The Initiative Fund of Southeastern and South Central Minnesota

SOUTHEASTERN AND SOUTH CENTRAL MINNESOTA INDUSTRY CLUSTER STUDY

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Executive Summary

Southeastern and south central Minnesota is a vital area with a diversity of industries and includes the key hub communities of Rochester, Mankato, Winona, Austin, Fairmont, and Red Wing. The Initiative Fund of southeast and south central Minnesota focuses on helping the region advance to the forefront of economic opportunity. The Initiative Fund engaged the Humphrey Institute of the University of Minnesota to analyze the key industries that serve as the backbone of regional economic development and that may continue to impact the future economy. The Initiative Fund posed two questions: (1) "What are the characteristics which have contributed to the development of these industries in the region?" and (2) "What can be done to further support and sustain these industries?"

In his book entitled *The Competitive Advantage of Nations*, Michael Porter offers four key determinants of competitiveness which he calls the "Diamond of Advantage." These four determinants, (1) *factor conditions*, (2) *home demand*, (3) *related and supporting industries*, and (4) *industry strategy, structure, and rivalry*, served as the framework for the analysis.

The project identified four clusters for the region: 1) **composites** (a diverse class of lightweight but durable plastic products), 2) **printing, publishing** and **software**, 3) **industrial machinery** and **computers**, and 4) **food processing**. Focus groups and individual interviews with local business leaders and economic development professionals offered insight into the industries. The following is a brief overview of our findings.

Factor Conditions

- *workforce*-strong work ethic but increasing shortage of workers and lack of needed skills
- *educational institutions*-critical for future growth; concern about inability to keep up with business' needs
- *infrastructure*-businesses are generally satisfied; need to continually update communication and transportation links
- *regulatory issues*-ongoing concern about Minnesota's business climate
- *location*-central location and proximity to Twin Cities a strength, but low population density of the region a limitation

Home Demand

- most customers extend domestically and in many cases globally
- home demand may have been stronger initially, but is weaker now in a relative sense as companies have expanded their markets

Related and Supporting Industries

- companies depend upon supplies from all over the world
- some feel opportunities exist for selected suppliers to locate in the region

Firm Strategy, Structure and Rivalry

- the industries of Southeastern and south central Minnesota are very diversified
- a majority of competition comes from out-of-state
- individual firms need to collaborate on training, technical information dissemination, environmental regulations, and general marketing

Table of Contents

Summary of Recommendations

Workforce

1. Ensure high school students learn necessary skills for the workplace.
To ensure that high school graduates meet basic work skill needs, educators could encourage business and community leaders to take an active role in the education of the next generation. High school is a critical point not only for transferring specific areas of knowledge, but for developing solid work habits and attitudes.

- **a. Develop curriculum advisory councils with community and business leaders.**
- **b. Promote mentoring programs.**
- **c. Create hands-on applications.**
- **d. Develop apprenticeship programs.**

2. Make certain that skills acquired in post secondary education meet the needs of area industries and the workplace.
Industry groups could advise educational institutions on course content and curriculum requirements. Without continuing input from the business community, it is difficult for academics to keep pace with the ever changing demands of the labor market. Though enrollment may fall during periods of low unemployment, technical colleges should consider sustaining programs critical to key regional industries (composites, machinery operation, welding, etc).

3. Expand training to workers currently within the labor force.
Area businesses need precise and cost effective worker retraining. Modeled on "just-in-time" product delivery, community colleges and worker retraining programs could provide a "just-enough" skills curriculum tailored to industry needs.

4. Explore child care and elderly care issues.
As more households are headed by a single parent or as households report both parents participating in the labor force, workers will place greater demands on quality day care provision.

Housing

Develop affordable housing alternatives for rural areas.
Local zoning ordinances and tax incentives could be modified to encourage area contractors to build multi-family units. More independent living residential complexes for the elderly could be constructed. By providing attractive and low maintenance housing, the elderly could be enticed to move out of homes too large for their needs and thereby allow families to move into existing housing stock.

Regulations and Local Ordinances

1. Promote consistency across municipalities and counties concerning environmental ordinances.
Industry, residents, environmentalists, and municipalities should collaborate on creating consistent and reasonable environmental alternatives to agricultural wastes.

2. Increase collaboration concerning regulatory issues.
Collaborative efforts between Minnesota Pollution Control and area businesses could be encouraged to promptly remedy environmental concerns. Eliminate state safety standards that are redundant to federal regulations.

Infrastructure

Reconstruct, maintain, and repair key transportation bottlenecks.
Industry leaders express satisfaction with the majority of infrastructure delivery (water, electricity, gas, telephones, sanitation, etc). However, business leaders advocate maintenance and upgrades for Highway 14 and 61, the Mankato airport, and existing railroad lines.

Quality of Life

1. Focus attention on livable wage issues and the needs of the lowest wage workers.
Due to low regional unemployment, some companies turn to migrant, immigrant, and refugee labor to sustain low skill production. The community could explore statewide discussions of earned income tax credit programs, child care availability, English as a Second Language instruction, and skills training.

2. Maintain local budgets for education, recreation, and cultural offerings.
Few firms in the region have strong local demand or local supplier links for their products. Companies report they remain in the community for the quality of life Southeastern and south central Minnesota offers. Education, recreation, and cultural offerings are long term investments in business retention and the health of the local economy.

Southeastern and South Central Minnesota Industry Cluster Project

I. Background

Southeastern and south central Minnesota has a diverse set of industries, such as food processing, computers, furniture, and health care, that contribute to the success of the regional economy. To enhance the competitiveness of these industries within the region, it is necessary to understand the individual industries and how they interact with other industries.

The purpose of this project has been to examine ways to strengthen economic competitiveness and increase economic opportunities in southeastern and south central Minnesota. The project team:

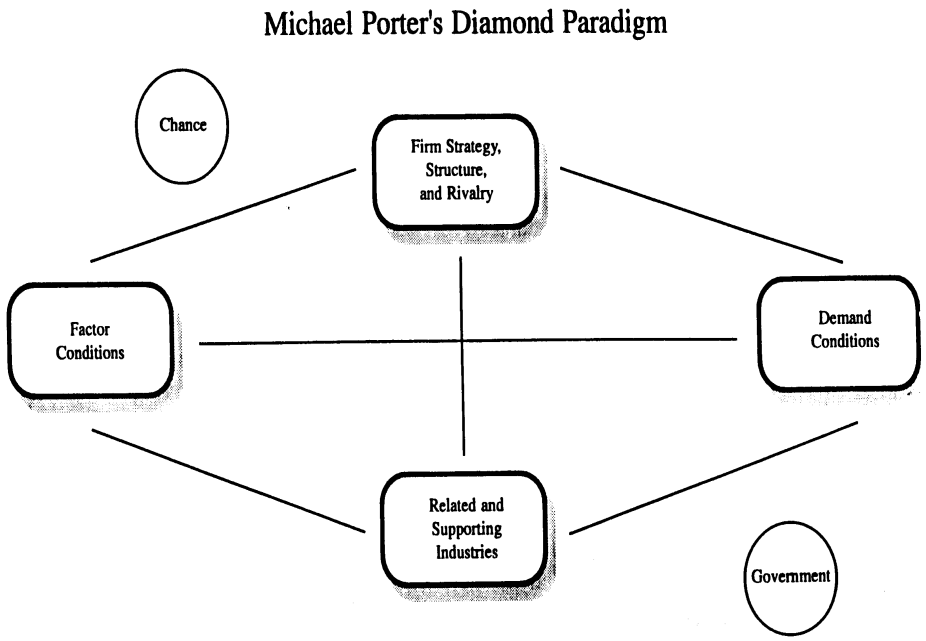
- identified clusters of industries in southeastern and south central Minnesota,
- examined the competitive advantages of these industries using the Michael Porter approach,
- brought communities, businesses, and economic development professionals together to discuss these clusters and the "regional" economy
- interviewed individual business leaders and economic development professionals and
- developed recommendations for action based on the industry cluster analysis

The Porter Approach

In his book, *The Competitive Advantages of Nations*, Michael Porter makes the case for thinking about economic development in a different way than public policy makers have done in the past. Porter argues that economic vitality is a direct product of the competitiveness of local industries; that local conditions have a profound effect on international **competitiveness**, but that conditions affecting competitiveness are not always cost-related factors or natural resources.

The four key determinants of competitiveness, which Porter calls the "Diamond of Advantage," are based on cases from around the world: 1) **factor conditions**, such as a specialized labor pool, specialized infrastructure, and sometimes selective disadvantages that drive innovation; 2) **home demand**, or local customers who push companies to innovate, especially if their tastes or needs anticipate global or local demand; 3) **related and supporting industries**, internationally competitive local supplier industries who create business infrastructure and spur innovation and spin-off industries; and 4) **industry strategy, structure, and rivalry**, intense local rivalry among local industries that is more motivating than foreign competition and a local "culture" which influences individual industries' attitudes toward innovation and competition.

In addition to these four areas, Porter includes the roles of **chance** and **government**. Often historical accident and/or government actions play significant roles in the early development or site location of local industry clusters.



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

The Partnership

The Southeastern and South Central Minnesota Industry Cluster Study was a joint project of the Initiative Fund of southeastern and south central Minnesota, the Hubert H. Humphrey Institute of Public Affairs at the University of Minnesota, and the Minnesota Department of Economic Security. The project was financed by the Initiative Fund. The State and Local Policy Program at the Humphrey Institute provided project coordination, conducted all interviews, and wrote the final report. The Department of Economic Security provided employment and location quotient data for the determination of industry clusters. Additional information and feedback came from Economic Partners for Southeastern Minnesota (EPSEM), the Minnesota Department of Trade and Economic Development, and the Twin Cities Metropolitan Council.

The Initiative Fund of Southeastern and South Central Minnesota

The Initiative Fund is a regional foundation which addresses growth and economic issues in a 20 county region. The Initiative Fund mission is to move the region to the forefront of economic opportunity in order to improve the quality of life for our residents, today and tomorrow. The vision behind this mission is to promote job creation and retention, workforce development, and community building; all factors contributing to a healthy and viable economy.

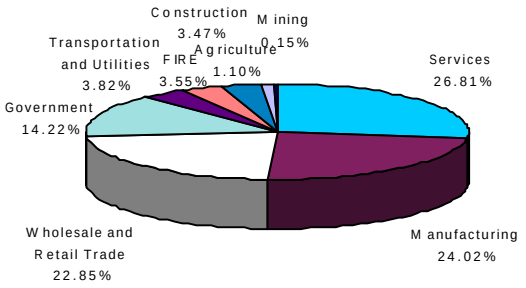
Economic Partners for Southeastern Minnesota (EPSEM)

EPSEM is a regional partnership interested in furthering economic opportunity in southeastern and south central Minnesota. Members of EPSEM include economic development professionals and utilities representatives from communities across the region.

II. Southeastern and South Central Minnesota's Economy

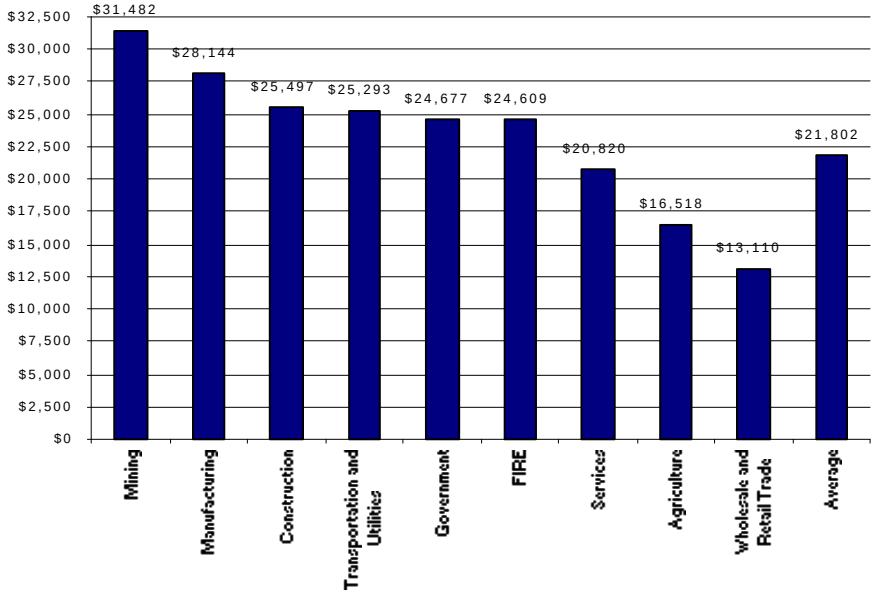
The economy of southeastern and south central Minnesota enjoys a diverse mixture of industries, a relatively low unemployment rate, and robust employment growth. However, the region lags the state in average income earned by industry and educational attainment.

1993 Southeastern and South Central Minnesota Percentage of Employment by Industrial Sector



In 1993, services, manufacturing, and wholesale and retail trade made up 74% of the 278,780 payroll jobs in the twenty counties of southeastern and south central Minnesota. According to Minnesota Department of Economic Security statistics, 74,745 southeastern and south central Minnesota residents are employed in the services sector, 66,971 in manufacturing, and 63,709 in wholesale and retail trade. Agricultural production with payroll labor employs 3,080 and constitutes only 1.1% of total employment in the region. However these estimates do not accurately reflect regional farm labor activity since most farmers are self-employed and not included in payroll statistics. (See Figure 1.)

