines. The U.S. Census provides definitions for metropolitan statistical areas and lists each MSA's components on the following website: http://www.census.gov/population/www/estimates/metrodef.html. Economic developers interested in conducting a cluster analysis and devising cluster-based economic strategies need to be aware that the concept can be a regional phenomenon in reality. This may involve collaboration among economic developers and other government representatives from different jurisdictions.

Step 2: Identify Key Partners

The key to a successful industry cluster analysis is to partner with industry or trade associations. These groups will help the researcher gain access to data sources. They will also function as important developers and implementers of cluster-based economic development strategies. The goal is to involve key partners early in the process and to keep them informed during the data-gathering phase. It is helpful to provide regular updates in order to get advice and interpretation of preliminary results.

Industry associations and trade organizations can function as important partners in collecting qualitative information and conducting the competitiveness analysis. These groups work as intermediaries between the researchers and the individual firm in the cluster and can provide access to individuals. Local industry groups are usually very accessible and they often will collaborate on tasks such as setting up focus groups, conducting surveys of their members, etc.

Step 3: Conduct Quantitative Analysis

The third step in industry cluster analysis is to identify industry sectors that appear to have a competitive advantage based either on employment concentration, high levels of wages, or fast relative growth. The product of this analysis is the identification of **candidate industry clusters.** This method of identifying candidate clusters is based on Cortright's analysis of Oregon's industry clusters (Cortright, 2003).

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Data source: Detailed firm-level employment data can be obtained by the state's employment department. The dataset is called Covered Employment and Wages (CEW), also known as ES-202 data and is based on tax reports submitted quarterly by employers subject to the Unemployment Insurance (UI) law. The dataset documents employment for those who are required to have UI coverage. There are a number of specific groups that are, by law, excluded from this coverage such as those who are self-employed (i.e. artists) and the agricultural labor force (this can affect industry clusters such as specialty foods, nursery products, creative services, artists, etc.).

The use of the dataset is restricted by confidentiality concerns. Most state departments do not allow the publication of employment, wage, or any other data that could identify an individual

employer. Researchers typically have to sign a non-disclosure agreement. The Oregon Labor Market Information System published some helpful information about the ES-202 data set that can be found at http://www.qualityinfo.org/olmisj/ArticleReader?itemid=00001367&print=1.

The Bureau of Labor Statistics (BLS) produces a comprehensive national set of the ES-202 data. It is available online at http://www.bls.gov/data/home.htm. BLS provides the data at the state, county, and MSA level. This is helpful in calculating equivalent data for certain industry sectors at the national level.

The goal of this step in the industry cluster analysis is to analyze industry segments at the lowest level of aggregation. This means that researchers have to analyze ES-202 data at the 3-digit or 4-digit SIC or 5-digit or 6-digit NAICS level. In 1997, a new industry classification system, the North American Industry Classification System (NAICS), was introduced. This new 6-digit system replaces the old Standard Industrial Classification (SIC) system. Associated with the classification system change is the problem of comparisons over time. Since some industries are now classified differently, comparisons over time may not be possible anymore.

Identifying Candidate Clusters

To identify candidate clusters, researchers have to conduct a comprehensive analysis of a region's economy regarding its employment concentration, wage levels, and relative growth. This quantitative analysis employs a triangulation strategy because it allows us to distinguish between growing and declining clusters as well as low paying and high paying clusters. The product of the quantitative analysis is the identification of **candidate clusters**, which will be subject for further investigation through qualitative and competitiveness analyses. To identify candidate clusters, the researcher can use three criteria. The first criterion is a location quotient that should be higher than 1.25. The second would be that the industries that could be candidate clusters should have average wages that are 10 percent above the national average. The third criterion is that the industry's growth rate should be higher than the national growth rate. The following briefly describes the three criteria:

Credit: Adidas-Salomon

Adidas is located in Portland, Oregon, and is part of the region's apparel cluster.

Criterion 1: Employment Concentration and Location Quotient Analysis

The location quotient (LQ) analysis can be used to determine the relative concentration of certain industries in a region compared to national averages. A location quotient for a particular industry is a ratio that compares the percentage of employment in a particular industry in a local economy to the percentage of employment the same industry constitutes in a reference economy (i.e., the national economy).

