

Cluster Monitor

A Guide for Analyzing Industry Clusters in the Portland-Vancouver Metropolitan Region

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About us

The **Institute of Portland Metropolitan Studies** is a service center of Portland State University. It is located in the School of Urban Studies and Planning, within the College of Urban and Public Affairs.

The mission of the Institute is to serve the communities of the Portland-Vancouver metropolitan area and further the urban mission of Portland State University by:

- Identifying the most pressing issues facing this metropolitan area and its communities, and developing the data and other information needed to fully communicate their scope and significance;
- Building capacity in the region to address critical metropolitan issues by:
 - brokering partnerships among faculty, students, and area communities to foster new understanding of and/or new strategies for addressing those issues; and
 - acting as a catalyst to bring elected officials, civic and business leaders together in a neutral and independent forum to discuss critical metropolitan issues and options for addressing them; and
- Developing new resources to support research and service activities needed to meet these objectives.

By acting effectively on this mission statement, the Institute will enable the:

- University to help advance the economic, environmental, and social goals held by the communities of this region; and
- Communities of this region to act collectively to seek and secure a sustainable future for this metropolitan area.

Questions? Feedback?

For questions, please contact the Institute of Portland Metropolitan Studies by phone at (503) 725 5170 or e-mail at ims@pdx.edu.

You can find us online at: <http://www.upa.pdx.edu/IMS>

1. Purpose and Introduction

The purpose of the Cluster Monitor is to provide public and private leaders with the information they need to understand the nature and performance of specific industry clusters in this metropolitan economy, the relative economic performance of this region compared to its primary competitor metropolitan regions here and abroad, and the links between public and private decisionmaking and the overall competitiveness of this region. Regular assessment of cluster performance is important because clusters are the building blocks of today's regional economies.

Currently there are no systematic efforts underway to regularly assess cluster performance in the Portland-Vancouver region. The concept of clusters, however, is frequently mentioned in local economic development plans. While most of the plans mention clusters, their definitions vary greatly and there is only minimal knowledge about established and emerging clusters as well as target industries.

This document describes the methods and products of what should be an ongoing effort to monitor the economy, clusters, and cluster competitiveness in this metropolitan area. It serves as a "cookbook" for the assessment of our economy, and for linking the findings of that assessment to local, regional, and state economic development efforts. The Institute of Portland Metropolitan Studies is committed to seeking funding to sustain this effort in the years ahead.

2. What are industry clusters?

A 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 the creation of new knowledge. It is that new knowledge that confers a competitive advantage on the firms involved.

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" shown in Figure 1. 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.

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 the processes that produce them.

Therefore, cluster strategies focus on the relationships between firms, not on individual firms. A cluster strategy is based on the assumption that creating new knowledge in a place confers advantages on all firms in that industry in that place, even if those firms are, in fact, competitors within their industries.

An industry cluster is about relationships between firms in a region not about magnitude and mere critical mass of firms.

Clusters are ideal for the creation of innovation.

Difference between existing and emerging clusters

It is important to differentiate between existing and emerging clusters.