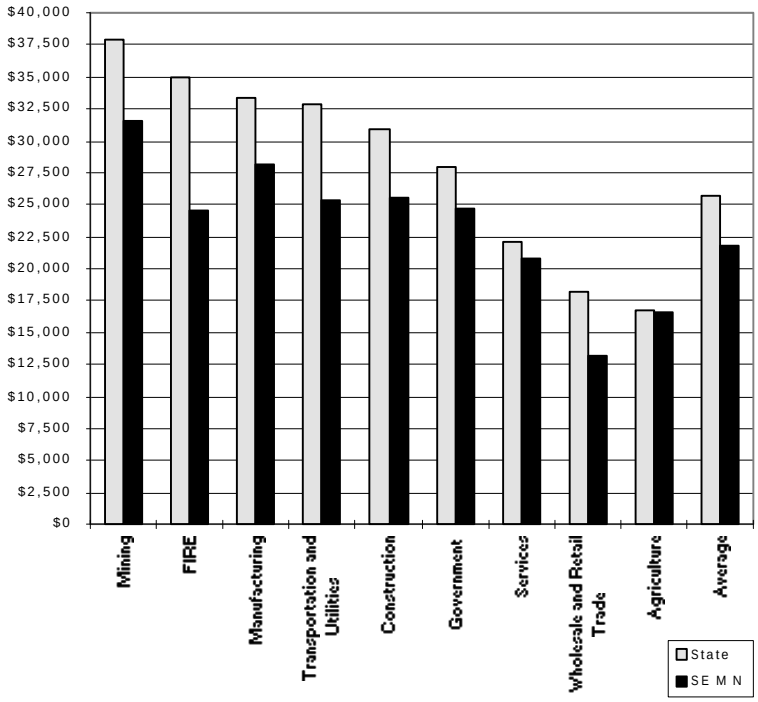
1993 Southeastern and South Central Minnesota Average Wage by Industrial Sector



The wage for the most prevalent industrial sector in the region, services, averaged $20,820 in 1993. Manufacturing, the second largest regional employer, paid an average wage of $28,144. The 23% of workers engaged in the wholesale and retail trade industry earned the lowest average wage of $13,110. (See Figure 2.)

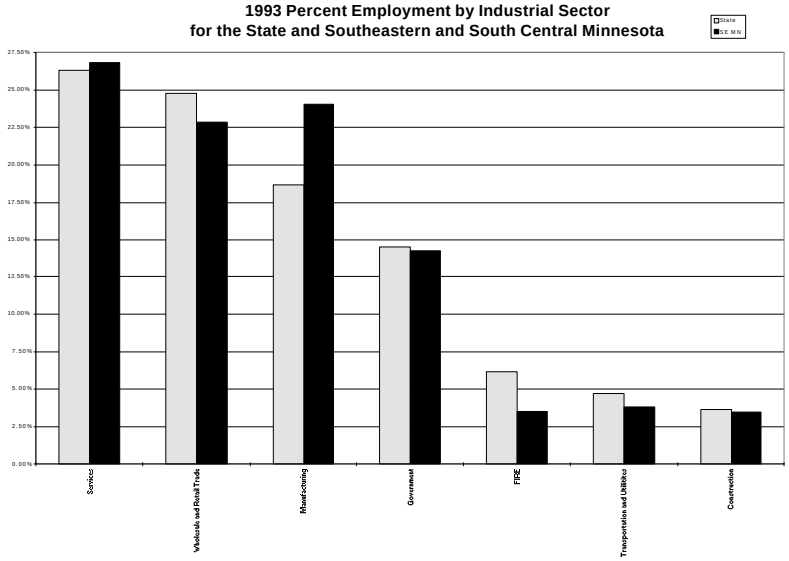
Average wages in southeastern and south central Minnesota trailed state earnings in 1993.

1993 Average Wage by Industrial Sector for the State and the Region



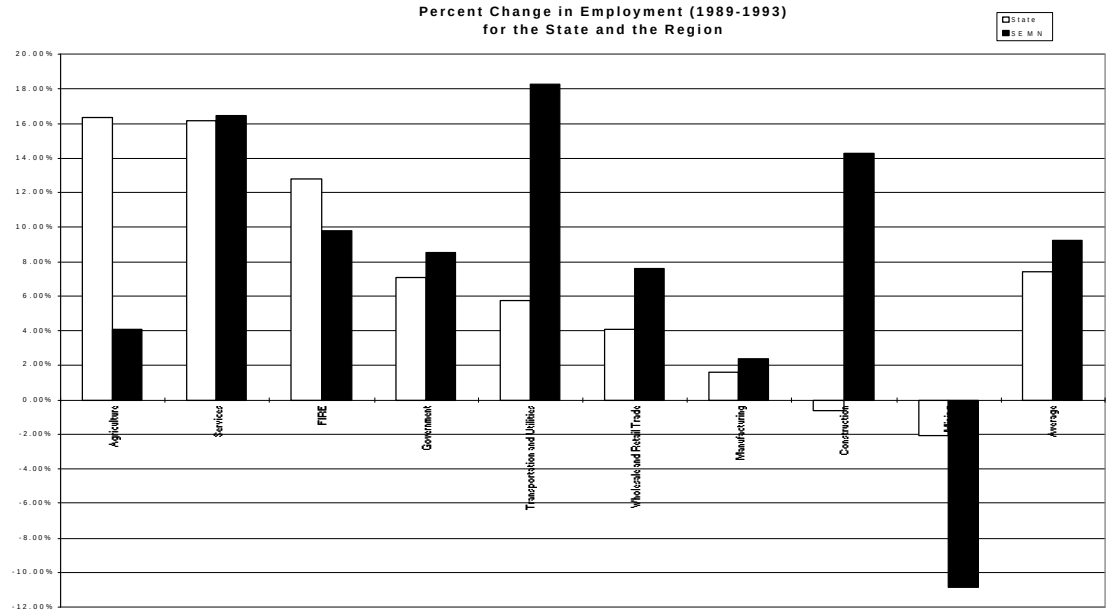
Across all industries, southeastern and south central Minnesota workers earned about $3,900 less than their counterparts statewide. The average state wage equaled $25,708 while the regional average amounted to $21,802. Regional finance, insurance, and real estate industries on average paid $10,314 less than the state wide average ($34,923 versus $24,609). Regional transportation and utilities jobs paid $7,630 less than the state average ($32,576 versus $25,293), construction averaged $5,447 less ($30,944 versus $25,497), manufacturing averaged $5,170 less ($33,314 versus $28,144), and wholesale and retail trade averaged $5,106 less ($18,216 versus $13,110). (See Figure 3.) However these calculations do not take into consideration differences in the average cost of living across the state and region.

1993 Percent Employment by Industrial Sector for the State and Southeastern and South Central Minnesota



Southeastern and south central Minnesota out paces the state in percentage of residents employed in manufacturing; a noteworthy trend considering manufacturing wages tend to be higher than other sectors. Manufacturing employs 24.0% of southeastern and south central Minnesota workers as compared to 18.7% for the entire state. The region shows less wholesale and retail trade employment as well as less finance, insurance, and real estate (FIRE) sector employment than the state average. FIRE comprises 6.2% of state

employment while engaging only 3.5% of the southeastern and south central Minnesota workforce. Wholesale and retail trade makes up 24.7% of state employment while 22.9% of southeastern and south central Minnesota jobs center on this sector. In other sectors the region reflects statewide employment trends. (See Figure 4.)
Over the five year period from 1989 to 1993, regional employment grew by 9.2% while state wide employment increased 7.4%. The greatest regional employment growth occurred in the middle-



range wage sectors of transportation and utilities (18.2%), services (16.5%) and construction (14.3%). The low wage wholesale and retail trade sector grew by 7.6% for the region as compared to 4.0% for the state. Regional agricultural growth is less than state averages (4.1% versus 16.3%), but again these agricultural statistics only reflect payroll employment. (See Figure 5.)

As of May 1996, the unemployment rate for the twenty counties of southeastern and south central Minnesota was 2.9%. Seasonally adjusted statewide unemployment for May 1996 was 3.5%. The U.S. Bureau of Labor Statistics reports national unemployment for May 1996 at 5.6%.

High levels of educational attainment implies a skilled regional workforce. Skilled workers add more value to their productivity and tend to be more adaptive to the ever changing needs of an economy. However, educational attainment for the region slightly lags state averages. According to 1990 U.S. Census data, the percentage of southeastern and south central Minnesota adults aged 25 or older who have a high school degree or greater is 78.7%. This is lower than the statewide average of 82.4% but higher than the national average of 77.6%.

Table 1: Educational Attainment

County	High School Graduates	College Graduates
Olmsted	88.0%	29.5%
Blue Earth	82.7%	22.7%
Nicollet	81.5%	22.4%
Steele	79.4%	16.0%
Dodge	78.7%	11.7%
Rice	78.7%	19.3%
Goodhue	78.0%	14.1%
Winona	77.7%	19.7%
Waseca	77.5%	13.6%
Wabasha	76.4%	12.4%
Le Sueur	76.3%	13.1%
Houston	75.9%	14.4%
Mower	75.8%	12.9%
Freeborn	75.5%	11.5%
Martin	75.2%	13.0%
Faribault	74.4%	12.0%
Watonwan	72.2%	10.1%
Brown	71.7%	12.3%
Fillmore	70.2%	10.5%
Sibley	68.2%	8.9%
Southeastern and South Central Minnesota	**78.7%**	**17.7%**
Minnesota	**82.4%**	**21.8%**
United States	**77.6%**	**21.3%**

Source: 1990 U.S. Census data.

Southeastern and south central Minnesota also reports lower rates of four year degree completion than state and national averages. Only 17.7% of southeastern and south central Minnesota residents have a college degree as compared to rates of 21.8% for all Minnesotans, and 21.3% for all U.S. citizens. Counties that contain the cities of Rochester, Mankato, Owatonna, Red Wing,

and Winona have higher rates of college completion than do counties without hub communities. For example in Olmsted County, the county where Rochester is located, 88% of adult residents have a high school diploma while only 68% of rural Sibley County residents completed high school.

How the Industry Clusters Were Identified

By definition, an industry cluster consists of a group of local industries that are closely linked by local supply networks, local customer networks, common labor markets, and access to technical expertise. The initial portion of the project was devoted to selecting four of the most competitive and successful industry clusters in southeastern and south central Minnesota. Focusing on industry clusters that give southeastern and south central Minnesota a competitive advantage will help economic development professionals better understand the strengths and challenges of the local economy and better focus on factors that may foster continued growth for the region. A team from the Department of Trade and Economic Development, the Minnesota Department of Economic Security, and research assistants from the Humphrey Institute collaborated to identify the top nine highly concentrated and competitive industries.

Data Sources and Definitions

The Department of Economic Security (DES) provided ES202 employment and wage data at a three digit Standard Industrialization Code (SIC) level. The ES202 data is developed from information collected from state employers covered under the Minnesota Reemployment Compensation Law. Results cover a 20 county area (Regions Nine and Ten) and concentrate on industries with over 1000 employees.

The location quotient is an important indicator of regional specialization. It is a ratio of the industry's local share of employment to its national share of employment. If a region's location quotient in a particular SIC code is equal to one, the region's industrial output equals national production and is assumed to be just satisfying local demand. If the location quotient is less than one, the regional industry produces less than the national average and indicates a regional lack of self-sufficiency. Finally, if a region's location quotient is greater than one, the regional industry produces at a level greater than the national average. Location quotients greater than one generally indicate the area exports a particular good or service and most likely serves a market beyond the immediate region.

This study focused on industries within southeastern and south central Minnesota having high location quotients and location quotients which increased over time. To identify industries with high levels of regional concentration, industries were ranked by both the 1993 location quotient and the change in location quotient from 1988 to 1993. If the 1993 location quotient surpassed the 1988 location quotient, the industry grew in regional concentration and was deemed as having growth potential.

While the location quotient is a quick and effective method to measure industry concentrations, it has its limitations. Location quotients are relatively easy to calculate from ES202 data. But location quotients reflect only a point-in-time picture of the past and do not convey information

beyond the local-national relationship. Reliance on employment data has limitations because it can give a misleading picture of competitiveness. Employment data readily exists for certain industries while other industries (such as composites or agriculture) offer scarce or nonexistent labor counts. Average wages provide another dimension of an industry's income generating activity and offer a rough indication of how employers value workers' skills, education, and experience. But since average wage calculations combine full and part time labor, wage differentials may reflect differences in the number of hours worked rather than differences in wage rates.

At the same time the industry cluster study was underway, the Center for Economic Development at the University of Minnesota Duluth conducted the *Minnesota Regional Manufacturing/Technology Opportunity Assessment: Southeast Region* research project. Dr. Richard W. Lichty and his research team analyzed the economic base of six regions in the state of Minnesota for Minnesota Technology, Inc. Data from the University of Minnesota Duluth are included in background sections on three of the four industry cluster analyses.