The formula for computing a location quotient is as follows:

$$LQ_i = (e_i/e)/(E_i/E)$$

Where: e_i = Local employment in industry I

e = Total local employment

E_i = National employment in industry I

E = Total national employment

LQ analysis indicates which industries have a comparatively larger (or smaller) presence in the local economy. A LQ equal to 1.0 means that the share of employment in a particular industry in a local economy is exactly the same as the share of employment in the same industry nationally. If the LQ is larger than 1.0, the local share of employment in a particular industry exceeds the national share of employment in the same industry and it means that locally the industry is more concentrated and might have a comparative advantage.

The threshold value for the LQ analysis is 1.25. This suggests that the analysis should focus on industries with a concentration 25 percent or greater than the concentration found in the United States as a whole. For a more detailed elaboration of the location quotient and its analysis see McLean and Voytek (1992) *Understanding Your Economy: Using Analysis to Guide Local Strategic Planning.*

Criterion 2: Wage Level Analysis

Wage levels are important determinants of the value that is placed on the production of certain goods. In a knowledge-based economy, average wage levels should be high for those industries that value innovation and knowledge creation. The objec-

tive is to find industry segments with wages levels that are significantly above the national average. To do this, we have to compute industry average annual pay for the nation and for the unit of analysis, i.e. the region, for a given year. Cortright (2003) uses the threshold value of average annual wage levels that are 10 percent above the national average.

Criterion 3: Growth Rate Analysis

The growth rate analysis identifies industry segments that are growing faster in the region than in the nation as a whole. Knowing which industries are fast growing is important because economic developers need to know which industries are doing well. Cortright (2003) uses a methodology that examines the five-year growth rates at the 4-digit industry level. He argues that the timeframe is long enough to minimize distorting effects of short-term changes.

McLean and Voytek (1992, p. 33-35) provide an excellent guide to computing annual growth rates. According to them, calculating annual growth rates is a more precise method than averaging because "it takes into account the incremental change in the base amount from year to year." (p. 34) They add that "the annualized growth rate is always slightly lower than the rate produced by averaging (sometimes considerably lower if growth rates are really high)." (p. 34) The following formula can be used to compute annual growth rates:

$$\mathbf{Emp_t = Emp_b\,(1+r)^n}$$

Where Emp_t = terminal year employment

Emp_b = base year employment

n = number of annual intervals in the time span

r = growth rate over each interval

McLean and Voytek (1992) provide the following example:

> Assume that from 1973 to 1979 employment increased 25 percent (from 20,000 to 25,000) and that from 1979 to 1988 it increased 30 percent (from 25,000 to 32,500). To find the compound annual growth rate for each period, one more piece of information is required: the number of years (or other time intervals) covered in each period. The 1973-79 period covers six years of change while the 1979-88 period covers nine years. Solve for r as follows:

$$Emp_{1979} = Emp_{1973} * (1+r)^6$$

$$Emp_{1979}/Emp_{1973} = (1+r)^6$$

$$25{,}000/20{,}000 = (1+r)^6$$

$$\sqrt[6]{1.25} = 1+r$$

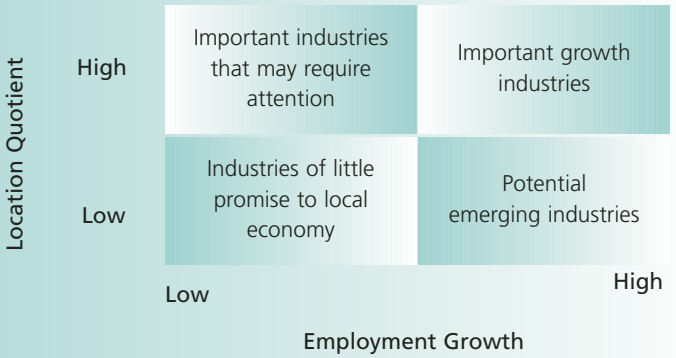
$$1.0379 = 1+r$$

$$.0379 = r$$

If converted to a percentage, the annual growth rate is 3.8 percent.

Once candidate clusters have been identified, the analyst could map the industry sectors using two of the criteria. Figure 2 might help in classifying candidate clusters using the location quotient and growth rate analyses.