Through cluster analysis we can differentiate between

✓ **Existing or Established Clusters**

✓ **Emerging clusters**

and

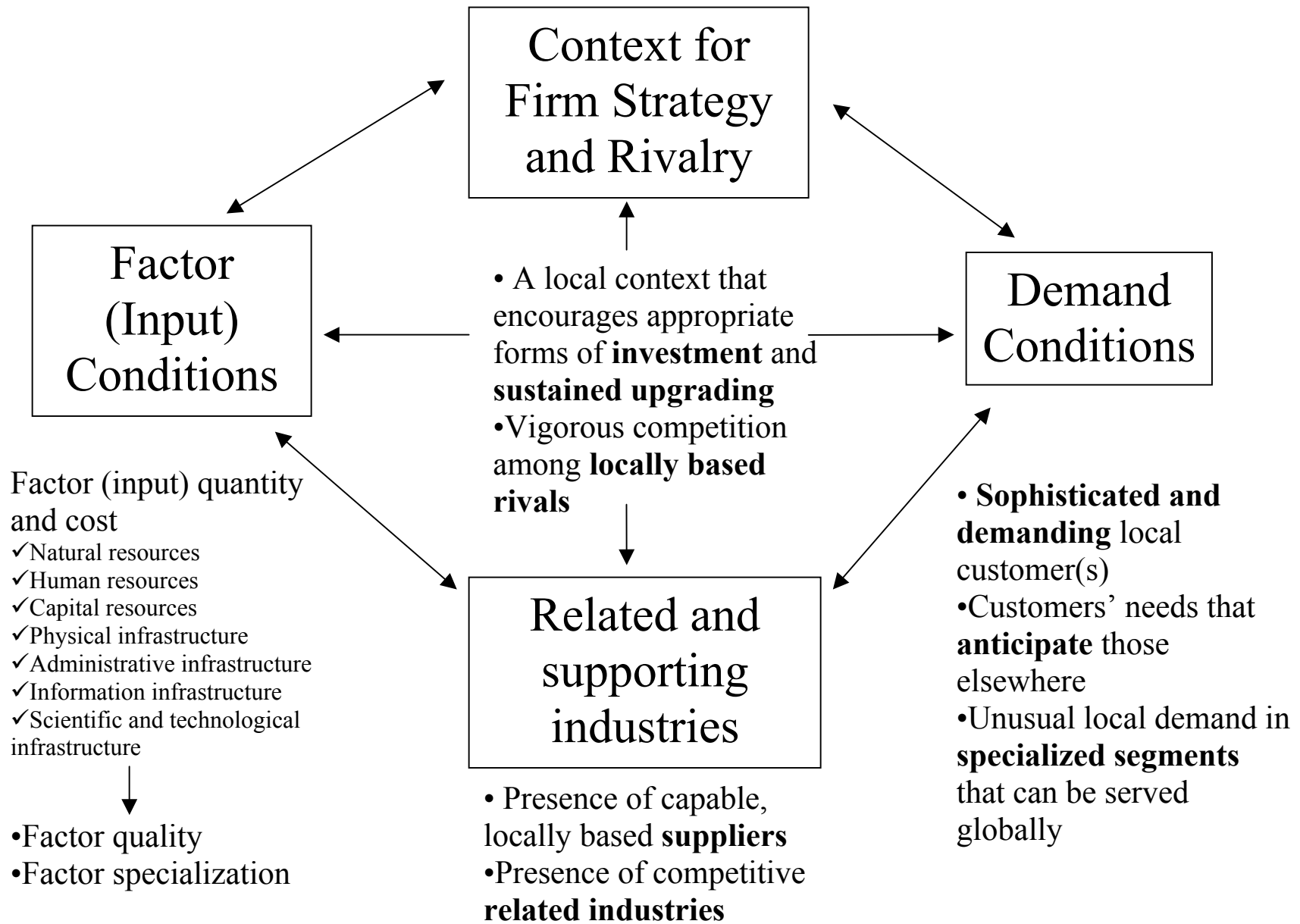
✓ **Target industries**

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 between firms.

Emerging clusters can be detected using national industry metrics and 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.

In contrast to existing and emerging clusters, **target or support industries** don't 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. For these industries, there is typically little to no evidence of a concentration of knowledge in the region. Additionally, there is no evidence of interactions between firms.

Figure 1: Porter’s diamond of competitive advantage



Source: Porter (2000)

3. 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 3 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 between 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 analysis serves not only as a mode of inquiry but also as an organizing tool.

Critical elements in cluster analysis are:

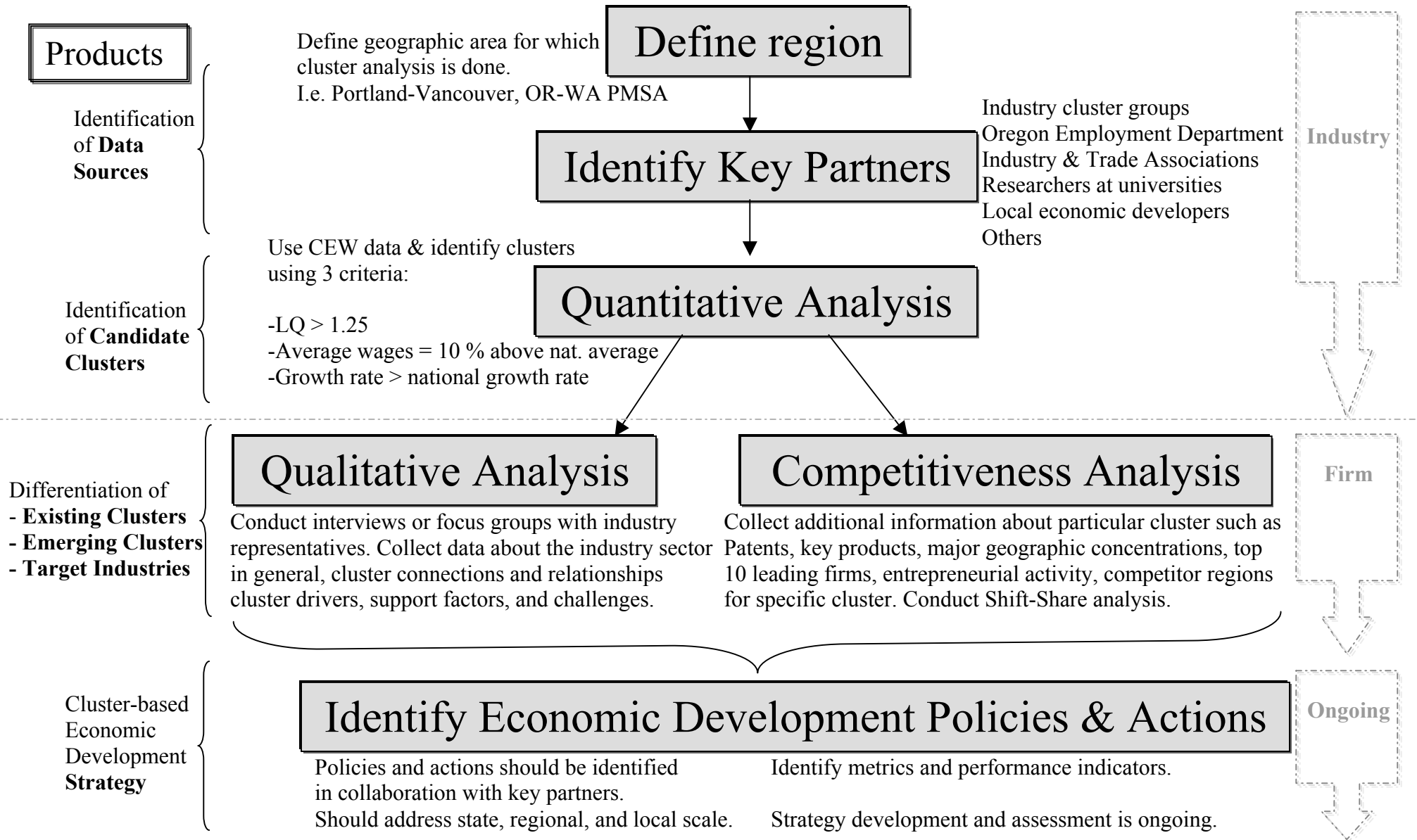
- ✓ **Quantitative Analysis**
- ✓ **Qualitative Analysis**
- ✓ **Competitiveness Analysis**

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 cluster 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 2 provides a schematic diagram for this process.