Dr. Lichty used employment data covered by social security taken from the detailed Department of Commerce, County Business Patterns series. Current state regulations concerning data privacy restrict the Department of Economic Security from providing employment and location quotient information beyond the three digit level for counties and even regions. To deal with such limitations, Dr. Lichty filled in disclosure omissions through an estimation procedure developed at the University of Nebraska. This estimation procedure creates location quotient and employment information for specific four digit SIC code industry subsectors. Subsector data provides researchers, businesses, and economic development practioners more detailed information to target those industries experiencing competitive advantage losses or gains.

Initial Industry List

Using location quotient calculations to evaluate growth and concentration, the team of individuals from the Department of Economic Security, the Department of Trade and Economic Development, and the Humphrey Institute identified nine industries as being the most successful and competitive industries in the region. The initial ten industries selected were:

- composites
- computer manufacturing
- food processing
- furniture
- health care
- industrial machinery
- printing and publishing
- recreation and tourism
- shoes/clothing.
- software

SIC codes do not exist for the composites industry. Composites manufacturing does not produce one single type of product or service and therefore escapes identification under current SIC classification. However, Initiative Fund and Department of Economic Development representatives working in the Winona area could identify a dozen composite manufacturers. Based on qualitative observations of company size, product diversity, lending activity, and employment growth, the team decided to include the composites industry in the industry cluster study.

From this initial list, a team of regional leaders from EPSEM, representatives from the Humphrey Institute and the Department of Economic Security decided upon the final four industries to be analyzed. After the Humphrey Institute research assistants presented the ten statistically strong industries, EPSEM representatives used their regional knowledge and expertise to narrow the initial ten industries down to five: industrial machinery, computer manufacturing, composites, food processing, and printing and publishing. Because the study had the capacity to analyze four industries, team participants decided to combine computer manufacturing with the industrial machinery cluster and add the software industry to the printing and publishing cluster. The final four industry clusters are:

- composites
- food processing
- industrial machinery (including computer manufacturing)
- printing and publishing (including software)

III. Analysis of the Four Industry Clusters

Company leaders of area industries were invited to participate in focus groups through interactive television at four sites in the region: Mankato, Owatonna, Rochester and Winona. Because of low focus group participation rates in some industries, the research assistants conducted phone and in-person interviews with company representatives. The two types of interviews produced different but equally valuable insights into the industries. While the focus groups helped stimulate discussion among leaders, individual interviews allowed for greater depth into the particular concerns of a company.

For the food processing, composites, and industrial machinery (including computer manufacturing) industries, focus group sessions were conducted in February and March of 1996 with supplementary interviews conducted the following months. Research on the printing, publishing, and software industries relied solely on individual interviews.

Composites

Rather than classify the industry by a final product, the composites industry is best understood as a manufacturing process for making a diverse range of materials. Composite materials have varied applications and are used in automotive parts, sports and recreation equipment, aircraft and aerospace components, caustic environment manufacturing, seismic retrofitting of buildings, and highway reconstruction.

Composites are products made from two or more dissimilar materials, one being a fiber or fabric, and the other a polymer. When combined, the dissimilar materials retain their distinctive properties but do not change their basic chemistry. The fiber or fabric provides the composite product mechanical properties while the resin matrix keeps the fiber in proper alignment. The reinforcement may be glass, carbon, aramid, or any other fiber which provides unique properties to the composite. Composites are lightweight, stiff, corrosion resistant, and can shield electronic signals. These properties show promising applications to a wide variety of industries, making composites manufacturing in Winona and western Wisconsin a high technology industry with strong growth potential. Winona lies claim to the highest concentration of composite manufacturing firms in the entire country.

Industry experts predict the greatest growth potential lies within automotive and aircraft applications. At present, composites cost twice the price of steel. But as fuel efficiency and weight becomes more important for electric cars, compressed gas vehicles, and other motor vehicles, demand for composite manufacturing may skyrocket. Aging bridges, deteriorating highways, and buildings in need of seismic reinforcement can benefit from the strength and durability of structural retrofitting with composite materials. Composites show potential use in railroad freight cars, offshore drilling rigs, and the marine industry. Manufacturing plants currently use machinery composed of composites for production in highly caustic environments. Musical instruments employ composite components for enhanced sound wave transmission. Today most golf clubs, fishing rods, and tennis rackets are made of graphite composites. Another area of possible application includes composite coatings of medical devices to shield components from radio and microwave signal interference.

Composites containing glass reinforcement are already a major national business with annual sales in the range of four billion dollars. However, “advanced” composites are in their infancy. Advanced composites are the focus of Winona manufacturers, which makes this region unique in national and global markets and poised for future growth. Advanced composites contain a reinforcement of higher strength glass, carbon, boron, aramid, or polyethylene that improves product performance, but also increases costs. Although advanced composites first appeared in the aerospace and defense sector, their future lies in the commercial area of aircraft, automotive, and a broad variety of niche applications.

Because composite manufacturing is a process and does not produce a single classification of end product, the industry does not fall under any existing SIC codes. The research team relied upon

discussions and personal references to identify companies involved with composite manufacturing. Representatives at the Minnesota Department of Economic Security wished to highlight various SIC code categories where composite manufacturing activities fall so as to track future location quotient, employment, and wage information. DES analysts worked backwards by examining companies already identified for the study, noting the end products area composite companies produce, and matching composite end products to existing SIC descriptions.

Table 2: Four Digit SIC Code Information for The Composites Industry

1995 Composites Sector in Southeastern and South Central Minnesota	**Location Quotient**
Coated fabrics, not rubberized (SIC 2295)	82.30
Manmade organic fibers, except cellulosic (SIC 2824)	80.78
Custom compounding of plastics resins (SIC 3087)	54.49
Musical instruments (SIC 3931)	20.97
Laminated plastics plate, sheet, shapes (SIC 3083)	12.91
Special industry machinery, not elsewhere classified (SIC 3559)	5.35
Plastics products, not elsewhere classified (SIC 3089)	2.88
Boat building and repairing (SIC 3732)	2.56

Source: 1995 Minnesota Department of Economic Security ES202 data

Not all southeastern and south central Minnesota employers that fall under these four digit SIC codes necessarily are composite manufacturers. Because of data disclosure restrictions and the very limited number of companies involved in the composites industry, DES cannot release average wage and employment information. Despite disclosure and data gathering problems, the location quotient calculations do suggest employment related to composite manufacturing is very highly concentrated in the region. For some products, southeastern and south central Minnesota employment concentrations are 80 times the national average.

Factor Conditions

Workforce skills

- Larger, well established composites companies have problems locating production employees with vital skills in problem solving, quality focus, communication, team work, flexibility, and productivity.
- To fill management level workforce needs, larger firms turn to the national market and increasingly to graduates of Winona State University.
- Networking and idea exchanges between entrepreneurs and former employees of larger composite companies provide talent for a continual string of small start up firms in the region.

As with many manufacturing industries, the skills needed in composites production line assembly differ from skill requirements for management, research and development, and sales.

Production labor

For the production side of most composites companies, the industry seeks individuals with skills in problem solving, a focus on quality, task orientation, a concern for productivity, computer proficiency, communication, and team work skills. With the regional unemployment rate at 2.9%, larger companies express difficulty in finding suitably skilled and dedicated workers. These firms therefore must provide in house training on issues of quality, process, and productivity. Polymer Composites Inc. (PCI), an employer of 70, has a two year grant from the state of Minnesota to upgrade production level skills. In addition to on-the-job training, firms seek skilled production level workers through Winona Technical College (WTC). However company leaders expressed concern about the future of composites education at WTC due to the coming program suspension.

Larger employers observe a difference between the older production level workers and the young work force. The younger work force tends to be more computer literate and better able to manage inventory control than older workers. But employers contend that many younger workers lack a work ethic and dedication to their jobs.

Employees of small start-up composite companies tend to be very knowledgeable of composite properties and willing to "tinker" to improve or create new process applications. Start up companies need workers with creativity, innovation, and flexibility as well as high levels of engineering knowledge to apply composite properties to novel applications.

Because composites have such varied applications, the nature of the final product dictates production work environments. For example, Polymer Composites utilizes highly automated processes whereas We-no-nah Canoe has a labor intensive work environment.

Wages in the production side of the composites industry tend to be average to low. An industry observer at Minnesota Technologies believes wages will rise within the next five to eight years as production moves out of the design and testing stages and demand for light weight products increases. Presently composites applied to consumer products yield lower wages than aerospace or defense applications. A potential for high wage and high value added production may arise within the auto, aircraft, and manufacturing sectors as those industries look to composites for their lightweight and noncorrosive properties.

Salaried Labor

For research and development and technical applications, companies seek individuals with bachelors and advanced degrees in math, sciences, and engineering. Companies expressed satisfaction with the quality of their degreed labor force. The professional labor pool comes from a national market, though an increasing number are graduates of the Composite Materials Engineering program at Winona State University (WSU). Many WSU students intern at area firms and some are later employed in the region.

Education and training

- To meet the growing workforce and research and development needs of area composite companies, industry and political leaders created the nation's only undergraduate composites engineering program at Winona State University.
- Concurrently, Winona Technical College developed a complementary program to fill labor force need for skilled technicians.
- Industry leaders participate in advisory boards for both educational institutions, utilize laboratories for experimental applications, provide hands on internship experiences for students, and often employ recent graduates in their shops.

In early 1987, Fiberite, then an employer of 600 in the area, planned to move its Composites Technology Division out of Winona to be closer to aerospace customers in California and Arizona. Then Governor Rudy Perpich, community representatives, and industry leaders looked for ways to keep Fiberite and other composite companies in Winona. These leaders founded the Composite Materials Technology Center (COMTEC) at WSU with the goal of improving labor force skills, promoting technological innovation, and strengthening the long range viability of the composites industry in the region. WSU is the only undergraduate program in the country to offer a specialized degree in composites engineering. Students regularly participate in internships at local companies and upon graduation either go on for advanced degrees or work within the region. Composite company leaders serve on the COMTEC advisory board and WSU professors and students work on experimental applications for local firms.

Also in 1987 Winona Technical College created the Composites Technology program to complement the WSU program and fill a labor force need for skilled technicians. The program offers hands on laboratory experiences with resins, reinforcements, manufacturing processes, materials testing, and statistical process control as well general humanities and science classes through WSU. Currently 17 first and second year students participate in the program, though in past years enrollment was at 30. (Enrollment tends to increase as unemployment increases.) Most students in the program are not directly out of high school and many are already employed in the industry. About 90% of program graduates find employment in Winona while others pursue four year degrees. Area companies participate on an advisory committee and use the college’s equipment to perform applications test runs.

In the Spring of 1996 the Minnesota State Colleges and Universities (MSCU) board decided to suspend the composites diploma and two year degree program at WTC. According to Daniel Wagner, Director of Academic Programs for MSCU two year programs, the program suspension is due to a lack of enrollment. All two year programs are driven by student to instructor ratios. If over a one year period enrollment drops below 14-20 students per teacher, the technical college president can suspend the program until expressed demand increases. Wagner stated that next Fall’s WTC composite program enrollment was 10, half of minimal student-instructor ratios. Courses will be offered in the Fall to allow current students in the composite program to finish degree work, but new students will not be allowed into the program.

If sufficient numbers of students express an interest, the composites program could be re-opened the following year. Wagner also stated that if local industries wish to subsidize the present program at its low enrollment rates, WTC could offer the composites degree upon the discretion of WTC president Jim Johnson. However composites instructor Scott Tjossem notes that companies such as Composite Products Inc., Polymer Composites Inc., and We-no-nah Canoe already pay WTC program tuition for their employees and that these companies should not be made to bear the total funding burden for a program that benefits the entire community. In another option, WTC could offer composite courses without offering a degree, provided class sizes are of a sufficient size. As Wagner observed, numerous suspensions are occurring throughout the state in programs that local industries deem valuable; but these programs simply do not attract sufficient numbers of potential students.

Infrastructure

- Composite companies express satisfaction with regional infrastructure, though some concern exists with highway 61 traffic bottlenecks.
- Waste disposal concerns the composites industry. Area companies are experimenting with new production techniques to reduce waste materials.

Overall, composite companies seem satisfied with the local infrastructure. Electricity and water supplies are adequate and appropriately priced. Most companies benefit from good transportation facilities, especially the availability of trucking and to a lesser extent, airports. A PCI representative complained about the deteriorating quality of highway 61 and the traffic bottlenecks as the road passes through various towns. The quantity of roads in southeastern Minnesota appears sufficient, but quality needs improvement through regular maintenance.

Winona has the good fortune to be fiber optic communication ready due to the work of a local entrepreneur. The president of the electronics firm Emd decided his and other companies need fiber optic technology and therefore sponsored installation at his own expense.

Waste disposal is a concern, especially for larger firms as they look for environmentally sound methods to dispose of solvents and resin by-products. Years ago it was said that Winona smelled like whatever Fiberite was manufacturing. Air emissions have greatly improved since then. Some firms are experimenting with new production techniques that reduce the quantities of wastes. For example, We-no-nah Canoe won the 1995 Awards for Composites Excellence for a kayak design that eliminates air emissions and waste intermediary materials.

Home Demand

- Two categories of composite manufacturers exist within the region, raw materials producers (such as Fiberite, RTP, PCI) and finished good producers (such as We-no-nah Canoes, CPI, Geotek, Coda Composites Company).