Figure 2: Method for Classifying Industry Clusters



Source: Center for Economic Development, Carnegie Mellon (2002)

The graph illustrates the following cluster types:

- Candidate clusters with a high location quotient and low employment growth may represent segments of the economy that have a stronghold in the region but do not experience any significant growth.
- Clusters with a high location quotient and high employment growth are important growth industries in the region. They may represent healthy existing clusters that export their products and that have a competitive advantage here because they are disproportionately more concentrated in the region than in other areas.
- Industry segments with a low location quotient but high employment growth can be potential emerging clusters. High employment growth is an indication that the industry's products are in demand and that the demand has to be met with adding labor.
- Industry segments with a low location quotient and low employment growth don't represent candidate clusters. They have little promise to contribute to economic growth in the region. However, they might be important support industries.

Step 4: Conduct Qualitative Analysis

After identifying candidate clusters, we have to differentiate **existing clusters** from **emerging clusters** and from **target industries**. An in-depth qualitative and competitiveness analysis of the candidate clusters will help with this differentiation. While the quantitative analysis focused on industry

Industry Cluster Interview Template

Introductions

- Researchers introduce cluster study (goals, timeline, partners, etc.)
- Ask whether taping the interview is ok.

General Business Information

- Could you give us a brief description of your company, the products you make, and also the history of it?
- Probe for the following:
  - Company Name
  - Contact Name
  - Current Employment (Full Time / Part Time)
  - Anticipated Employment for the following year
  - Annual Sales (Breakout by % regional, elsewhere in the state, in US, International)
  - Years in Business
  - Founder(s)'s previous employer (for firm genealogy purpose)
  - Headquarters or Branch Location
  - Brief description of business and industry, the firm's main products
  - SIC/NAICS classification (if interviewee knows)

History of the Region's Industry

- What were the pivotal events determining the development of your industry cluster in this region? What firms and people have shaped the industry?

Cluster Connections and Relationships

- In what ways does proximity to your suppliers but also to your competitors and other companies matter?
- In what ways are the companies in your cluster connected with each other?
  - In terms of supplier and customer relationships, in what ways did the industry evolve into a cluster/agglomeration of firms?
  - How and why does proximity to suppliers and customers matter in/to the industry?
  - In addition to proximity, what other types of connections are critical to innovation and growth of the industry?

Cluster Drivers

- What are the most important factors that contribute to the competitiveness of your company/industry?

Innovation

- What are the main sources for new product and process ideas?

Talent

- How would you rate the availability of a skilled workforce in this region?
- How easy/difficult is it to attract and retain workers? What makes it easy/difficult?

Support Services

- What kind of support services does your industry rely on?
- Are these available locally?
- In what ways do you interact with (local) firms that provide your support services?

Competitor Regions

- In what ways is this metropolitan region different from other competitor regions?

Challenges

- What kind of challenges does your industry face locally/nationally/globally?
- How do these challenges affect your company's ability to remain competitive here in this region?
- What is your sense of where the industry is headed in the future?

Potential for Collaborative Action

- In what ways could firms in your industry collaborate with each other?
- How could the public and the private sector help with creating these collaborative relationships?

Public Policy

- What policy factors will influence the industrial growth in the next 10 years?
- In what ways can public policy help your industry be more competitive?

Wrap-Up

- Ask if there was a topic left out.
- Are there additional topics/issues of concern?
- Promise to follow-up with the interviewee/focus group participants.

After the interview

Send a thank you card/e-mail.

sectors as classified by SIC or NAICS codes, the qualitative and competitiveness analyses focus on in-depth information about individual firms and their connections with others within industry clusters. In addition, through qualitative research one can assess the quality of the business environment, support services, demand conditions, etc.

Examining individual firms in more detail is important because quantitative sector analysis does not capture the full range of firms that are part of a particular industry cluster. For example, professional service firms such as public relations companies in a high tech region can be very specialized and focused on the high tech industry. They can be an essential part of the high technology cluster. Temporary labor agencies may also be part of high technology clusters. They provide high technology manufacturing firms with production workers. However, these public relations firms and the temporary labor agencies are not captured in the SIC or NAICS codes that are selected for high technology manufacturing and their relationship to core firms may only be discovered through interviews.

Qualitative analysis also reveals the extent to which cluster firms work together and are connected to each other through buyer-supplier relationships and other more informal networks. These networks are critical for cluster performance because they provide a vehicle for information sharing and knowledge exchange that can lead to competitive advantages. Such network relationship can only be assessed through interviews or focus groups in which industry representatives share insider information about their firms.

In-depth interviews and focus groups also reveal the importance of factor inputs such as natural, human, and capital resources, physical, administrative, information, and scientific and technological infrastructure. The presence and the quality of these factor inputs shape the competitiveness of industry clusters and need to be examined from a public policy perspective. Qualitative inquiry can give researchers and economic developers important clues as to whether there are factors missing or in decline.