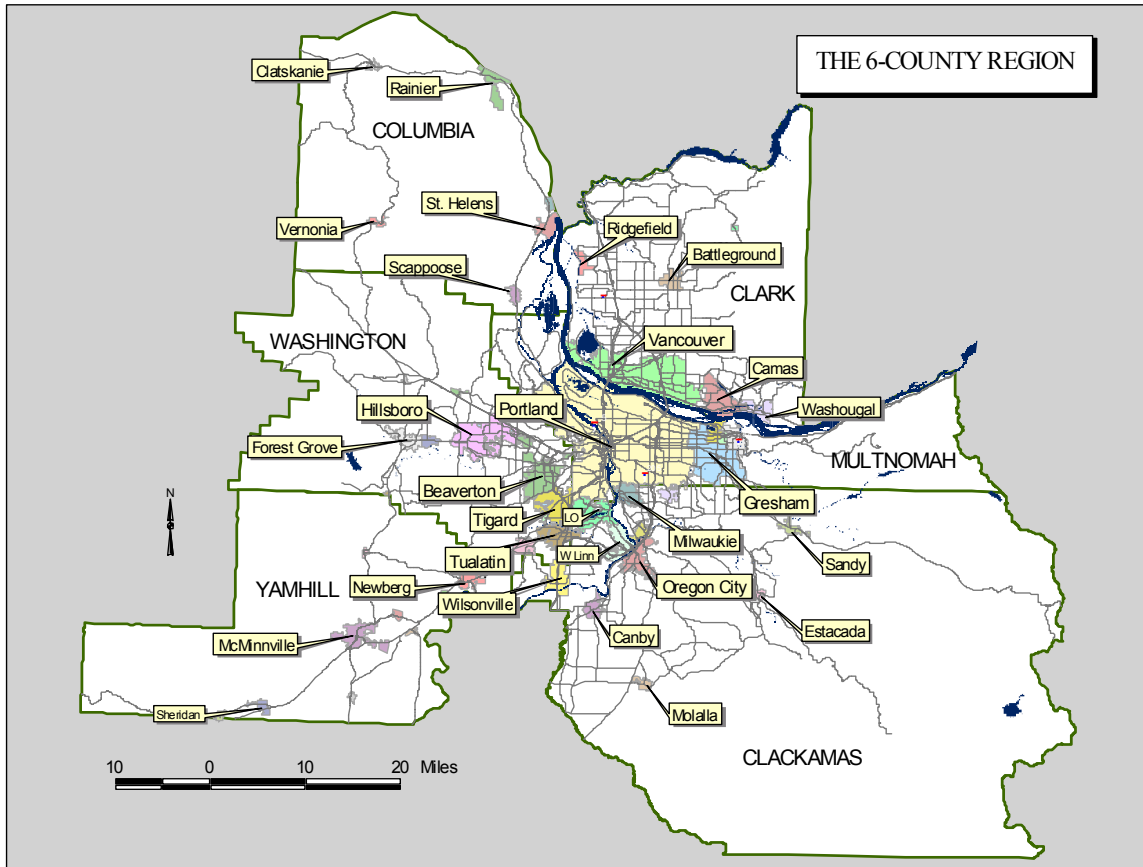
Figure 2: Methodological framework for analyzing industry clusters



A. Define the region

Industry clusters are part of the regional economic fabric. Today, metropolitan regions represent the relevant economic geography for most cities. For the purposes of this report, the “region” is defined as the six-county **Portland-Vancouver, OR-WA, Primary Metropolitan Statistical Area (PMSA)** as used by the Census and the Bureau of Economic Analysis (BEA). The region consists of Clackamas, Columbia, Multnomah, Washington, and Yamhill counties in Oregon, and Clark County in southwest Washington (Figure 3).

Figure 3: Map of 6-county metropolitan area



B. 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.

Cluster analysis needs to be done in cooperation with the industry.

Getting industry leaders involved is critical for developing a cluster-based economic development strategy.

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. Our experience is that local industry groups are very accessible and that they often will collaborate on such things as setting up focus groups, conducting surveys of their members, etc.

The following table provides an overview of selected key partners in this region.

Table 1: Potential Cluster Partners in the Portland-Vancouver metropolitan region

