

# **Economic Impact of the Centers of Excellence**

*A report to the Minnesota State Colleges  
and Universities*

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# Summary

**Intermediate measures of progress indicate that the Centers are moving to fulfill their potential to enhance employment and economic activity in Minnesota. But in many respects it is too early for the Minnesota State College and Universities Centers of Excellence to be having significant economic impact on the Minnesota economy.**

## **Intermediate indicators**

The Centers of Excellence continue to provide valuable *customized training* to businesses in their sectors of focus, even though the economy is weakening in the near term. Over 1,400 incumbent workers enrolled in Center-related for-credit and non-credit customized training courses in 2008.

Increases in the *numbers of associate degrees and diplomas* indicate that the Centers are having the desired impact of increasing the available pool of qualified labor for their target industries. The number of associate degrees awarded in Center-related programs increased by 35 percent from 2006 to 2008, and the number of diplomas increased 15 percent.

Graduates of the programs continue to be hired by industry. Moreover, they are placed in *relatively high-wage jobs* indicating they bring established and important skills to their employers. Center graduates who are employed in industries related to their Center programs are earning close to or above the industry median wage in the year immediately following graduation.

*Businesses in the target industries are engaged* in the Center's activities and supportive of the Centers. In the most recent reporting period, nearly 200 business partners were identified across the four Centers.

These intermediate indicators show that the Centers have reached a point consistent with a vigorous start as measured in the third year of operation. Clearly, this is not the end point anticipated in the authorizing legislation, but it would be judged reasonable and appropriate by outside observers including industry partners.

## **Background**

A report on the economic impact of the Minnesota Centers of Excellence is mandated by the legislation which established the Centers of Excellence program. The four Centers of Excellence funded by the legislative initiative and appointed by the MnSCU Board of Trustees are:

- 360° Manufacturing and Applied Engineering Center of Excellence
- Minnesota Center for Engineering and Manufacturing Excellence (MNCEME)
- Center for Strategic Information Technology and Security
- HealthForce Minnesota

A complete list of the partner organizations for each Center is available in the full evaluation report.

As described in authorizing legislation, the Centers of Excellence are expected to have a statewide economic impact rather than a concentrated impact in a specific region. Moreover, as described in previous years' reports, we conclude that the potential statewide impact of the Centers will develop over time and it is too early in their life cycle to expect to see significant impact on employment and economic activity in the sectors of the economy on which the Centers focus.

## **Comparisons**

A survey of three established centers of excellence in other parts of the country showed only one which measured economic impacts in the way envisioned for the Minnesota Centers.

Building on the examples of other centers, it is clear that any assessment of the economic impact of the Minnesota Centers needs to take into account the actual mix of activities at each center and the priorities given to those activities.

## **Minnesota's economy**

The Minnesota economy, like the nation's economy, faces substantial challenges in the up coming years and the industries served by the Minnesota State College and Universities Centers of Excellence will be important to Minnesota's future economic success.

- For the first time since 1990, it appears that unemployment in Minnesota is closely matching unemployment in the U.S. as the country endures a recession. In the last

two recessions, Minnesota unemployment peaked significantly lower than U.S. unemployment and the difference grew as the recession deepened.

- Manufacturing and applied engineering employment in Minnesota has dropped back to about the 1990 level after rising from 1990 to 2001. That is a much better performance than U.S. employment in this sector which fell 25 percent since 2001 after being essentially flat during the previous decade.
- Healthcare employment in Minnesota shows strong growth, especially since 2002. Over the time period since 1990, Minnesota's employment growth in health care has outpaced the nation's despite being behind through the 1990's.
- Information systems and security employment has fallen faster in Minnesota than in the U.S. as a whole since its turning point early in this decade.

While Minnesota enjoys the highest per capita personal income among states in the Plains region according to the latest Survey of Current Business, it also has the lowest growth rate in personal income. Minnesota needs to seek ways to enhance its competitiveness both vis-à-vis other states and versus international competitors as well.

### **Assessing economic impact**

The MnSCU Centers of Excellence can have potential impact on the Minnesota economy through at least five main channels:

- Training existing workers
- Producing more and better trained graduates
- Consulting with existing businesses and anticipating workforce needs
- Applied research
- Entrepreneurship, innovation, and the formation of new enterprises

The ultimate measures of the final economic impact of the MnSCU Centers should include these quantities for the statewide sectors that the Centers serve:

- Employment growth
- Estimated higher incomes for program graduates working in those sectors
- Production and exports (in goods producing sectors only)
- Investment in research and development

- Survival of businesses and, possibly, establishment and growth of new ones

Not all of these measures will be applied in the same way or will carry the same importance for different centers.