Qualitative inquiry needs to be done in cooperation with the identified key partners. These partners function as conveyors and help with gaining access to industry representatives. Economic development practitioners can aid with the qualitative data gathered through their firm interviews and site visits.

It is important to follow-up the interview with presentations, interim reports, etc. This will be valuable confirmation of the data and a good way to reach out to industry cluster partners. It will also get them further involved in strategy formulation and the development of economic development action plans. Feser and Luger add to this and emphasize that cluster analysis serves as a mode of inquiry and can spark broader discussions of economic development in a community (Feser & Luger, 2003).

Data analysis of qualitative interviews: The analysis of qualitative data in a cluster study should focus on common themes and topics that the various interviewees bring up. Cluster analysts should take notes during the interview. Notes will help to write an interview summary that highlights important points that were raised by the interviewee. Over the course of several interviews, the researcher will recognize common themes and topics across interviews or focus groups. These common themes will add up to a synthesis of the qualitative data.

The competitiveness analysis is an important component of any industry cluster study because it provides regional leaders with information about the relative competitive advantage of a respective industry cluster compared to other clusters in other regions. Such information in turn will help practitioners devise an economic development strategy that is aimed at differentiating the region and its clusters from competitors.

A note on focus groups: Focus groups can be the ideal methodology for collecting data about industry clusters. Focus groups are interviews conducted in a group setting. They provide the advantage of gathering various firm representatives who belong to one industry cluster. For more information on focus group methodology, see David Morgan's book on focus groups (1997).

Step 5: Conduct Competitiveness Analysis

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Comparing key variables

The competitiveness analysis is done by collecting data that compare the region to other regions along a variety of different variables such as:

- gain in employment in industry clusters compared to other regions (shift-share analysis),
- knowledge creation as evidenced by patents,
- major firms and their products,

Key Variables for Competitiveness Analysis

- *Gain in employment in industry clusters compared to other regions (shift-share analysis)*
- *Knowledge creation as evidenced by patents*
- *Major firms and their products*
- *Venture capital investments*
- *New firm formation and entrepreneurial activity*
- *Federal funding for science and technology*
- *Data on talent and labor (educational attainment, etc.)*

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Shift-share analysis

Shift-share analysis is a method to analyze differences between growth in a local economy and growth in the national or other regional economies. The method allows for isolating the effect of local influences on growth from effects that operate industry-wide or at the national level.

The method divides local employment into three components:

- national share (NS),
- industrial mix (IM), and
- local factors (LF).

The national share reflects national trends. The industrial mix refers to specific trends in the industry. Local factors account for local influences on an industry's performance.

McLean and Voytek (1992, p. 68-71) provide the following formula:

Total Employment Shift = $NS_i + IM_i + LF_i$

National Share: $NS_i = e_i^{t-1} (E^t/E^{t-1})$

Industry Mix: $IM_i = e_i^{t-1} ((E_i^t/E_i^{t-1}) - (E^t/E^{t-1}))$

Local Factors: $LF_i = e_i^{t-1} ((e_i^t/e_i^{t-1}) - (E_i t/E_i^{t-1}))$

Where:

e_i and E_i are local and national employment in industry i,

e and E are local and national total employment for all industries, and

t-1 and t are beginning and end of the time period, respectively.

Shift-share analysis helps the analyst to identify industries that are strong or weak in a region compared to elsewhere. It also helps to determine to what extent shifts in employment share are due to local factors or to broader trends and whether existing clusters are growing, stable, or declining

Knowledge creation measured by patent activity

Knowledge creation is key to the competitiveness of an industry cluster. The creation of ideas with commercial value can be measured by patent registration. The U.S. Patent and Trademark Office (USPTO) regularly publishes detailed information on patent registration. Patents are normally registered under the first-named inventor. Data is collected for the first-named inventor's residence, the patent's technology class, the year and the name of the company for which the patent was registered. This data can be analyzed by industry cluster and by region.

USPTO publishes patent data online at:

http://www.uspto.gov/web/offices/ac/ido/oeip/taf/reports.htm#by_geog

For a searchable full-text patent database, see:

http://164.195.100.11/netahtml/search-bool.html

Major firms and their products

An analysis of the major firms and their products is essential for cluster analysis because it adds a level of specificity that will help regional leaders to characterize particular industry clusters. Research has shown for example that high technology regions specialize and that a region's particular industrial strengths are shaped by the region's industrial history (Cortright & Mayer, 2001).