- A few finished goods producers buy some raw materials from local companies, but the majority of markets are national and international in scope.

Composite manufacturing falls into two different types of production, raw materials and finished goods. Raw materials manufacturers include Fiberite, RTP, and PCI. Through various processing techniques these companies provide the intermediary materials needed by composite finished goods manufacturers world wide. Companies such as We-no-nah Canoe, Coda Composites Company, Geotek, and CPI take materials like carbon fiber or Kavlar fiber and produce a diversity of final goods ranging from canoes, violin bows, kite braces, electric fences, auto parts, and airplane parts. Because composites have so many different applications, markets vary from company to company. Neighboring PCI and RTP compete in the same thermoplastics market, but finished goods manufacturers report they often compete with isolated companies across the country.

At times finished goods manufacturers may use some local composites raw materials in a particular process, but for the majority of firms, local demand is nonexistent. Demand for the varied products is national and international in scope. As Steve Bowen of PCI (in reference to the Porter diamond theory) stated, "We consider the US market to be our local market."

Related and Supporting Industries

- Most raw materials must be obtained nationally or internationally.
- Some non-composite intermediate materials are manufactured in the region or in the Twin Cities and incorporated into final products.

Composite materials supplies are not produced locally. Polypropylene and petroleum based materials are refined in the southeastern US, Japan, or Europe. Glass fiber comes from Ohio and Texas while nylon is manufactured in Texas. Some local machinery shops have specialized knowledge about the equipment needs of composite companies and therefore fabricate production machines according to changing specifications. Local firms in Winona and the Twin Cities manufacture a number of finished goods parts that are not themselves of composite materials, but that are added to the final product. However the majority or raw materials are simply not available in the region and must be shipped to the composites manufacturers.

Firm Strategy, Structure, and Rivalry

- Winona has the highest concentration of composite manufacturers in the entire country.
- Composites manufacturing is a home grown industry with roots in the Fiberite Corporation. Nearly every present day company is a Fiberite spin-off or had early ties to the pioneer company.
- An entrepreneurial spirit prevails in Winona and mutual support exists between businesses, banks, educational institutions, and civic groups.
- Interest in industry associations is growing as firms look towards potential mutual benefits.

- As founding entrepreneurs retire, local companies are being bought out by international corporations. This trend raises concerns over the direction of future growth and continued commitment to the local area.

Though Winona has the highest concentration of composite manufacturers in the entire country, few firms have local competitors. Composite applications are so varied and so cutting edge that little overlap exists between local companies. Firms mention isolated competitors located across the country or overseas. Some companies are the only composite manufacturer in their specialized market niche.

Composite manufacturers in Winona are home grown industries. Almost every entrepreneur worked for or had some connection to the Fiberite Corporation. Fiberite traces its Winona roots to Joseph Miller who in 1923 started Miller Waste Mills, Inc., a manufacturer of railroad journal box packing waste for steam locomotives, freight, and passenger cars. During World War II, Miller's company landed defense industry contracts to manufacture windshields for fighter planes. In 1949 sons Rudolph and Ben Miller organized Fiberite to utilize cotton mill waste. The Miller brothers started coating high quality cotton waste with phenolic and melamine resins to produce cafeteria trays and other plastic materials. The company grew in sophistication and branched into composite manufacturing processes. Throughout its history in Winona, Fiberite attracted a pool of composite engineers from across the country. These engineers at times broke off from the parent company to form their own start-up companies in a particular specialty. This innovation process explains the continual proliferation of new companies in the region.

When asked why local composite companies started and remain in Winona area, most company representatives cite quality of life issues or a simple, “this is where we started.” Company officials talk of being close enough to the Twin Cities to take advantage of big cities resources yet far enough away from the Twin Cities to enjoy a more small town quality of life. Individuals speak glowingly of the natural beauty of the area and the recreational activities available along the Mississippi River, the bluffs, and Lake Pepin.

Thirty to forty years ago few job opportunities existed in the region and individuals felt compelled to create their own sources of employment. In repeated interviews, company leaders talked about an “entrepreneurial spirit” that exists within the Winona area that fosters innovation and new company creation. Local banks understand the needs of composite firms. For years Winona State University and Winona Technical College have served as information sources concerning business management, engineering, and now specialized composite processes. Company leaders often socialize together and participate in civic activities that promote educational and recreational concerns in the region.

Within the past year Stanley Prosen, co-owner of Coda Composites Company and a founding father in the composites industry, has organized quarterly breakfast meetings amongst composite entrepreneurs to share industry information and better network. Prosen notes that in the past individuals were somewhat reluctant to share industry information, but that company leaders are beginning to see a value in sharing certain types of mutual concern information. Composite

manufacturers also participate in trade shows and informational meetings of the Winona chapter of SAMPE (the Society for the Advancement of Material and Process Engineering), a professional member society of the industry.
Dr. Charles Hamermesh of SAMPE states that the smaller composites companies need to form an alliance to look at the needs of the metal working industry. For years composite engineers have maintained that their materials are the replacement to metals. Dr. Hamermesh believes composite manufacturers should invite metal experts together for a round table to catalog and prioritize specific metal properties deficiencies. With a knowledge of specific metal industry needs, composite companies can better focus their marketing and research and development efforts. To date, no one company or organization has compiled this information, and because of the competitive nature of the industry, Dr. Hamermesh doubts that individual firms can form such alliances. Dr. Hamermesh believes that only a nonprofit trade organization or a government agency could have the credibility to gather industry specific data and disseminate the information for the mutual benefit of all composite manufacturers.

Almost every company has their headquarters, research and development departments, and manufacturing divisions located in Winona. But this may be changing in the coming years. Within the last four years a number of local firms have been bought out by international corporations. As founding entrepreneurs of composite as well as other manufacturing firms reach retirement age, some have sold their ownership rights to offers from outside the region. The size and profitability of composite firms appear attractive to multinational firms interested in diversifying their holdings into industries showing promise for future expansion. This buy out trend has been a source of concern within Winona as evidenced by stories appearing in the local media. Concern exists over issues of control. With headquarters transferring from Winona to European locales, previously active participation within the local community may decline and future growth may be directed outside the region. The location of composite company ownership is of special concern to Winona since local raw material supplies are practically nonexistent and home demand is minimal. Without localized supply and demand, some community leaders wonder what will keep composite manufacturing in the area.

Printing, Publishing, and Software

While emerging from different historical roots, printing, publishing, and software represent two ends of the spectrum in rapidly changing information industries. The printing, publishing, and software industries are technology driven. For example, to meet government regulations, new ink needs to be developed to reduce VOC emissions. Quick printing is one of the fastest growing segments of the printing industry. Continuous technological innovations will stimulate the increased usage of the ink-jet printers in the printing industry

Software programming is becoming more modular, allowing for shorter product development cycles. The entire market is young, innovative and competitive; many opportunities for growth exist. Current trends within the industry include downsizing, more modularity of software packages, and the growth of an international market

While the printing and publishing industry is diversified in the region, a few larger firms that help drive the industry cluster created spin-off firms and helped establish the strength of the industry. Brown Printing Co. was founded in 1949 in Waseca. Initially, the company ran both a weekly newspaper and did commercial printing. Wayne Brown took over the commercial printing and became a pioneer in making web-offset printing possible. Likewise, Schmidt Printing Inc. started in 1912 and settled on the printing niche of the market during the 1970s and 1980s by making inserts included in magazines all over the world.

A Brown Printing Co. representative commented that in the past southeastern and south central Minnesotahas had cost advantages over printers in older, larger cities (such as the Twin Cities). While Brown Printing Co. has a fully integrated operation, companies in larger cities often have operations in multiple buildings and struggle to keep their costs down. Thus, non-urban companies could use their "one-stop" services to keep their costs lower than urban plants.

Currently, many companies depend upon supplies and connections from the Twin Cities. The southeastern region benefits from the strong concentration of printing, publishing, and software industry clusters in the Minneapolis/St. Paul area. Many of the industry leaders praised the Twin Cities for being an excellent printing center. This strength contributes to the competitive advantage of the printing and publishing industry cluster in southeastern and south central Minnesota.

In the twenty county southeastern and south central Minnesota region in 1993, employment and wage statistics were as follows:

Table 3: Three Digit SIC Code Information for the Printing and Publishing Industry

Printing and Publishing Sector and SIC Code	Employment	Average Weekly Wage	Location Quotient
Commercial printing (SIC 275)	4,753	$371	3.82
Periodicals (SIC 272)	>1,000*	ND*	2.0 to 5.0*
Manifold business forms (SIC 276)	<1,000*	ND*	>2.0*
Newspapers (SIC 271)	1,317	$331	1.27
Miscellaneous publishing (SIC 274)	203	$252	1.08
Miscellaneous wood products (SIC 249)	185	$223	0.95
Paperboard container boxes (SIC 265)	361	$531	0.73
Miscellaneous conventional paper products (SIC 267)	227	$426	0.40
Books (SIC 273)	<1,000*	ND*	<1.0*
Blank books and bookbinding (SIC 278)	<1,000*	ND*	<1.0*

Source: 1993 Minnesota Department of Economic Security ES202 data

* *Data privacy restrictions prevent disclosure.*

The region is particularly strong in the area of commercial printing. Over 4,700 people are employed by commercial printing firms in the region. Commercial printing's share of total employment in the region is nearly four times the national average (location quotient=3.83). Other than periodical (location quotient= 2.0 to 5.0) and manifold business forms (location quotient >2), the other specialized areas have location quotients less than or slightly greater than one.

The study done by Richard Lichty at the University of Minnesota/Duluth was used to supplement the Minnesota Department of Economic Security's ES202 data. Table 4 summarizes 1990 and 1993 location quotients and employment statistics for the region.

Table 4: Four Digit SIC Code Information for the Printing and Publishing Industry

Printing and Publishing Sector and SIC code	LQ 1990	LQ 1993	Change in LQ	Employ-ment 1990	Employ-ment 1993	Change in Employ-ment
Commercial printing, lithographic (2752)	4.71	4.85	0.14	4,634	5,424	790
Paper coated and laminated, packaging (2671)	3.52	3.53	0.01	135	167	32
Stationary products (2678)	2.72	3.32	0.60	75	81	6
Book publishing (2731)	1.76	2.15	0.39	313	424	111
Newspapers (2710)	1.46	1.29	-0.17	1,551	1,351	-200
Miscellaneous publishing (2740)	1.36	1.03	-0.33	229	186	-43

Source: Minnesota Regional Manufacturing/Technology Opportunity Assessment: Southeast Region Economic Base Report #2. Bureau of Business and Economic Research. University of Minnesota.

The figures in Table 4 support the finding that southeastern and south central Minnesotahas a high concentration of printing and publishing employment. The six industries listed in the table above have a location quotient greater than one. Commercial printing, lithographic (SIC 2752), paper coated and laminated, packaging (SIC 2671), stationary products (SIC 2678), and book publishing (SIC 2731) grew in location quotient and employment from 1990 to 1993.

According to the ES202 data, the software industry is not as concentrated as the printing and publishing industry. In the twenty county southeastern and south central Minnesotaregion in 1993, employment and wage statistics were as follows:

Table 5: Three Digit SIC Code Information for the Software Industry

Software Sector and SIC Code	Employment	Average Weekly Wage	Location Quotient
Computer and data processing (737)	404	524	0.19

Source: 1993 Minnesota Department of Economic Security ES202 data

* *Data privacy restrictions prevent disclosure.*

Dr. Lichty's study from the University of Minnesota Duluth offers more detailed and comprehensive data of the southeastern and south central Minnesota software industry. Table 6 shows 1990 and 1993 location quotients and employment statistics for the industry:

Table 6: Four Digit SIC Code Information for the Software Industry

Software Sector and SIC Code	LQ 1990	LQ 1993	Change in LQ	Employ-ment 1990	Employ-ment 1993	Change in Employ-ment
Computing programming services (7371)	1.07	1.09	0.02	555	720	165
Prepackaged software (7372)	0.34	0.68	0.34	63	245	182

Source: Minnesota Regional Manufacturing/Technology Opportunity Assessment: Southeast Region Economic Base Report #2. Bureau of Business and Economic Research. University of Minnesota Duluth.

The location quotient for computer programming services (SIC 7371) is 1.08. This indicates that southeastern and south central Minnesota's employment in that area of the software industry is slightly higher than the national average. Although the location quotient for prepackaged software (SIC 7372) is less than one, it doubled from 0.34 to 0.68 and the number of employees almost quadrupled from 1990 to 1993.

Factor Conditions

- A reliable, skilled workforce was cited as the most critical factor condition. While the region breeds a strong work ethic, firms face a shortage of workers and a mismatch between skills and needs.
- Communication infrastructure drives the industry's innovation.

- The central location of the region facilitates shipments to East and West Coast customers, while some firms feel isolated from both suppliers and purchasers.

Workforce, Education and Training Issues

Firms need a wide gamut of skills. Entry-level positions are mainly filled by graduates from local high schools. Mid-level and managerial positions tend to require college graduates. Many executives mentioned that they look for trainable individuals with good communication skills and a strong work ethic.