At this early stage in the development of the Centers, it is most appropriate to consider intermediate indicators of progress in building impact through the channels listed above.

# Background

The legislation that granted funds to the Minnesota State Colleges and Universities System (system) for the establishment of up to four new centers of excellence in state educational institutions required that a report be prepared to assess and document the impacts of the centers on the regional economies in which the centers were located. The report is to be made to the legislature in January 2009, during the third academic year of the operation of the centers. Based on the implementation of the Centers of Excellence inside the system, we conclude that the centers are more likely to have impact on certain sectors of the statewide economy rather than in particular geographic areas. Moreover, the main impact will not be felt until several years, perhaps even a decade, after this first impact assessment. This report describes the logic used in reaching those conclusions and then reports on several intermediate indicators of Center impact.

## *Two models*

Any evaluation of the economic impact of the Centers must be based on a model of the operation of the Centers and their connection to the economy. There are two main competing conceptual models that could be applied to describe the workings of the Centers of Excellence. They can be described as the Concentrated Model and the Dispersed Model.

### **Concentrated model**

The Concentrated Model imagines a geographically-focused center housed inside a larger system. This model includes several important elements:

- Faculty and other resources are housed at a single institution inside the larger educational system or, possibly, a small number of related or coordinated institutions located near one another.
- The institution offers a unique, and often advanced, curriculum in the chosen field or fields, unduplicated within the system.
- Undergraduate and graduate students from across the state or region enroll at that institution, either initially after high school or later as they seek specialized training.
- The educational focus is on the initial training of post-high-school students who earn degrees and then move into industry.

- The institution is located near an existing concentration of related industries and employers or such a concentration is encouraged to develop in proximity to the center, in order to facilitate interchange that includes curriculum change, consulting, and applied research.

According to this model, the concentration of academic resources will complement and encourage the accelerated development of a narrow set of industries that locate near the centers in order to hire students, consult with faculty, and develop products and services based on research conducted at the centers.

The desired outcome of implementing a center of excellence following the concentrated model would be the growth of an industry concentration like Silicon Valley in California or the electronics industry that developed outside Boston along Route 128. Another well-known example would be the Research Triangle in North Carolina where three educational institutions supply and serve a concentration of technologically-based industries.

Closer to home, it appears the University of Wisconsin System has implemented a Centers of Excellence program along the broad organizational outlines of this model. However, the Wisconsin Centers are not focused on industrial sectors of the state's economy and, thus, are unlikely to have easily traceable economic effects. In particular, Wisconsin has Centers of Excellence focused on cancer communication, developmental disabilities, women's health research, family studies, neutronics, teaching, and the study of the European Union. Of these seven Centers, only the neutronics center could possibly have the direct industry impact envisioned for the Minnesota Centers.

If a state were to implement an excellence program along the lines of this concentrated model, it would be natural that the economic effects of the centers would be concentrated in the geographic areas near the centers. The chief measures of success would be the number of firms in the particular industries being served, the total sales of those firms, and the total employment at those firms in that geographic area. In addition, it would be reasonable to consider measures of overall economic activity in the region surrounding the center – measures such as total employment, retail sales, and, possibly, home prices. Additional measures might include the exports of those firms to the rest of the United States and the world (if known) and the investment by area firms in physical facilities and research.

## **Dispersed model**

A second model of educational excellence and technology transfer is what we will call the Dispersed Model. This model has attributes that are very different from the Concentrated Model:

- Faculty and research facilities are housed at a larger number of institutions which may be located at some distance from one another, regionally or even nationally.
- The institutions offer a coordinated curriculum in the chosen field or fields.
- Undergraduates, graduate students, and other adult learners may receive certificates and degrees from any one of a number of institutions in the specialized network.
- The coordinating institutions offer a variety of degrees as well as provide training and retraining to existing workers in the selected industries.
- The institutions interact with businesses in the targeted industries that may be located over a broad geographic area.

In contrast to the concentrated model, the dispersed model need not foster the development of geographically concentrated industries unless there are other economic reasons for those industries or firms to cluster in a certain location, such as access to natural resources or transportation services.

Therefore, the success of this dispersed model is most likely to be reflected not in the economic health of a particular geographic area, but rather in the relative performance of the particular industries being served on a statewide basis. Therefore, the approach to evaluating the economic impact of such a dispersed program would be to examine the performance of the targeted industries in the state, looking at data on their employment, sales, and exports.

Obviously, the two models set forth here are two ends of a spectrum of possible ways for colleges and universities to use a focus on excellence to support specific sectors of the state economy.