Helpful data sources are industry directories, membership lists, and published firm lists. Regional business journals typically publish the so-called Book of Lists every year. These books list the major employers (ranked by sales, revenues, employees, etc.). For more information, check your local business journal's website.

Other sources for information about individual firms include:

- EDGAR – *U.S. Securities and Exchange Commission (SEC)*
  All companies, foreign and domestic, are required to file registration statements, periodic reports, and other forms electronically through EDGAR. A complete list of filings is available through EDGAR online at: http://www.sec.gov/edgar.shtml

- **Hoover's -** http://www.hoovers.com/
  Information that can be accessed for free is limited to data about a company's top competitors, subsidiaries, financial data, information about products, etc.
- **Dun & Bradstreet -** http://www.dnb.com/us/
  This is a subscription-based data set, which means that you would need to pay a fee for each record. Records typically include the name of the company, its mailing address, information about ownership and the executives, employment, industry sector, and sales volume. It may be a good dataset for geographic mapping of industry clusters.

Venture capital investments

Venture capital is necessary to support an entrepreneurial economy because new startup companies need outside capital investment to become successful businesses. The inflow of venture capital into a cluster and a region indicates how entrepreneurial and vital a region is. If a region attracts a relatively large amount of venture capital into certain industry segments, then that region might have a competitive advantage in these areas over others.

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There are two data sources that can provide helpful information about venture capital investments. One of them is a database that restricts access to venture capital firms that reported their activities in a survey. To access this database, researchers would need to partner with a venture capital firm in their region.

- **PricewaterhouseCoopers' MoneyTree:** This database contains information about venture capital investments. It's collected through venture capitalists. Detailed data on metropolitan investment patterns is accessible through login passwords only. http://www.pwcmoneytree.com/moneytree/index.jsp
- **Venture Economics -**
  http://www.ventureeconomics.com/vec/statshome.htm

This database contains statistical summaries by nation, region, and metropolitan region. The source for the data is PricewaterhouseCoopers' MoneyTree survey.

New firm formation and entrepreneurial activity

Data on new firm formation and entrepreneurial activity is not readily available. Ideally, this information is collected through a survey of companies in a region. The survey would assess a company's history and its genealogy.

There are a few sources that compare entrepreneurial activity among regions. One of these sources is the Progressive Policy Institute's New Economy Index, which is available online at: http://www.neweconomyindex.org/. Specifically, the Metropolitan New Economy Index (http://www.neweconomyindex.org/metro/index.html) lists a variety of new economy measures and compares the 50 largest consolidated metropolitan areas (CMSAs). The report assesses regional entrepreneurial activity as measured by the number of newly publicly traded companies. This is also called initial public offerings. The source of this data is the EDGAR Online database of the Securities and Exchange Commission, EDGAR-ONLINE, for 1999 and 2000. For more information about the new economy index's data sources: http://www.neweconomyindex.org/metro/sources.html

Talent and labor

The most readily available data that give an indication about the level of education of a regional population is Census data on **educational attainment**. This data can be accessed online through the American FactFinder at http://factfinder.census.gov/servlet/DatasetMainPageServlet?_ds_name=DEC_2000_SF1_U&_program=DEC&_lang=en.

To get education attainment data for all the metropolitan areas in the U.S., one needs to build a query by selecting "Census 2000 Summary File 3 (SF 3) - Sample Data" and then clicking on geographic comparison tables.

Another indicator for a region's talent pool is the **share of the managerial, professional, and technology jobs of total regional employment**. This data can be accessed through the Current

Population Survey that the Bureau of Labor Statistics and the Bureau of the Census provide. The data is available at: http://www.bls.census.gov/cps/cpsmain.htm.

A third important method for analyzing a region's labor market is **migration patterns**. Analyzing census information can do this. Cortright analyzed the migration patterns of the 25-to 35-year-old population. To examine migration patterns, researchers can also use data from the Internal Revenue Service (IRS). Such migration data is available at http://www.ire.org/datalibrary/databases/migration/. With this data, one can track people coming and leaving a metropolitan area and it can help to gauge whether a community is gaining or losing wealth and brainpower.