Organization	Contact	Function	E-mail
Oregon Economic and Community Development Department	Sherry Sheng Ron Fox	Deputy Director Business Manager	Sherry.Sheng@state.or.us ron.g.fox@state.or.us
Oregon Employment Department	Art Ayre Amy VanderVliet	State Employment Economist Regional Economist	Art.L.Ayre@state.or.us Amy.S.Vandervliet@state.or.us
Washington State Employment Security Division	Scott Bailey	Regional Economist	scott.bailey@esd.wa.gov
Portland Development Commission (PDC)	Marty Harris Mike Ogan	Economic Development Director Economic Development Manager	HarrisM@pdc.us oganm@portlanddev.org
City of Hillsboro, Economic Development	Larry Pederson	Economic Development Manager	larryp@ci.hillsboro.or.us
City of Beaverton, Economic Development	Janet Young	Economic Development Manager	jyoung@ci.beaverton.or.us
City of Tualatin, Economic Development	Doug Rux	Economic Development Manager	
City of Gresham, Economic Development	Shelly Parini	Economic Development Manager	Shelly.Parini@ci.gresham.or.us
Clackamas County, Economic Development	Renate Mengelberger	Economic Development Manager	renatem@co.clackamas.or.us
Clark County, Economic Development	Gerald Baugh	Economic Development Manager	gerald.baugh@ci.vancouver.wa.us
American Electronics Association (AeA), Oregon Chapter	Jennifer Bosze Jim Craven	Director Government Affairs	Jennifer_Bosze@aeanet.org jim_craven@aeanet.org
Software Association of Oregon (SAO)	Larry Wade	Director	larry@sao.org
New Economy Coalition (NEC)	Don Krahermer Jim Johnson Dave Chen		dkrahermer@SCHWABE.com bjj@easystreet.com chen@OVP.com

Table 1: Potential Cluster Partners in the Portland-Vancouver metropolitan region

Organization	Contact	Function	E-mail
Semiconductor Workforce Consortium			
Oregon RAINS	Mike Francis		bizmike@hotmail.com
Oregon Entrepreneurs Forum	Linda Weston		lindaw@oef.org
Oregon Association of Nurserymen (OAN)	John Aguirre	Executive Director	jaguirre@oan.org
Oregon Metals Industry Council			http://www.oregonmetals.org/
Oregon Creative Services Alliance	Check if they are still around		
Impresa Consulting	Joe Cortright	Economist	joe@impresaconsulting.com

4. Conduct Quantitative Analysis

The first 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 Joe Cortright's analysis of Oregon's industry clusters (Cortright, 2003).

Data source: Detailed employment data can be obtained by the Oregon 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 affects industry clusters such as specialty foods and nursery products).

The use of the dataset is restricted by confidentiality concerns. The Oregon State Employment Department does not allow the publication of employment, wage, or any other data that could be identified with an individual employer. Researchers have to sign a non-disclosure agreement. More information about the ES-202 data set 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 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. The Oregon Employment Department is currently working to report ES-202 data in the NAICS 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 qualitatively 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.

Employment Concentration: 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*.

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 objective 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 Portland-Vancouver metropolitan area, for a given year. Cortright (2003) uses the threshold value of average annual wage levels that are 10 percent above the national average.

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 “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:

$$\mathbf{Emp}_t = \mathbf{Emp}_b (1+r)^n$$

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:

$$\begin{aligned} Emp_{1979} &= Emp_{1973} * (1+r)^6 \\ Emp_{1979}/Emp_{1973} &= (1+r)^6 \\ 25,000/20,000 &= (1+r)^6 \\ \sqrt[6]{1.25} &= 1+r \\ 1.0379 &= 1+r \\ .0379 &= r \end{aligned}$$

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

The following graph might help in classifying candidate clusters.

Figure 4: Method for classifying industry clusters

Location Quotient	High	Important industries that may require attention	Important growth industries
	Low	Industries of little promise to local economy	Potential emerging industries
		Low	High
		Employment Growth	

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

- 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. The timber and lumber industry in the Portland region represents such a segment.
- 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. Parts of the high technology cluster in the Portland region represented such a cluster before the economic recession began in 2001.
- 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.

D. 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 sectors as classified by SIC or NAICS codes, the qualitative and competitiveness analyses focus on individual firms within industry clusters.

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 high technology regions such as the Silicon Forest are very specialized and focused on the high tech industry. They are an essential part of the high technology cluster. Temporary labor agencies are also part of a 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.

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 gather through their firm interviews and site visits.