## ***The Minnesota State Colleges and Universities Centers of Excellence***

In implementing its program of Centers of Excellence, the system chose a strategy that approximates the dispersed model quite closely. The choice of a dispersed rather than a concentrated model fits the economic and educational situation in Minnesota well for two reasons.

First, the four Centers were established to serve existing, relatively well-developed industries rather than to support and develop new fledgling industries. Manufacturing and healthcare facilities are spread across the state rather than concentrated in narrow corridors or islands. And, while information systems firms may be centered in the Twin Cities area, information systems serve enterprises across the entire state.

If, on the other hand, the goal of the Centers had been to begin or nurture an infant industry, a case could have been made for implementing a more concentrated model. In that case, the establishment of a center at a specific institution might have been coordinated with favorable tax treatment for the target industry and, perhaps, other incentives to locate facilities in the geographic area of the host institution.

Second, the system serves a very diverse student body. The average age of students in the system is 29 years and many have families and established jobs or careers as they seek additional training at MnSCU institutions. This would make it difficult for many students to enroll at a single college or university that offered unique training in a given field.

### ***Timing of economic impact***

This evaluation takes place before enough time has elapsed for the Centers to be showing impact on economic activity in the State of Minnesota. Common sense indicates that the full impact of the centers on producing bachelor's degree graduates in certain fields cannot be seen in less than four years of operation. But beyond that, economic experience and a sizable literature on economic development argue forcefully that the growth of clusters of industries take a good deal of time, five to ten years or more. This is so even when the aid to those industries includes direct subsidies rather than the more indirect route taken through fostering educational centers.

Data from surveys of businesses taken earlier in the evaluation of the Centers reinforces that view. Broadly speaking, those businesses expected that the Centers would have some impact on labor supply in their industries within three to five years, but that other effects of the Centers would take longer to develop. Therefore, in this study, we have indicated the measures that make sense in the long-term, but we have also provided some intermediate measures that can give perspective at this time.

# Evaluation of other centers

To gain additional perspective on methods for evaluating the Centers of Excellence, we interviewed the executive directors of three established centers in other parts of the country. These three centers had previously been identified and surveyed by Fieldstone Alliance, a consulting group hired to conduct a study of funding strategies for the 360° Manufacturing and Applied Engineering Center (360°) headquartered at Bemidji State University. We interviewed the center executives with regard to any measurement of impact which they performed or had considered.

## *Three centers*

The three centers surveyed were:

- The Maricopa Advanced Technology Education Center in Arizona
- The Agriculture Center of Excellence in the state of Washington
- The Polymers Center of Excellence in North Carolina

All three centers have been in existence for more than a decade and serve three different industries with widely differing services. They range in staff size from 2 to 18 people and in budget from \$125,000 per year to \$2.1 million dollars. All were asked how they measure their impact and/or how they have considered such measurement. Their approaches varied as much as their activities.

## **The Maricopa Advanced Technology Education Center**

Maricopa Advanced Technology Education Center (MATEC) has been in existence since 1999 and currently has a staff of 12. MATEC develops programs, materials, and training that enable students, faculty, and technicians to continuously master the evolving competencies in science, mathematics, technology, and communications required by the workforce of the semiconductor, automated manufacturing, and electronics industries. A significant activity of the Center is the operation of Net**WORKS**, a National Science Foundation Resource Center that is focused on the advancement of semiconductor, automated manufacturing, and electronics education. The Digital Repository contains classroom ready resources. They provide a National Faculty Externship Program, Online Webinars, and TechSpectives Blog to keep individuals up-to-date with emerging technologies and educational issues.

MATEC is housed at the Maricopa Community Colleges in Phoenix, Arizona. It has partnership agreements with 129 higher education institutions across the nation, 12 of them in Arizona. In addition, it has business partnerships with three large national or international semiconductor industry groups. The Center receives about a quarter of its support from its host institution, about half from the National Science Foundations and the final quarter of its funds from providing contract training and selling training materials.

### **Impact measurement**

MATEC does not do any formal measurement of its impact at the present time, but the director and his staff have considered alternative methods for attempting such measurement. Their favored approach would be to count or estimate the number of additional relevant associate degrees granted in Arizona and across the country as a result of their activities. This is where they feel they have the greatest impact. In addition, estimates of the number of added four-year degrees and the number of graduates of non-degree training courses would also be valuable.

Of course, implementation of such a measurement strategy would involve substantial resources and some sophisticated evaluation to estimate the number of added degrees at 129 partner institutions. Interestingly, the director feels that there is a larger economic impact from developing a large number of two-year graduates as opposed to a small number of four-year degree holders.