A shortage of high-skilled and semi-skilled workers challenges the printing and publishing industries. The region's low population density and competition with both local and Twin Cities' firms over skilled workers contribute to the labor shortage. One company noted that companies are so desperate to get graphic designers that they recruit students from schools before they have completed their programs. Many firms are forced to recruit nationally at a great cost. Technograph Corp's representative felt that the lack of workers is the main workforce issue and there is little educational institutions can do without increased enrollment.

Most firms rely on internal training which allows workers the opportunity to advance within a company. Instead of looking for high-skilled individuals, firms look for people who can be trained internally and who accept ownership of their work. Many interviewees commented on how southeastern and south central Minnesota's culture breeds a good work ethic. Brown Printing Co.'s representative believes the region is sheltered from urban problems, enjoys plentiful natural resources, and is residence to a bright and ambitious population.

Yet, printing industry leaders expressed concerns about the lack of basic math and communication skills in the available workforce. Some firms have one-on-one interaction with high schools and colleges, provide internships, and involve themselves with curriculum boards. For example, Carlson Craft holds youth apprenticeship-type programs with local high schools and technical colleges.

Some firms in the software industry interact closely with local schools. Winnebago Software, an employer of 200 workers, provides employment opportunities for Winona State University students at the management level. Technology Concepts, Inc. utilizes students from WSU's Computer Science Department. To facilitate their relationship, Technology Concepts works closely with WSU to match skills with opportunities and provide internships for students. While companies shared examples of proactively working with local educational institutions, many feel a need to increase the match between schools and workforce opportunities.

Satisfaction with the local technical schools varied. Some executives feel these schools are not keeping pace with changing technologies and skill needs of local businesses. Yet other firms, such as Corporate Graphics International in North Mankato, are satisfied with the local technical college. An executive from Taylor Corporation in Mankato suggests that southeastern and south

central Minnesota public schools have an excellent opportunity to excel in language and computers.

Infrastructure

In general, companies are aware of the rapidly changing communication possibilities. Companies such as Taylor Corporation and Schmidt Printing Inc. discuss the necessity of staying current with trends and adapting to the uncertainties of the future. Corporate Graphics International is concerned about finding enough people who understand the changing technology. Keeping up with the costs of staying current is difficult. Most firms predict that printing and publishing will find a niche in the electronic services. Larger firms emphasize the need to continually update access to infrastructure (such as fiber optics and electronic satellites) so that they can maintain competitiveness on a national and international level. Smaller firms express worries about having the access and finances to compete with larger firms' communication capabilities. An executive from Taylor Corporation expressed concern that, due to the region's low population density, some of the newest technology available to their competitors in larger cities will be slow to surface in southeastern and south central Minnesota.

Shipping was cited as a vital infrastructure issue. Interviewees are generally satisfied with private shipping firms. Some companies, such as Schmidt Printing Inc., feel it is advantageous to be centrally located to their clients on the East and West Coast. Other firms face higher shipping costs because they are located far from their customers. This forces firms to be more flexible in their services and to do a higher quality job. In shipping, it is vital to overcome geographic challenges and be available to customers. For example, Carlson Craft explained how they have used two means of shipping to reduce costs. Various executives expressed concerns with highway 14 and would like it updated.

Many firms use the Minneapolis/St. Paul Metropolitan Airport. The representative from Brown Printing Co. emphasized the importance of being within seventy-five miles from a major airport. While many regional businesses are satisfied with the services, distance poses a problem for other firms. The Rochester airport seems adequate for firms located close to it, yet many cited the Mankato airport fails to meet their needs.

While access to capital is not cited as a problem for printing and publishing firms, software firms feel it limits growth. An industry leader from Technology Concepts Inc. notes that it is difficult to find financial investors because their software is leased. Software companies need to offer attractive terms to buy out the lease up front, or use capital available from internal sources.

Home Demand

- Home demand is weaker in southeastern and south central Minnesota relative to other areas.
- Large printing companies create market opportunities for spin-offs and regional supplies.

While most industry leaders said consumer demand is weaker in the region than other locations, larger companies play an important role as initial markets for smaller and medium sized firms. This demand produced a number of spin-off firms and opportunities for business. For example, Schmidt Printing Inc. took advantage of their proximity to Brown Printing Co.'s magazine binding operations and began producing complimentary magazine inserts. In the past, this also helped contribute to a better educated labor pool.

Similarly, two software companies note the initial significance of Minnesota's market. Winnebago Software's first customers were from Minnesota. Likewise, an executive from Technology Concepts Inc. said that home demand was important when they wanted to find a market segment and develop products; but in the long-term, less than 5% of their revenue comes from the local market. Firms have often grown or will outgrow local demand opportunities.

Some of the smaller firms rely on local demand but feel they have come close to saturating certain niches in the market. Companies such as Technograph Corp, Wild Wings, and Free Press Co. are more dependent on local demand. Larger companies indicate demand is actually weaker locally than in other U.S. locations. Firms such as Schmidt Printing Inc., Taylor Corporation, Brown Printing Co., Josten's Inc., and Carlson Craft said the local market accounts for a very small to zero percentage of their customers.

Many executives said that if they expand business, it would be more advantageous to do so outside of Minnesota to be closer to their suppliers. Firms feel their local opportunities are limited; many are already or beginning to sell internationally.

Firm Strategy, Structure and Rivalry

- Firms compete for workers, not customers.
- Regional printing and software industries benefit by firms headquartered in the southeastern and south central Minnesota.
- Many firms attribute their location in the region to the high quality of life and personal connections to the area.
- Technological innovations will complement the printed word, not replace it.

While some local market competition exists, interviewees spoke more about national and international competition. Firms in the region offer diverse products and either serve different customers or share the same customers. Brown Printing Co. and Schmidt Printing Inc. supply the same customers with different products. Firms rarely share information or rely on interrelationships between competitors; the industry tends to be very competitive. An executive from Wild Wings noted the advantage of being located in the region and their proximity to other printing and publishing firms. While no formal association exists, there are casual interaction and referrals among firms.

Strong entrepreneurship coupled with a genuine love for the area are cited frequently as the industry's success and location in southeastern and south central Minnesota. For example, Taylor Corporation's success can be attributed in large part to the entrepreneurship of the owner. Software company leaders see the Rochester area and the region as a whole as a "hot bed" for software. Software companies spunoff from larger computer manufacturers such as IBM in southeastern and south central Minnesota. Some industry leaders believe the local software industry has yet to reap the benefits of regional cooperation. Minnesota benefits from proximity to IBM and a strong software industry in the Twin Cities.

Related and Supporting Industries

- Companies rely heavily on Twin Cities and out-of-state suppliers.
- Given the strong commercial printing industry, there may be opportunities for new local suppliers.

Because of the Twin Cities' strong printing and publishing industry, many firms rely on ink suppliers, plate suppliers, and letter shops from Minneapolis and St. Paul. Paper is the most important supply; much of the paper used in the region comes from paper mills outside of Minnesota.

Some industry leaders suggest opportunities abound for local suppliers and spin-off firms to feed into the printing industry. Specifically, room exists for more local graphics suppliers to replace purchasing from outside the region and a potential to develop paper made from corn stocks.

Government

- Business leaders express frustrations about Minnesota's workers compensation, environmental regulations, and high taxes.
- U.S. postal regulations are an important factor condition for some printing firms.

Schmidt Printing Inc., which prints card inserts for magazines, is affected by U.S. postal regulations on paper weight and consistency. Changes in regulations could affect the company's ability to do business and force them to change their product in order to meet the new postal standards. Environmental and emission standards were most commonly cited as the biggest regulatory problem for the printing industry. Minnesota environmental regulations are stricter than other states. Printing businesses are required to go through more testing, monitoring, and other additional processing with higher costs. Companies recycle almost everything, especially paper and ink.

Workers compensation regulations are still a problem for some firms. Various firms use seasonal employees, who are entitled to draw workers' compensation under Minnesota law. Some express concern that Minnesota's treatment of injuries and accidents is unfair to business. The burden of proof falls almost entirely on the employer when dealing with work-related injuries.

Minnesota's tax climate could affect future expansion in the region. One executive discussed how all firms in Minnesota will continue to lose business outside of Minnesota under the current tax base. Some printing executives said that if they were to expand their operations, they would be forced to do so outside of Minnesota.

Industrial Machinery and Computer Manufacturing

IBM Rochester is a driving force behind the computer manufacturing industry. A number of spin-off, software, and other manufacturing firms started with IBM's influence. The Rochester area benefits from a specialized labor force which helps strengthen and solidify the computer manufacturing industry.

In the 20-county southeastern and south central Minnesota region in 1993, employment and wage statistics were as follows:

Table 7: Three Digit SIC Code Information for the Computer Manufacturing Industry

Computer Manufacturing	Employment	Average Weekly Wage	Location Quotient
Computer and Office Equipment (357)	>5,000*	ND*	>5.0*
Electrical industrial apparatus (362)	863	564	2.44
Electrical light and wiring equipment (364)	>1,000*	ND*	2.0 to 5.0*
Electronic components and acc. (367)	2,899	460	2.37
Household audio and video equipment (365)	<1,000*	ND*	>1.0*
Communications equipment (366)	<1,000*	ND*	>1.0*
Miscellaneous electrical equip. and supplies (369)	531	378	1.52

Source: 1993 Department of Economic Security ES202 data

* *Data privacy restrictions prevent disclosure.*

The computer manufacturing industry has a high employment concentration. At least four of the reported areas have employment shares twice the national average. Computer and office equipment has more than five times as much employment share than the national average.

Four digit SIC code data from the University of Minnesota Duluth study supplement data from the Department of Economic Security. Table 8 summarizes location quotients and employment statistics for 1990 and 1993 at a more detailed level:

Table 8: Four Digit SIC Code Information for the Computer Manufacturing Industry

Computer Manufacturing Sector and SIC code	LQ 1990	LQ 1993	Change in LQ	Employ-ment 1990	Employ-ment 1993	Change in Employ-ment
Computer peripheral equip, n.e.c. (3577)	40.60	46.12	5.52	7,606	6,606	-1,000
Electronic components, n.e.c. (3679)	3.82	4.76	0.94	1,473	2,136	663
Electrical equipment and supplies (3699)	1.78	4.21	2.43	271	487	216
Radio and TV communications equipment (3663)	4.70	3.41	-1.29	1,457	1,045	-412
Telephone and telegraph apparatus (3661)	1.77	1.45	-0.32	398	310	-88

Source: Minnesota Regional Manufacturing/Technology Opportunity Assessment: Southeast Region Economic Base Report #2. Bureau of Business and Economic Research. University of Minnesota.

According to Dr. Lichty's study, the location quotient in 1993 for computer and office equipment (SIC 3577) in southeastern and south central Minnesota was 46.12. This industry declined nationally. But, because the region declined at a slower rate than the national rate, the 1,000 job decrease is less than it otherwise might have been. Another four industries have location quotients at least twice as large as the national average in 1993.

In the 20-county southeastern and south central Minnesota region in 1993, employment and wage statistics were as follows:

Table 9: Three Digit SIC Code Information for the Industrial Machinery Industry

Industrial Machinery and Equipment	Employment	Average Weekly Wage	Location Quotient
Railroad equipment (332)	<1,000*	ND*	>5.0*
Non-ferrous foundries (castings) (336)	<1,000*	ND*	2.0 to 5.0*
Metal cans and shipping containers (341)	<1,000*	ND*	2.0 to 5.0*
Construction and related machinery (353)	1,308	573	2.71
Industrial machinery, n.e.c. (359)	1,680	552	2.43
Concrete, Gypsum and Plaster (327)	735	495	1.67
General industrial machinery (356)	701	528	1.28
Metal services (347)	336	400	1.24
Misc. fabricated metal prod (349)	642	495	1.20
Concrete Work (177)	580	446	1.20
Iron and steel foundries (332)	287	494	1.04
Refrigeration and service machinery (358)	<1,000*	ND*	>1.0*
Misc. manufacturers (399)	<1,000*	ND*	>1.0*
Industrial org. chemicals (286)	<1,000*	ND*	<1.0*
Misc. chemicals n.e.c. (289)	<1,000*	ND*	<1.0*
Metal forgings and stamping (346)	<1,000*	ND*	<1.0*
Special industrial machinery (355)	343	558	1.0
Metalworking machinery (354)	712	539	0.99
Miscellaneous plastics products (308)	1,385	529	0.91
Misc. durable goods (509)	418	363	0.62
Motor vehicles and equipment (371)	958	505	0.49
Fabricated structural metal products (344)	382	493	0.42

Source: 1993 Department of Economic Security ES202 data

* *Data privacy restrictions prevent disclosure.*

The industrial machinery industry also has a number of specialized areas employing less than 1,000 workers with location quotients close to one.

Table 10 uses information from the University of Minnesota Duluth study to summarize southeastern and south central Minnesota industrial machinery location quotient and employment numbers for 1990 and 1993.