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, One Year
- Annual Sales (Breakout by % regional, elsewhere in OR, in US, International)
- Years in Business
- Founder(s)'s previous employer (for genealogy purpose)
- Headquarters or Branch Location
- Brief description of business and industry, main products
- SIC/NAICS classification (if they know)

History of the region's industry

What were the pivotal events determining the development of your industry cluster in the Portland metropolitan area? 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 the Portland 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.

Do actually follow-up through presentations, interim reports, etc. This will be valuable confirmation of the data and a good way to reach out to industry cluster partners.

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.

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

C. Conduct Competitiveness Analysis

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 a region devise an economic development strategy that is aimed at differentiating the region and its clusters from competitors. In the case of the Silicon Forest, for example, the region is very competitive in semiconductor manufacturing R&D. Regional leaders would be well advised to develop policies and programs that will help to further develop this advantage.

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,
- venture capital investments,
- new firm formation and entrepreneurial activity,
- federal funding for science and technology,
- information on talent and labor (educational attainment, etc.).

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 of a region. Local factors account for local influences on an industry's performance.

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

$$\text{Total Employment Shift} = \text{NS}_i + \text{IM}_i + \text{LF}_i$$

$$\text{National Share:} \quad \text{NS}_i = e_i^{t-1} (E^t/E^{t-1})$$

$$\text{Industry Mix:} \quad \text{IM}_i = e_i^{t-1} ((E_i^t/E_i^{t-1}) - (E^t/E^{t-1}))$$

$$\text{Local Factors:} \quad \text{LF}_i = e_i^{t-1} ((e_i^t/e_i^{t-1}) - (E_i^t/E_i^{t-1}))$$

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:

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

The Institute of Portland Metropolitan Studies has a comprehensive patent dataset for the period of 1977 to 1999. The data can be analyzed with Microsoft Access.

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 history (Cortright & Mayer, 2001). Helpful data sources are industry directories, memberships lists, and published firm lists. The Portland Business Journal publishes a Book of Lists every year that lists the major employers (ranked by sales, revenues, employees, etc.). For more information, check http://www.bizjournals.com/bookoflists/?op=bol_form_market&t=portland. Other regions have similar lists published by their respective business journals.

Other sources for business information about individual firms:

Oregon’s Secretary of State’s Corporate Division publishes a business registry and renewal database online at <http://www.sos.state.or.us/corporation/bizreg/index.htm>. It contains useful information about individual companies.

ReferenceUSA through Multnomah County Library’s electronic sources: <http://www.multcolib.org/ref/bus.html>

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.

Other subscription-based dataset

Dun & Bradstreet - <http://www.dnb.com/us/>

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.

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 that has access. We have been very lucky to work with OVP Venture Partners (Dave Chen) and to gain access through them.

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 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. Please see Appendix 3 for an example of a survey instrument.

There are a few sources that compare entrepreneurial activity between 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 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 gives 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. Joe Cortright is currently working on a research project that analyzes migration patterns of the 25 to 35 year old population. To analyze 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.

E. 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. The study ought to reveal gaps and missing links in cluster relationships and economic development policies and actions should be designed to address such deficiencies.

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 policymaking 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).

5. Cluster Monitor Work Plan

Over the next 6 months, the Institute should:

➤ ***Work to secure funding for ongoing industry cluster analysis***

In order to conduct regular and ongoing industry cluster analysis, the Institute should work in cooperation with Board member and venture capitalist Dave Chen to identify and secure additional sources of funding. The following budget illustrates the financial resource needs for this project.

Graduate Research Assistant (12 months, 20 hours/week)	\$ 25,000
Project Advisor, Joe Cortright, Impresa Inc.	\$ 5,000
Institute of Portland Metropolitan Studies (Time & Expenses)	\$ 10,000
Information dissemination (Report, website)	\$ 5,000
<hr/> Total	<hr/> \$ 45,000

➤ ***Collaborate with Regional Partners on the Industry Cluster Initiative***

In their work for the Metropolitan Economic Policy Task Force, the Regional Partners – a network of the region’s economic development practitioners – identified an industry cluster development initiative. This initiative will be undertaken over the next six months.

The Regional Partners selected the following four clusters for their work:

- Silicon (semiconductors & photovoltaic),
- micro to nanotechnologies,
- cyber-security,
- metals and transportation equipment.