Principles for Cluster-Based Economic Development

- *Use clusters to understand your economy*
- *Help build relationships among cluster firms*
- *Become cluster-driven*
- *Metropolitan economies and unique metropolitan economic "fingerprints"*
- *Economic geography varying by industry*
- *Talent as the least fungible resource*
- *Linking cluster competencies to develop defensible strategies*
- *Strategy and differentiation*
- *The importance of place and becoming a location of choice*
- *Cluster initiatives need to have private support and leadership*

Step 6: Identify Economic Development Policies and Actions

Through industry cluster studies we are able to see a regional economy in a different light. A detailed examination of cluster dynamics will tell regional leaders in what ways their companies and sectors are connected to each other. A cluster study ought to reveal gaps and missing links in cluster relationships, and economic development policies and actions should be designed to address such deficiencies and to support cluster development.

Ideally, cluster analysis is done in cooperation with key partners such as industry representatives, trade associations, and economic developers. Incorporating these partners into every step allows the analysts to incorporate feedback and multiple interpretations. It will also provide a unique opportunity to educate key partners about the industry cluster concept and its value to policy-making and economic development practice.

Cluster-oriented economic development policies can be applied to a variety of groups such as workforce development agencies, state and local economic developers, higher education institutions, industry groups, and utilities among others. These groups can use their cluster understanding as an organizing method for their programs. For example, economic development agencies can employ a cluster orientation in the ways they organize their departments and have their business or industry managers work in groups that focus on individual clusters (Waits, 2000).

SOME PRINCIPLES FOR CLUSTER-BASED ECONOMIC DEVELOPMENT

As this article has shown, industry clusters are a method and at the same time an instrument for economic development. Local economic development practitioners would need to focus on several aspects to bring cluster-based economic development to life. First, industry cluster analysis should be an ongoing and regular process. Industry cluster studies only make sense if the collected data is updated regularly. Cluster analysis done well represents a significant commitment of time and resources, and insights to be gleaned from longitudinal analysis make that commitment justifiable and worthwhile. Cluster performance should be monitored. Second, collaboration with partners is key to the success of cluster-based economic development. Local economic developers should collaborate at the regional level in conducting industry cluster studies and developing cluster-based economic development policies. After a cluster study is conducted, economic development practitioners, industry experts, and other regional groups should continue their conversation about the results and the progress in implementing policies.

Typically, the cluster concept is not widely understood, and regional leaders would need to be educated about the value of cluster-based economic development. Such outreach and education can be done in meetings with interested economic development organizations, through newspaper articles, public forums on the topic, and other events that invite regional leaders into a conversation with cluster representatives and researchers.

The following principles can help economic development practitioners and other regional leaders in developing cluster-based economic development strategies.

- **Use clusters to understand your economy** In the most successful regions, the economies are organized into industry clusters of interrelated, export-oriented firms. It is important for regional leaders to understand the structure of

Useful Web Sites

Useful Internet Portal to Online Socio-Economic Data

EconData.Net:
http://www.econdata.net/

Geographic Definitions:

http://www.census.gov/population/www/estimates/metrodef.html

Explanation of Covered Employment Data:

http://www.qualityinfo.org/olmisj/ArticleReader?itemid=00001367&print=1

Bureau of Labor Statistics:

http://www.bls.gov/data/home.htm

Patent Statistics:

By Geography:
http://www.uspto.gov/web/offices/ac/ido/oeip/taf/reports.htm#by_geog

Full Text: http://164.195.100.11/netahtml/search-bool.html

Firm-Level Data:

SEC Filings: http://www.sec.gov/edgar.shtml

Hoover's: http://www.hoovers.com/free/

Dun & Bradstreet: http://www.dnb.com/us/

Venture Capital Statistics:

MoneyTree Survey:
http://www.pwcmoneytree.com/moneytree/index.jsp

Venture Economics:
http://www.ventureeconomics.com/vec/statshome.htm

Entrepreneurship Statistics:

New Economy Index:
http://www.neweconomyindex.org/

Metropolitan New Economy Index:
http://www.neweconomyindex.org/metro/index.html

Census Statistics:

(includes data on educational attainment, occupations, etc.)