Table 10: Four Digit SIC Code Information for the Industrial Machinery Industry

Industrial Machinery Sector and SIC code	LQ 1990	LQ 1993	Change in LQ	Employ-ment 1990	Employ-ment 1993	Change in Employ-ment
Hoist, cranes, and monorails (3536)	9.33	13.09	3.76	173	228	55
Aluminum foundries (3365)	8.71	10.09	1.38	512	606	94
Carburetors, pistons, rings, valves (3592)	0.06	7.68	7.62	3	341	338
Commercial laundry equipment (3582)	0.00	7.30	7.30	0	88	88
Construction machinery (3531)	6.14	7.25	1.11	1,300	1,404	104
Motors and generators (3621)	4.69	4.59	-.10	883	794	-89
Steel wire and related products (3315)	5.38	3.91	1.47	343	268	75
Printed circuit boards (3672)	7.24	3.82	3.42	1,205	724	-481
Nonferrous die-casting except aluminum (3364)	1.89	3.46	1.57	62	100	38
Metalworking machinery, n.e.c. (3549)	1.75	3.35	1.60	50	117	67
Farm machinery and equipment (3523)	4.16	3.23	0.93	691	523	168
Refrigeration and heating equipment (3585)	2.35	2.09	0.26	739	650	89
Gray and ductile iron foundries (3321)	1.55	1.64	0.09	308	322	14
Power-driven hand tools (3546)	0.00	1.59	1.59	0	68	68
Specialized industry machinery, n.e.c. (3559)	0.05	1.55	1.50	10	317	307

Source: Minnesota Regional Manufacturing/Technology Opportunity Assessment: Southeast Region Economic Base Report #2. Bureau of Business and Economic Research. University of Minnesota.

Dr. Lichty's data shows a high employment concentration in industrial machinery for southeastern and south central Minnesota. Twelve of the listed industries have employment concentrations more than twice the national average. Carburetors, pistons, rings, valves (3592) and commercial laundry equipment have shown a substantial increase in location quotient from 1990 to 1993.

Conversely, steel wire and related products (3315) and printed circuit boards (3672) have experienced a drop in their location quotients. Lichty notes that the printed circuit board industry seems to be having trouble creating employment. Because the industry demonstrates national growth, southeastern and south central Minnesota seems to be loosing its initial competitive advantage in the printed circuit board business.

Factor Conditions

- A shortage of both high-tech and low-tech workers exists in the region. At the higher end of the market, electrical engineers, other engineers, and individuals with disk drive backgrounds are scarce. Likewise, traditional technical workers, such as welders and machinists, are also limited in supply.
- According to industry representatives, high schools, community colleges, and four-year colleges are failing to stay current with changing technology. Many students lack basic math, reading, and communication skills, yet some executives feel their workers are better educated compared to the rest of the United States.
- Companies increasingly rely on video conferencing and the Internet as ways to overcome geographical distance from customers and suppliers.

Workforce, Education, and Training Issues

Because companies participating in the study vary from high technology to more traditional heavy manufacturing, the needed workforce skills vary. In general, companies require a broad range of skills, from hourly production workers to engineers to senior managers. Production workers need basic math, reading, and communication skills. In addition to technical skills involving systems architecture, computer engineering, and software programming, higher level workers need to be able to communicate, deal with uncertainty, and organize. Firms look for trainable people with a good work ethic and who possess a sense of work ownership. Overall, workforce issues were mentioned as the most critical problem for industrial machinery and computer manufacturing companies.

Firms that rely on high technology, such as IBM Rochester (an employer of 5,100) talked about how firms in the region are "stretched" at both the high and low end of the market. At the high end of the market companies compete nationally for individuals with higher education. Currently a shortage of engineers and individuals with disk drive backgrounds exists. Firms are forced to hire people from the Twin Cities, Wisconsin and the nation. At the low end of the market, firms struggle to fill entry level positions and rely frequently on supplemental or temporary employment. Many firms utilize internal training and employees are often promoted internally. Crenlo Inc. (an employer of 1,100) has had long-standing problems finding welders, individuals with heavy manufacturing experience, and other more traditional machinists. According to some industry leaders, local schools have discontinued programs that teach mechanical skills and are not responsive enough to local businesses' needs.

Responses from industry leaders varied on how well educational institutions were meeting their needs. Overall, it is becoming more difficult to find individuals with basic math and reading skills necessary for jobs at all levels. Firms attempt to overcome educational institutions' deficiencies and enhance educational offerings through direct interaction and various programs with schools. For example, although SPX Corp-Power Team Division and Viracon Inc. of Owatonna were pleased with the quality of their labor supply and the local educational institutions, they are

finding a bare minimum number of workers to meet their needs. To overcome this obstacle, SPX Corp firms work closely with schools to meet projected future needs and change the "old style" of education to incorporate education on teams, open communication, and interpersonal skills.

Executives in Rochester, Winona, and Mankato also feel local primary and secondary schools are not satisfying their needs. Industry leaders from IBM and Western Digital note that dissatisfaction with public schools sometimes hinders highly educated individuals from moving to the area because they want their children to have better options for education.

Overall, executives feel that technical schools are not doing as good of a job as they did in the past. Graduates are not taught the relevant skills they need for local companies. Business leaders state that technical schools and community colleges should learn to be more flexible and responsive to local industries' needs. Instead of relying on educational institutions, many companies are doing their own training. Clear With Computers Inc. in Mankato, an employer of 400, works with South Central Technical College to try to overcome some of these problems through a three month program to re-educate laid-off workers.

While four year colleges are helpful and meet some of the firms needs, executives report a need to increase the capacity and responsiveness of such institutions. Emd Associates commented that they would like to see an expansion of the engineering departments at Winona State University and other local colleges. Additionally, the Clear With Computer Inc. executive notes that while the Mankato State Lab is a good program, it is slow in generating sufficient quantities of employees they need to fill a growing number of technical positions.

Executives in Rochester (Western Digital and IBM) felt that their recruiting has been impacted by the lack of a four-year college and limited graduate courses in the area. This impacts both employees and workers' dependents.

Infrastructure

- Adding power and continually upgrading of technology, especially fiber optics, is costly.
- Shipping expenses are high due to location far from suppliers and customers.
- Highway 14 and the Mankato airport need to be updated.
- Some executives cited an increasing dependency on video conferencing and the Internet as a method of communication with long distance clients and suppliers.

Employers seem generally satisfied with transportation, communication, and utilities infrastructure. Many noted that communication was the most critical area of infrastructure, but most companies (especially the larger ones) feel they are leaders in communication technology. Pemstar Inc.'s executive talked about the high cost of adding power; firms need to continually add equipment and maintain adequate products for communication flow. Key businesses that consume a lot of power have lower/preferred rates. It is crucial that Minnesota continues to offer competitive rates to high volume consumers.

Some smaller and mid-size firms are more concerned about telecommunications infrastructure than larger firms. For example, Technical Services For Electronics Inc., an employer of 150 in Arlington, felt that the phone system and recent change in their area code pose problems. Their ability to use the Internet and communicate nationally and internationally is limited, which gives company leaders the impression that they are lagging behind other regions.

Many executives mention high shipping costs as either a problem or a selective disadvantage. Because incoming freight rates are not as competitive in comparison to other states, firms either distribute from other areas or use two forms of shipping. For example, Fastenal Co. distributes from and ships to Memphis to overcome the high freight costs in Minnesota. Various companies try to deal with the problem of not being located near a port by relying on rail shipments and "piggy-backing" shipments.

While some executives view location in the center of the United States as desirable since they are half-way between East and West Coasts suppliers and customers, others felt they are isolated. Kato Engineering in Mankato voiced distance problems with shipping materials to the West coast and distance issues with Minneapolis. Firms in Rochester, Mankato, and Owatonna emphasize the need to update Highway 14.

Companies are pleased with utility service. According to industry leaders, members of a consortium of about fifteen to twenty counties (Southeastern Minnesota Power and Utilities) provides good service and is working to become more cost competitive.

Home Demand

- Contacts and networks in the region open doors for companies, but some executives feel these opportunities are underutilized.
- Most customers are located outside of the region.
- A high concentration of the industry in certain areas causes people to better understand relevant business issues.

Most industrial machinery companies are located in the region because the founder was born in the area, liked the lifestyle, and felt akin to the region. One executive from Viracon Inc. discussed how the company initially located in southeastern and south central Minnesota to be strategically close to their customers who purchased farm equipment; but because their products have evolved, the company no longer serves that market. The founder of Clear With Computers Inc. initially located in Mankato in 1983 because he is from the area and thought Mankato State University and South Central Technical College would provide a good workforce. Institutional education was sufficient for the first eight years of Clear With Computers operations, but over time the post secondary schools failed to stay current with advancing skills. Clear With Computers, for example, develops technology which enables sales systems for Fortune 500 companies. Its clients demand highly functional products that utilize the latest in technology. While there was discussion about business costs being more favorable elsewhere, no firm offered any indication

about relocating. IBM, a driving force behind the computer manufacturing industry, located in Rochester because the owner wanted a Midwestern location and because he had personal connections to the area.

An executive from Technical Services For Electronics Inc. perceived that location in southeastern and south central Minnesota puts his firm at an advantage due to close proximity to customers, the area's work ethic, and continuing local development. A few executives in Rochester feel that home demand was important when they want to find a market segment and develop products. One industry leader believes the region offers significant contacts and networks in Minnesota. A Pemstar Inc. representative stated that companies could help each other and could create mutual benefits if they made themselves more visible to each other. For example, over the past five months Pemstar Inc. established dialogue with another company and together they realized ways to save on transportation costs.

Firm Strategy, Structure, and Rivalry

- Local competition does exist, but the industry is diversified.
- Firms compete more for workers than for customers.
- Most firms are not worried about keeping up with changing technology, but are concerned about finding people who understand technology.
- A number of spin-off firms exist. Room remains for more local suppliers, but it may be difficult for small firms to enter the market.

In Rochester, competition exists between firms such as IBM and Western Digital for the computer disk drive business. But in most circumstances competition extends well beyond southeastern and south central Minnesota to other countries.

A number of spin-off firms exist, particularly from IBM Rochester. Specifically, IBM helped some smaller firms develop. In other cases former IBM workers took the initiative to start businesses based on their skills and the advantage of Rochester's knowledge base. For example, Pemstar Inc. was found in 1994 by eight senior managers involved in IBM's disk drive business. Of their 220 employees, the first 80 individuals came from IBM. Other spin-off firms coming from Clear With Computers Inc., Emd Associates, and Viracon Inc can be found throughout the region.

Many firms note they have good relations with their business partners and customers. Some collaborate through trade organizations to deal with community issues. Other company leaders state personal relationships with firms are more beneficial than trade organizations. However, there is a need to develop a local, or even regional, network which focuses on understanding current industry and regional issues.

Related and Supporting Industries

- Suppliers, technology, and logistics are lacking in the region; this lack forces companies to go domestic and abroad for support.

A number of firms report having direct communication with their suppliers concerning specifications and requirements. Most firms depend on non-local (Twin Cities, national, and international) support for most of their supplies. For example, Western Digital uses suppliers mainly in Silicon Valley on the West Coast and some in Singapore. Firms that mostly rely on local suppliers, such as Clear With Computers, Inc. and All Flex, Inc., view supplier networks as good. But these companies report no advantages to using local suppliers; they could receive equally adequate support in other locations.

Government

Numerous interviewees voiced frustration about the Minnesota State Legislature's tendency to "reinvent" federal rules and make them more stringent. Various examples of environmental regulations were cited, such as a state audit which requires costly verification of safety standards on commercially purchased machines that are already certified safe. Some executives emphasize that the Minnesota Pollution Control Agency and other state agencies need to be more responsive to companies trying to improve their environmental protection techniques and need to be faster and more efficient in assisting companies.

The cost of employee benefits and basic wages in Minnesota are greater than payrolls for manufacturing plants located out of state. Worker's compensation and high taxes are also cited as costly for employers.

Food Processing

The food processing industry in southeastern and south central Minnesota has long, historical roots in the region. The deep, rich, black soil of the twenty county area grows an abundance of corn and soybeans. Martin county produces the greatest quantity of pigs in the state. Large poultry and dairy farms abound. The Hollandale area, a region between Albert Lea, Austin, and Ellendale, is a major vegetable growing zone.

Over the years numerous grain, meat, vegetable, and dairy processing companies developed in the area to refine and distribute these raw commodities. Today the number of food processors within the region has decreased as firms consolidate or are bought out so as to better survive fierce industry competition. Analysts speculate trends with the greatest potential for profits will focus upon natural and organic processing, low calorie and low fat foods, food services production for restaurants, specialty meats, and value added processing.

The following data, provided by the Department of Economic Security, includes 1993 three digit SIC code information, employment figures, and average wage for the food processing industry in the 20 county region of southeastern and south central Minnesota.

Table 11: Three Digit SIC Code Information for the Food Processing Industry

Sector	**Employment**	**Average Weekly Wage**	**Location Quotient**
Dairy products (SIC 202)	2,853	$490	8.06
Grain mill products (SIC 204)	1,849	$578	6.23
Farm product raw materials (SIC 515)	1,630	$419	6.15
Meat products (SIC 201)	5,777	$517	5.63
Preserved fruits and vegetables (SIC 203)	2,818	$354	5.19
Fats and oils (SIC 207)	281	$510	3.76
Miscellaneous food and kindred products (SIC 209)	<1,000*	ND*	>1.0*
Sugar and confectionary products (SIC 206)	<1,000*	ND*	<1.0*

Source: 1993 Minnesota Department of Economic Security ES202 data

* *Minnesota data privacy restrictions prevent disclosure of this information.*

Regional employment in dairy products manufacturing is eight times the national average. Grain mill products and farm product raw materials show an employment concentration six times national labor averages. Employment in meat products, preserved fruits, and vegetables processing are five times greater than national rates while fats and oils processing is three times more concentrated in southeastern and south central Minnesota than in the rest of the country.