The Regional Partners’ deliverables are:

- industry data outlining needs and opportunities,
- findings and issues delivered to support organizations,
- strategies detailing industry development roles and responsibilities,
- 2 to 3 private-sector led recruitment / site selector calls per cluster.

The Institute should provide research support to the Regional Partners and conduct an in-depth industry cluster analysis for the four selected clusters.

➤ ***Continue conversation with regional groups on industry clusters and educate regional leaders about industry clusters***

Over the past years, the Institute developed close relationships with groups and agencies in the region that work on economic development issues. This work should be continued. In particular, the Institute should continue a conversation about industry clusters with worksystems inc., the Oregon Economic and Community Development Department, the Oregon Employment Department, the Regional Partners and their member organizations, higher education administrators and others.

The Institute should implement the idea of a Cluster School for regional leaders. This could either be organized as a stand-alone event or incorporated into Don Barney’s efforts to conduct the regional roundtable as a course for regional leaders.

The concept of industry clusters is still not widely understood and the Institute should continue its work on educating the public about the meaning of the cluster concept. This 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.

➤ ***Conduct quantitative analysis for 6-six county region***

The Institute should conduct a comprehensive quantitative analysis of ES202 employment data for the six-county metropolitan region. This analysis should be done for the most up-to-date data that is collected and classified through the NAICS system. The data should be analyzed using location quotient analysis, average wages and growth rates should be computed. The result of the analysis will be the identification of candidate clusters.

This needs to be done in collaboration with the Oregon and Washington regional economists (contact Amy VanderVliet with the Oregon Employment Department and Scott Bailey with the Washington State Employment Security Division).

➤ ***Begin qualitative and competitiveness analysis of candidate clusters identified through quantitative analysis***

After identifying candidate clusters through the quantitative analysis, the Institute should decide which clusters will be analyzed in greater detail through a qualitative and a competitiveness analysis.

➤ ***Begin to identify metrics and performance indicators***

The Institute should begin to identify metrics and performance measures for each industry cluster. These measures will help evaluate the cluster's performance.

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 in the following areas:

- Employment: Gain or loss? In which SIC/NAICS codes?
- Patent activity: Gain or loss? In which classes?
- Health of major firms: Employment gain or loss? Corporate performance?
- Venture capital: Gain or loss? In which areas?
- Entrepreneurial activity: In which economic segments? What are the reasons behind creating new companies (crisis, opportunity, etc.?)
- Talent Labor: Labor migration to/from area? To which areas? From which areas?
- Implementation of economic development policies and actions: What difference do policies and programs make? Who benefited from what? What can be improved?

➤ ***Begin to identify cluster-based economic development principles***

The Institute should begin to identify cluster-based economic development principles like the ones outlined in Appendix 4.

6. Appendices

Appendix 1: Corporate genealogy survey instrument

The Silicon Forest Family Tree
 High Technology Genealogy Research Project
Questionnaire
 Heike Mayer, phone: (503) 725 -5869; fax: (503) 725 5199; mayerhe@irn.pdx.edu

The survey is conducted for dissertation research purposes. Your participation in the survey is voluntary, and you may refuse to answer any question, or withdraw your consent to participate, at any time. All data collected will be treated as strictly confidential. The data will be destroyed at the completion of the research. If you have any questions, please contact Heike Mayer, phone (503) 725-5869 or e-mail her at mayerhe@irn.pdx.edu. You can also contact Portland State's Human Subjects Research Review Committee (phone: (503) 725-8182).

Company _____ Address _____ _____ _____ Company headquarters _____ _____ Number of Local Employees In 2001 _____ Key Contact _____	Year founded _____ Phone () _____ Fax () _____ URL _____ e-mail _____ _____ Position _____
_____ ZIP Code	

1. Which of the following best describes your company's industry segment?

- Semiconductors
- Semiconductor Manufacturing Equipment
- Display Technology
- Electronic Design Automation Software
- Printers

- Software, *please specify* _____
- Others, *please specify* _____

2. What are your company's main products and / or services?

Please specify: _____

3. Which of the following best describes *the way your company got established* in the Portland metropolitan area (please mark and specify)?