Census' American FactFinder:
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_ds_name=DEC_2000_SF1_U&_program=DEC&_lang=en

Current Population Survey:
http://www.bls.census.gov/cps/cpsmain.htm

Migration Data:

Internal Revenue Service:
http://www.ire.org/datalibrary/databases/migration/

Examples of Cluster Studies from Portland's "Regional Connections" project:

http://www.pdx.edu/ims/regcon.html

their regional economies and in particular to understand cluster dynamics. The industry cluster perspective provides several benefits. The focus on industry clusters allows regional leaders and economic developers to focus on a group of firms rather than on an individual firm. This allows focusing on collective rather than individual benefits. By extending the analysis beyond the individual firm, economic developers and decision makers take a variety of factors into account that are important for knowledge creation and competitiveness (such as suppliers, customers, the location and the existing support factors). This in turn, provides policymakers with a broader set of factors that can be influenced more easily than an individual firm's decisions.

- **Help build relationships among cluster firms**
  The goal of cluster-based economic development strategies should be to help build relationships among cluster firms to promote the synergy and intangible factors that contribute to a firm's competitiveness. Through cluster relationships, firms exchange ideas and knowledge and upgrade products and processes. This in turn makes them more competitive in the marketplace. Clusters in essence help individual firms to compete. A cluster-based economic development strategy ought to focus on these relationships. The strategy should focus on creating firm relationships because often firms do not know that they are part of an industry cluster. Through participating in cluster-based economic development programs, industry leaders have the chance to get to know each other.

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- **Become cluster-driven**
  The key to conducting a successful cluster analysis and to developing cluster-based economic development strategies is to become cluster-driven. Economic development agencies for example need to organize their activities by clusters. The practice of economic development currently focuses too sporadically on individual companies. In most cases, business recruitment, retention and expansion programs do not follow a particular strategy, but are rather responsive to a firm's call and tactical in nature. The key to being strategic is to be cluster-driven.

- **Metropolitan economies and unique metropolitan economic "fingerprints"**
  Over time, regions develop unique economic strengths and regional leaders need to build on these strengths. Firms that already have a stronghold in a region are there for good reasons and are less likely to move. Regional leaders need to take advantage of the benefits that industry clusters provide to these individual firms. They need to examine what their regional economic "fingerprint" looks like and how they can sustain continued growth in these areas of specialization.
- **Economic geography varying by industry**
  Different industry clusters have different location requirements. In the case of the Portland, Oregon, metropolitan area, for example, the nursery cluster has very different location needs than the creative services industry cluster. The former industry relies on fertile farmland for growing shrubs and tress while the latter industry is located in the central city to accommodate employee preferences for a lively downtown. The economic geography varies by cluster.
- **Talent as the least fungible resource**
  A talented pool of labor is critical to the ability of firms to be innovative and competitive. Knowledge-based industry clusters thrive in places that are attractive to a workforce which is skilled and educated. However, we still know little about labor migration patterns, especially among young populations. Regional leaders should examine the factors that contribute to the attraction and retention of young people. The cluster methodology and framework falls short in analyzing the importance of talent. More attention has to be paid to the ways in which talent contributes to cluster formation and competitiveness.
- **Linking cluster competencies to develop defensible strategies**
  Knowledge gained from the presented methodology about a region's industry clusters can be used to develop unique and defensible strategies for economic development. If a region designs strategies that fit its fingerprint, then economic niches will be built that are unique and do not represent mere copies of other successful places.
- **Strategy and differentiation**
  Cluster-based economic development is strategic if regional leaders pay attention to efforts that help differentiate their region from its competitors. A strategy outlines the areas in which a region strives to be exceptional and how it will achieve this. It outlines the connection between economic development actions and visions. Focusing on differentiation requires being clear about what will not be done in cluster-based economic development. Thus, a successful

cluster strategy requires focus, clarity of purpose, and knowledge about what competitors are already doing.

- **The importance of place and becoming a location of choice**
  Clusters rely on a variety of factors that a location can provide for them. Cluster firms and their suppliers, customers, and support services are rooted in a place. Place is important in determining a cluster's competitiveness because proximity to the components of a cluster provides advantages. Regional leaders have to recognize the importance of place and that place can become a location of choice for companies and talent.
- **Cluster initiatives need to have private support and leadership**
  Only sustained private sector involvement and leadership make cluster initiatives successful. Leadership is necessary to keep the momentum and to achieve measurable results. To the private sector, involvement in cluster initiatives and programs offers collective benefits. For example, lobbying collectively for more investments in higher education is more beneficial and effective than if only a few or an individual firm voices their opinion. Furthermore, functioning and healthy clusters benefit private companies by improving the base of local suppliers, upgrading necessary production factors such as workforce and the R&D infrastructure, etc.

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