Together these location quotient calculations indicate that Southeastern and south central Minnesota has a much higher than national average employment concentration in food processing and that the industry is relatively specialized. Location quotients greater than one generally signal that local industries serve markets outside the regional economy.

For a more detailed subsector analysis, four digit SIC code data from the University of Minnesota Duluth provides employment and location quotient estimates for southeastern and south central Minnesota food processors. The following food processing subsectors show increased location quotients in southeastern and south central Minnesota from 1990 to 1993:

Table 12: Four Digit SIC Codes for Food Producers with Rising Location Quotients

Sector and SIC code	**LQ 1990**	**LQ 1993**	**Change in LQ**	**Employ-ment 1990**	**Employ-ment 1993**	**Change in Employment**
Malt (2083)	37.15	37.92	.77	123	119	-4
Creamery butter (2021)	10.74	16.33	5.59	49	62	13
Cereal breakfast foods (2043)	8.48	14.75	6.27	320	587	357
Flour and other grain mill products (2041)	10.03	10.88	.85	309	373	64
Cheese, natural and processed (2022)	9.24	10.43	1.19	766	954	188
Edible fats and oils, n.e.c. (2079)	5.03	6.95	1.92	120	156	36
Ice cream and frozen desserts (2024)	0.00	6.50	6.50	0	343	343
Sausages and other prepared meats (2013)	2.75	4.87	2.12	520	1,030	510
Animal and marine fats and oils (2077)	2.40	3.11	.71	50	81	31
Frozen fruits and vegetables (2037)	1.75	1.93	.18	195	220	25

Source: Minnesota Regional Manufacturing/Technology Opportunity Assessment: Southeast Region Economic Base Report #2. Bureau of Business and Economic Research. University of Minnesota Duluth.

A location quotient of 37 for malt indicates this type of food processing occurs in southeastern and south central Minnesota at 37 times the national average self sufficiency rate. The food processors listed above have very high location quotients and indicate these subsectors are very important to southeastern and south central Minnesota's economic base. Of special note are processors of cereal breakfast foods, cheese, ice cream, and sausages who each added over 150 jobs to the regional economy over the three year period.

The following food processing industries experienced losses in location quotients from 1990 to 1993:

Table 13: Four Digit SIC Codes for Food Processors with Declining Location Quotients

Sector and SIC code	LQ 1990	LQ 1993	Change in LQ	Employ-ment 1990	Employ-ment 1993	Change in Employment
Vegetable oil and mills, n.e.c. (2076)	34.29	31.09	-3.2	74	71	-3
Soybean oil mills (2075)	16.36	12.11	-4.25	273	227	-46
Meat packing plants (2011)	8.94	7.84	-1.1	2,553	2,421	-132
Frozen specialties, n.e.c. (2038)	7.85	7.67	-.18	754	911	157
Dry, condensed, evaporated products (2023)	9.72	6.76	-2.96	307	259	-48
Canned fruits and vegetables (2033)	7.91	6.18	-1.73	916	773	-143
Prepared flour mixes and doughs (2045)	6.60	4.69	-1.91	200	191	-9
Poultry slaughtering and processing (2015)	4.91	2.79	-2.12	2,012	1,390	-622
Candy and other confectionary products (2064)	1.37	1.31	-.06	147	160	13
Fluid milk (2026)	2.44	0.66	-1.78	405	105	-300

Source: Minnesota Regional Manufacturing/Technology Opportunity Assessment: Southeast Region Economic Base Report #2. Bureau of Business and Economic Research. University of Minnesota Duluth.

The above food processors all show very high location quotients for the region, but over the three year period these industry subsectors have experienced decreasing location quotients. Decreasing location quotients, coupled with employment losses, are indicators of an industry subsector loosing its competitive advantage. Meat packing plants, canned fruits and vegetables, and fluid milk producers have all lost over 100 employees from 1990 to 1993. Poultry processors show the greatest loss in competitive advantage with a halving of its location quotient and a loss of 622 employees over a three year period.

Factor Conditions

Workforce skills

- The majority of food processing tends to be low skill, low wage level employment. Fierce price competition within the industry prevents firms from paying high wages.
- Employers seek production line workers with a strong work ethic. A “Minnesota work ethic” prevails amongst older workers, but not so amongst younger employees. Many firms benefit from an “immigrant work ethic.”
- Some specialized production work requires computer and machinery operation skills. Food processors report difficulty attracting and keeping skilled laborers. Skilled workers often move outside of rural Minnesota to take advantage of higher wages in urban areas.

Much of food processing requires manual dexterity and a strong work ethic. For many types of processors, specific skills are not necessary; the ideal worker would display consistent motivation, attentiveness to tasks, manual dexterity, and good attendance. Wages for the industry range between $6.86 to $10.00 an hour (though wage rates can reach over $13.00 an hour in some larger, well established companies) and upward mobility within production line work tends to be limited. Company leaders in one focus group session talked of a "Minnesota work ethic" that older workers share but that no longer prevails among younger workers. Food processing employees often are farmers working in the plants during the winter or individuals working part time to supplement family incomes. Honeymead Products Company, a soybean processor, values skills learned by individuals with a farming background. These employees tend to be generalists who operate and repair a wide range of processing equipment and value life in rural areas.

Some food processing companies increasingly employ migrant, immigrant, and refugee labor for processes which do not require communication in English. The turkey processor Jerome Foods reports 65%-70% of its production line workforce does not speak English. On the plant floor employees represent eight distinct cultures and speak eight distinct languages.

New technology within food processing demands an increasing proportion of the workforce to possess computer and machinery operation skills. Price competition within the industry prevents most firms from paying at the high end of the wage scale. Individuals who possess technical skills often migrate to urban areas where wages are higher. Machine repair and maintenance, instrumentation, and electrical repair are skills in high demand but short in supply.

Education and Training

- Food processors provide in house instruction or contract with consultants to meet training needs.
- Public universities and technical colleges need to design more courses and programs that are responsive to the specific requirements of food processors.

Food processors need highly specific, short term training relevant to their particular types of production. For food handling or sanitation processes, firms hire private contractors or design in house training. For hard to hire skills in programming and operations control, companies send employees to local educational facilities.

The president of Zumbro/IFP, Inc., a value added custom food processor of packaged or dry ingredients and finished food products, wished to see the University of Minnesota's agricultural programs become more responsive to the training needs of regional food processors. The college of Agriculture, in conjunction with local food processors, could use interactive television and design courses addressing specific sanitation, instrumentation, or food handling techniques. Some local institutions, such as Riverland Technical College in Faribault, offer courses in statistical process control that food processors find valuable to their operations. In the past, area technical colleges offered evening courses in sheet metal, machinery repair, instrumentation, and computer applications. Food processors report many technical schools place a greater emphasis on offering credit courses that can transfer to four year institutions and do not place as many resources in trade skills. As a result, technical schools lost some of their best night school instructors and companies feel they are not obtaining optimal use of educational resources.

Infrastructure

- Currently regional food processors tend towards concentration in the fiercely competitive primary processing industry.
- Higher profits may await value added food processors; but success in this market niche coincides with product innovation and proximity to the major consumer markets of Chicago and the coasts. However some regional firms have successfully entered the national custom food packaging market.
- Southeastern Minnesota's future competitive advantage may lie in the industry's ability to devise new ways to take advantage of its proximity to the primary processing market and the availability of low cost labor during non-peak periods.
- Regional firms will continue to consolidate and contract unless the industry better balances primary and value-added processing.
- For primary food processors, freight costs and proximity to agricultural raw commodities are critical to continued competitive advantage. Roads are adequate, but some Minnesota rail lines have fallen into disrepair.
- Affordable housing remains a concern in rural areas, especially for those communities facing suburban growth.

Two categories of food processors exist within the industry; primary and value-added. Primary processors take a raw commodity such as milk and produce cheese or take peas and can the vegetables for consumption or further use. Value added processors take the product of the primary processors and do extensive refinement to create finished products such as microwave popcorn or ready to eat meals.

Southeastern and south central Minnesota with its rich, black soil provides farming opportunities in vegetable, fruit, dairy, hog, and poultry production. Primary processors' proximity to growers created a historical competitive advantage for the region. Competition within the primary processing industry is very intense, leaving very narrow margins for profit.

A number of food processors believe greater profits lie in value added production, especially for innovative firms with early entry into consumer markets. However, successful value added processing requires extensive packaging. Some believe extensive packaging is best performed in plants in close proximity to the heavily populated consumer markets of Chicago and the coasts. The market for value added processing simply is not large enough in Minnesota. However, several national custom food packaging firms, such as Zumbro/IFP, Inc. in Faribault, Rytway Packaging in Northfield, and Creative Contract Packaging in Austin, successfully operate in southeastern and south central Minnesota. Dr. Sander of Zumbro/IFP, Inc. notes that though the consumer market in Minnesota is relatively small, opportunities for regional firms to build service businesses are excellent due to raw commodity proximity. Steve Lagasse of Dean Foods believes southeastern and south central Minnesota processors can maintain their historical competitive advantage if the industry finds new ways to benefit from their proximity to the primary processing market and the availability of low cost labor during non-peak agricultural periods.

Some businesses expressed an interest in eventually breaking into the value added markets, especially since the Midwest is centrally located and ideal for consumer distribution. But to date many area firms have been unable to break into value added processing. This leaves many southeastern and south central Minnesota companies in the more competitive primary processing market. To reduce costs and survive the fierce competition, numerous firms have consolidated, merged, or been bought out buy larger national and international companies. Small companies specializing in frozen foods have experienced the greatest amount of consolidation in recent years, followed by canned vegetable processors. Larger companies have maintained their market shares. Lagasse observes that the food industry in Minnesota will continue to contract and consolidate unless the industry does a better job balancing primary processing with value added processing.

Like many rural areas throughout greater Minnesota, affordable housing for workers is a concern for the region. Southeastern and south central Minnesota faces a challenge of not only a lack of housing, but of rising property and home values as the Twin Cities metropolitan area expands into towns like Northfield. Industry wages tend to be modest, making it difficult for families to afford home ownership.

Proximity to raw commodities is the competitive advantage southeastern and south central Minnesota offers to the food processing industry. This proximity to raw commodities is especially critical to the viability of area primary processors. Packaging costs are about equal for all industry competitors; freight costs are the competitiveness tie breaker with processors that are more distant from market. Companies generally agree the region has an adequate highway system. Vegetable processors depend upon rural rail lines to transport commodities and processed products. Rail lines into Waseca and Owatonna are adequate, but western Minnesota has railroad maintenance problems. Honeymead Products Company reports that their railroad

turnaround time to the west coast and back used to take 21 days. With deteriorating service, current turnaround time to Chicago is 25 days. Though federal dollars decline and the railroad industry consolidates, agriculture and food processors express a need for continued public support for this mode of transportation.

Home Demand

- Demand for food processed in southeastern and south central Minnesota is national and international in scope.
- The region's central geographic location allows companies to ship products across country.

Decades ago food produced and processed in southeastern and south central Minnesota met a regional demand from the upper Midwest through the Chicago area. With advances in transportation and sophisticated marketing techniques, southeastern and south central Minnesota food processors face a national and international demand for their products. The region's central geographic location allows for cost effective shipping of products across country. Some speculate that this central location may prove more advantageous if companies become more involved with value added processing. Southeastern and south central Minnesota firms may use geographic location as an advantage with the NAFTA treaty. Local companies may export commodities or import raw goods from Mexico, engage in further processing, and then distribute goods to Chicago and the coasts.

Related and Supporting Industries

- Every food processor in southeastern and south central Minnesota enjoys close proximity to their producers.
- Food processors benefit from support and satellite industries that exist within close proximity to their operations.

Proximity to the farm and agricultural abundance are the most important reasons why an extensive food processing industry developed within the region. To assure raw commodities reach the processor and the processed product reaches its destination, private trucking companies developed to provide for the varied transportation needs of the industry. One large meat processor contracts with various local companies to meet their refrigeration needs. Subcontracting even occurs on company premises in production phases vital to operations. For example, one private company leases facilities within a major meat processor's plant and provides customized slaughtering services.

Firm Strategy, Structure, and Rivalry

- Competition is national and even international in scope.
- To survive competition and achieve economies of scale, small firms are consolidating or being bought out by national and international corporations. Production decisions are increasingly being reached in distant headquarters beyond the local plant.
- Unless the industry does a better job balancing primary and value added processing, companies will continue to contract and consolidate.
- Though competition is fierce, some companies share industry specific data.

At one time local processors dotted the rural landscape of southeastern and south central Minnesota and competed with one another for regional demand. Today firms compete on a national and international scale. To help firms survive in larger and larger consumer markets, smaller companies are either consolidating or being bought out by multinational corporations. With these consolidations, production decisions are increasingly being made at a headquarters overseas.

Steve Lagasse of Dean foods stresses that Minnesota processors must take advantage of their proximity to the primary processing market and the regional availability of low cost labor during non-peak growing seasons if the industry wishes to remain competitive. Without a balance between primary and value-added processing, southeastern and south central Minnesota food processing firms will continue to contract and consolidate.