Branch plant of another firm? Parent Company Name: Year established in Portland: Headquarters Location:

Spin-off of a previously existing operation / division and / or technology from an existing company? Parent Company Name: Year established in Portland: Location:

Start-up by founders leaving an existing company? Parent Company Name: Year established in Portland: Location:

Company relocated to the Portland metropolitan area from somewhere else? Parent Company Name: Year established in Portland: Relocated from:

Other (merger, acquisition, strategic alliances, etc.), please specify: Parent Company Name: Year established in Portland: Acquired by: Year acquired:

4. Please identify the founders of your company and their prior work experience.

Founders' names:

-
-
-
-

Previous employer:

-
-
-

Type of previous expertise (marketing, R&D, etc.), *please specify*:

-
-
-

5. Have former employees of your company founded their own firms or has your company spun-off divisions or technologies?

Company Names:

-
-
-
-
-

Founders:

-
-
-
-

Year established:

-
-
-
-

This survey is also evaluating Portland's role as a location for high tech companies. Thus, we would like to ask you some questions about your perception of Portland as a place to do business.

6. What are the three most important reasons why your company is located in the Portland metropolitan area?

- 1.
- 2.
- 3.

7. Please name the top three competitive advantages and disadvantages of this region with regards to innovation and knowledge creation:

Top 3 Competitive Advantages:

- 1.
- 2.
- 3.

Top 3 Competitive Disadvantages:

- 1.
- 2.
- 3.

8. Please name the top 3 areas in which you would benefit from a better local higher education infrastructure.

- 1.
 - 2.
 - 3.
-
-
-

Thank you for your participation!
Stay tuned for the Silicon Forest Family Tree Poster!

Please fax the completed survey to Heike Mayer
Institute of Portland Metropolitan Studies, Portland State University
Fax: (503) 725-5199 by November 30, 2001.

Appendix 2: Industry clusters in the Portland-Vancouver metropolitan region

In 1997, the Institute of Portland Metropolitan Studies began to systematically analyze the region's economy by using an industry cluster focus. The project was called Regional Connections and the focus of the first phase, 1998 to 2000, was to examine the region's economy and to assess the candidate clusters. During the second phase, the Institute conducted a variety of in-depth cluster studies on the high technology industry, the nursery industry, the creative services industry, and to a lesser extent on the metals, machinery, and transportation equipment sector. We have not yet conducted an in-depth cluster study on the specialty foods and food processing industry and the lumber and wood products industry. The detailed reports are available online at: <http://www.upa.pdx.edu/IMS/currentprojects/neo.html>.

Through the research, however, we are not able to distinguish the region's established cluster from emerging clusters. The established industry clusters within the region include:

- **High Technology**
 - Silicon Wafer Manufacturing
 - Semiconductor Manufacturing
 - Semiconductor Equipment Manufacturing
 - Electronic Design Automation
 - Display/Imaging Technologies
 - Printers
 - Software Development
- **Metals, Machinery, Transportation Equipment**
- **Nursery Products**
- **Specialty Foods and Food Processing**
- **Lumber and Wood Products**

The emerging industry clusters within the metropolitan area include:

- **High Technology**
 - Nano & Micro Technology
 - Cyber Security
 - Health and Medical Information Technology
- **Creative Services**
 - Advertising
 - Public Relations
 - Film & Video
 - Web/Internet Content & Design
- **Sports Apparel and Recreation-related Products**

Appendix 3: Principles for cluster-based economic development strategies

The following principles can help 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 their regional economies and in particular to understand cluster dynamics. The industry cluster perspective provides several benefits: First, 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 the firms' 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.

➤ **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 don't follow a particular strategy, but are rather responsible and tactical. 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-Vancouver metropolitan area, 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 trees while the latter industry is located in the central city to accommodate employee preferences. 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 that 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**
The knowledge about a region's industry clusters can be used to develop unique and defensible strategies for economic development.
- **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 it. It outlines the connection between economic development actions and visions. Focusing on differentiation requires being clear about what won't 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 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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