Though every company has its production and sales secrets, some companies share industry specific information. For example, though Jerome Foods attempts to find unique products and therefore does not share certain research and development information, the company does share agri-metrics statistical information once a month with other turkey processors. The Midwest Food Processors and the AgriGrowth Counsel are other examples of trade groups in which regional firms report participation. Information sharing is common between suppliers and subcontractors, though again firms are careful to not divulge secrets concerning new product innovation.

Government

- Industry leaders call for farmer friendly attitudes and a balance between environmental concerns and the needs of agriculture and processors.

Of great concern to southeastern and south central Minnesota food processors are local ordinances and zoning laws that attempt to regulate animal farm production. Swine farmers were amongst the first producers to face local ordinances limiting the number of animals raised per farm. Families employed in the Twin Cities metropolitan area are moving into new suburbs created in southeastern Minnesota. For those people whose incomes are not dependent upon agriculture, there is a growing intolerance to the negative side effects of the agriculture and food

processing industries. Jerome Foods expressed concern about ordinances passed in Steele and Rice counties to limit the number of turkeys farmers may raise per lot. Such limits on turkey farmers decrease processing capabilities and pose production challenges.

Companies wish to foster farmer friendly and producer friendly attitudes amongst residents and local government leaders. Industry leaders call for a balance between responsible animal and pesticide waste management and their need for sufficient quantities of raw commodities. As the Del Monte company representative stated, “One cow is not an environmental problem. The waste from thousands of cows is a problem. We in the industry must acknowledge an environmental problem exists and we must develop techniques to handle it or we shall go out of business.”

IV. Recommendations for the Region

Workforce

Across the four industries highlighted in this report, company representatives note worker skill deficiencies in the following critical areas:

- problem solving
- ability to work in teams
- listening, writing, and oral communication
- leadership
- personal motivation, work habits, goal setting, and a focus on quality
- math, science, computer literacy

However these critical skill deficiencies are not unique to southeastern and south central Minnesota. Since many southeastern and south central Minnesota firms do not have strong local supplier or demand networks, a well prepared workforce becomes critical to the comparative advantage of the region. To enhance national and global competitiveness, southeastern and south central Minnesota should build upon its educational and work ethic roots and place high priority on workforce training.

1. Ensure high school students learn necessary skills for the workplace.
To ensure that high school graduates meet basic work skill needs, educators should encourage business and community leaders to take an active role in the education of the next generation. The high school is a critical point for not only transferring specific areas of knowledge, but for developing solid work habits and attitudes.

a. Develop curriculum advisory councils with community and business leaders.
Twice a year, district school boards should meet with business and community volunteers to review present course work requirements and make curriculum recommendations that ensure students have the opportunity to learn basic workplace skills. Business, Senior Corps of Retired Executives (SCORE), and community volunteers should present their recommendations in the form of a skill preparedness report card to the media and local school districts.

b. Promote mentoring programs.
Many high school students fail to see the connection between what is learned in the classroom and how it fits in with "the real world." Other students lack information about possible careers. Often guidance counselors promote four year liberal arts educations at the expense of not fully promoting technical college degrees. To address these issues and make the classroom come alive, high schools should foster mentoring partnerships with local business leaders. Company leaders, such as Mike Cichanowski of We-no-nah Canoe, currently volunteer as mentors to at risk high school students in the Winona School District.

Volunteers act as role models, encourage students to stay in school, and provide information about career options that do not necessarily involve a traditional four year college degree. Mentoring programs such as the Winona at risk program could be expanded to include a wider range of youth and business volunteers. A local business or nonprofit organization could "adopt" teams of 4-5 students with similar interests and aptitudes. Volunteers could periodically invite student teams to visit the work site, inquire about student's academic progress, and informally advise students about skill needs in their particular industry.

c. Create hands-on applications.

To increase problem solving and team work skills, high school teachers could work with local businesses to create group projects with real world applications. For example, a local laboratory could ask a chemistry class to analyze area ground water for contamination. Students would be divided into teams and use the knowledge they develop in the classroom to solve problems on their project. Student teams would present their findings in oral and written presentations to representatives from the sponsoring business. Prizes could be awarded to the most innovative teams with the best performers invited to lunch with the mayor, business, media, and community leaders. Every student by the time they graduate from high school should have participated in at least one hands-on team project.

d. Develop apprenticeship programs.

The region reports a shortage of machinists, welders, and other technically skilled workers. High schools could work in conjunction with area manufacturers and technical colleges to develop work site apprenticeship programs. Course work should include hands-on learning at local shops along with instruction from technical college instructors. High school students enrolled in such courses would receive advanced credit which they may apply at the regional technical colleges and universities.

2. Make certain that skills acquired in post secondary education meets the needs of area industries and the workplace.

Composite industry leaders have formed advisory councils with Winona State University and Winona Technical College to review curriculum within the composites materials programs. Other industries could take the example of composites entrepreneurs and advise area post secondary institutions in course design and curriculum requirements. Without continuing input from the business community, it is difficult for academics to keep pace with the ever changing demands of the labor market.

Two year technical colleges suspend or close programs when enrollment levels drop below 14-20 students per instructor. Technical college enrollment in critical skill programs tends to drop when unemployment rates are low. Southeastern and south central Minnesota unemployment rates are at a low of 2.9% which may partially explain why fewer students are enrolling in various technical college programs than prior years. When the Minnesota State Colleges and Universities evaluate the option of suspending or eliminating programs, it should take into account low unemployment rates and the effect program suspension may have on critical industries to a region.

A number of businesses in Rochester spoke of a need for a four year post-secondary institution in the area. Though it is doubtful a new college or university will appear in the region, community leaders could speak with regional institutions that provide extension degrees. If demand is great enough, more college courses could be offered at community centers. The local technical college could develop a limited number of four year programs specifically geared to the local software or business management needs. The University of Minnesota is currently accessing local educational needs and the role it should play within the region.

3. Expand training to workers currently within the labor force.
One area business executive spoke of the need to quickly provide continuous and cost effective worker retraining. Modeled on "just-in-time" product delivery, community colleges and worker retraining programs could provide a "just-enough" skills curriculum tailored to industry needs. To make worker retraining cost effective for both the business and the supplying agency, more courses should be targeted to industry specific skills rather than classes designed to meet the needs of individual firms.

4. Explore child care and elderly care issues.
As more households are headed by a single parent or as households report both parents participating in the labor force, workers will place greater demands on quality day care provision. Larger employers can explore on-site day care provision while workers at smaller firms will have to rely on day care provided within the community.

Housing
Develop affordable housing alternatives for rural areas.
As the costs of home construction escalate, expanding industries attract workers, and Twin Cities commuters create suburban housing in the region, residents of southeastern and south central Minnesota face a dwindling availability of affordable housing. County and local governments could modify local zoning ordinances and provide tax incentives to encourage area contractors to build multi-family units. Community housing corporations could facilitate construction of independent living residential complexes for the elderly. By providing attractive and low maintenance housing, the elderly could be enticed to move out of homes too large for their needs and thereby allow families to move into existing housing stock. Municipalities or community housing corporations could provide one-stop centers for information on loan programs, financing, zoning, regulations, and building permits so as to make affordable housing construction more attractive to private developers.

Regulations and Local Ordinances
1. Promote better consistency across municipalities and counties concerning environmental ordinances.
In response to environmental and neighborhood concerns, individual municipalities (especially those experiencing suburbanization) are passing stricter regulations concerning feed lot size and animal waste run-off. However, these ordinances limit the food processing industry's production capacity and makes plant relocation a greater possibility. Rather than assume an adversarial

relationship, industry, residents, environmentalists, and municipalities should collaborate on creating consistent and reasonable environmental alternatives to agricultural wastes.

2. Increase collaboration concerning regulatory issues.
A handful of companies expressed concern over workers compensation regulation in the state of Minnesota. However, much of this issue has been addressed through legislation recently passed by the Minnesota State Legislature. Other companies believe that Minnesota Pollution Control and other state agencies duplicate the work of the federal Environmental Protection Agency and creates unnecessary regulatory hurdles. Companies wish to form a collaborative rather than adversarial relationship with Minnesota regulatory agencies. Industry leaders state that collaborative efforts allow firms to more quickly remedy environmental concerns and avoid litigation delays.

Infrastructure
Reconstruct, maintain, and repair key transportation bottlenecks.
Industry leaders express satisfaction with the majority of infrastructure delivery (water, electricity, gas, telephones, sanitation, etc). However, firms in the vicinity of highways 14 and 61 state these roads need maintenance and reconstruction to limit transportation bottlenecks. Most firms report satisfaction with the Twin Cities and Rochester airports, but companies that fly out of the Mankota airport report facilities are not adequate for business use. Maintenance of existing railroad track as well as more efficient train service would keep a complete range of transportation options open for area industries.

Quality of Life
1. Focus attention to livable wage issues and the needs of the lowest wage workers.
Various lower level production positions do not generate sufficient incomes to adequately support families. To overcome this problem and related social implications, community leaders should explore statewide discussions of earned income tax credit programs, child care availability, and skills training. Increasing numbers of companies rely upon the labor of migrants, immigrants, and refugees to maintain operations within the community. More coordinated efforts are needed in the delivery of social services, skills enhancement, and English as a Second Language training to this important segment of the labor force.

2. Maintain local budgets for education, recreation, and cultural offerings.
In an age of declining public revenues, recreation, sports, adult education, and cultural programs are often the first programs eliminated from budgets. However such measures can be short sighted, especially given the business climate of southeastern and south central Minnesota. Few firms in the region have strong local demand or supplier links for their products. Companies report they remain in the community for the quality of life southeastern and south central Minnesota offers. Company leaders enjoy the region's low crime rates, small town spirit, family centered activities, and natural beauty. Repeatedly in national surveys, Rochester has ranked in the top three locales for best places to live in America. Taxpayers must be educated to these business climate realities and informed that expenditures on education, recreation, and cultural offerings are long term investments in business retention and the health of the local economy.

V. Summary and Conclusion

The Porter diamond provides a useful approach to understanding the success of southeastern and south central Minnesota's industries. Understandably, the four industries analyzed in this study have common factors and characteristics. The following section identifies common attributes between the four industries.

Factor Conditions

Workforce

Workforce issues have been the most critical concern for all four industries. Low unemployment rates and low population densities contribute to a shortage of workers. Food processing, printing and publishing, and traditional manufacturing mainly depend upon unskilled labor and individuals with high school and sometimes technical school education, while computer manufacturing, high technology manufacturers, and software companies rely on individuals with bachelors and graduate degrees. Regional firms compete with each other for workers rather than for customers.

In addition to the skilled worker shortage, a mismatch between educational institutions' instruction and firms' needs has surfaced as a crucial issue. Some companies use in-house training to overcome this selective disadvantage for lower skilled workers and are forced to recruit nationally for higher skilled personnel. Because an adequate workforce is crucial to the current and future success of an industry, it is important that firms, educational institutions, and economic development agencies identify and address such problems.

Although labor shortages and inadequate skills challenge the industries, computer manufacturing, composites, and software benefit from a specialized labor pool within the region.

Infrastructure

Overall, industry leaders are satisfied with the region's infrastructure. Ensuring the region has adequate fiber optics is crucial to the future success and growth of the industries. Highway 14 and 61 need to be upgraded. Many firms rely on the Twin Cities International Airport. While the Rochester airport is good for those firms close to it, the Mankato airport is unsatisfactory.

Government and Regulatory Issues

Industry leaders note that Minnesota's unfavorable business climate made it difficult to compete with out-of-state competitors. Worker's compensation, redundant safety standards, and inflexible waste management regulations create excessive burdens on firms conducting business in Minnesota.

Home Demand

Home demand is weaker in southeastern and south central Minnesota relative to other areas. All four industries' customer base is national and international in scope. The region's central location in relation to East and West Coast customers is advantageous. Yet, some industry leaders felt isolated from both suppliers and customers.

Printing and publishing, food processing, and industrial machinery have a strong historical presence in the region. Each industry has grown beyond its initial demand in the region.

Related and Supporting Industries

The food processing industry benefits from close proximity to their suppliers. Yet, composites, industrial machinery, printing and publishing, and computer related industries rely on national and international supplies. A lack of local suppliers and the need for unique raw materials has forced firms to rely on non-local sourcing.

Firm Strategy, Structure, and Rivalry

Overall, competition extends nationally and internationally. Composites, printing and publishing, industrial machinery, and food processing are diversified industries. Although competitors are abundant outside of the region, local competition is limited.

Entrepreneurship has helped shape successful regional industries. The region's high quality of life, personal connections, and strong work ethic have encouraged entrepreneurs to turn selective disadvantages into competitive advantages. The pervasive entrepreneurial spirit of southeastern and south central Minnesota has fostered the diverse industry clusters to initially establish themselves, and over time, to grow within the region.

As national competition increases and founding entrepreneurs retire, southeastern and south central Minnesota firms are increasingly being consolidated or bought out by international firms. As more decisions are made in distant headquarters and fewer firms rely on local supplies or a local customer base, some community leaders wonder what factors will keep key industry clusters rooted in the region.

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