In March 2008, an independent consultant performed an evaluation of the largest of MATEC's programs, NetWORKS. The evaluation section of the report focused on: 1) NetWORKS' acquisition of a collection of resources; 2) NetWORKS methods to disseminate learning materials, and 3) NetWORKS methods to advance the capacity of educators to adapt as new technologies and/or learner needs change. The report did not attempt to measure the economic impact of the NetWORKS program, but the consultant recommended that the Center develop more detailed and focused measures beyond simple "body counts" in order to demonstrate the Center's impact.

### **The Agriculture Center of Excellence**

The Agriculture Center of Excellence is located at Walla Walla Community College in Walla Walla, Washington. It is one of eleven identified centers inside the Washington State Community and Technical Colleges. The Center is a leadership concept designed to promote economic development through collaborative processes and partnerships. The Center functions as a resource to other educational institutions and industry, serving as the nucleus for development of curriculum, skill standards and promoting technological

advancements. The 11 Centers in Washington identify best practices and provide workforce training services to industry and educational institutions upon request.

The Center works collaboratively with the Eastern Washington Partnership Workforce Development Council, Walla Walla Port Authorities, Economic Development Council, and other industries and agencies in support of agriculture and agriculture related business initiatives. Among its partners are John Deere Company, Tyson Foods, and the Northwest Food Processors Association. The Center has a small staff of two and a small budget funded principally by the state.

### **Impact measurement**

Despite the focus on supporting economic development in a particular industry, no attempts have been made to estimate the actual economic impact of Center and none are envisioned. When asked about possible impact evaluation strategies, officials talk about measuring the educational efficiencies and costs savings to community and technical college system as a perceived benefit that they might endeavor to measure. However, they do not feel the need to estimate impact in terms of jobs or economic activity.

### **The Polymers Center of Excellence**

Begun in 1994, the Polymers Center of Excellence (PCE) is a not-for-profit organization created by the state of North Carolina to assist the plastics industry through a variety of activities:

- ***Plastics Training:*** They hold one-day classes in plastics selection and polymer properties, plastic part design, injection molding and extrusion. The plastics courses are designed for engineers, technicians, and operators.
- ***Plastic Part Design and Troubleshooting:*** They assist with design and development needs as well as solve part problems.
- ***Plastic Material Property Testing:*** They have a fully equipped material testing laboratory to test plastic properties and composition.
- ***Extrusion Compounding:*** Their twin screw extrusion lines can compound research and pilot-plant quantities of specialty plastic compounds to your specifications.
- ***Injection Molding:*** They can do molding trials and small-quantity moldings on their injection molding machine.

PCE enjoys a close and mutually supportive relationship with the Society of the Plastics Industry (SPI), the American Plastics Council (APC), the Carolinas and Piedmont-Coastal Sections of the Society of Plastics Engineers (SPE), and a large number of private firms. In addition, PCE has formal working partnerships with UNC-Charlotte, NC State University and the North Carolina Industrial Extension Service.

Thus, the Polymers Center of Excellence is primarily a resource to plastics companies. With its extensive equipment and capabilities, it can help businesses to design, refine, and do molding trials of their products – acting as a true partner in bringing those products from concept to finished product. Its educational activities focus mainly on one-day classes for existing workers in the field.

### **Impact measurement**

In the latest fiscal year, the Polymers Center of Excellence reported the following economic impact on the state of North Carolina:

- \$52 million of economic activity
- 92 jobs retained
- 86 jobs created

These estimates come from evaluations that are done on a quarterly basis by the Manufacturing Extension Partnership of the North Carolina State Industrial Extension Service. The Service sends a survey to all of the firms who have done business with the Center. Firms that sell products that were developed with the help of the Center have a relatively easy time in quantifying the impact of the Center when responding to the survey. And multipliers can be applied to the sales and payroll numbers reported by the firms to estimate overall impact from the center's activities in product design and manufacture. No separate formal estimate is made of the impact of the training activities of the PCE. To the extent that the Minnesota centers, especially the two manufacturing-based centers, develop product design, troubleshooting, and process design capabilities, implementing a similar survey could be an important source of information for future economic impact estimates.

## ***Other centers***

In addition, we surveyed information on a wide range of Centers of Excellence, some at universities and some freestanding with ties to educational institutions. We also interviewed a number of administrators at these centers. Outside of the Polymers Center discussed above, we did not find any that expressed their economic impact in economic activity and jobs. Those that provided formal measurement of their operations did so in terms of businesses and/or students served and other measures.

## ***Lessons learned***

From our survey of other centers and their methods of evaluation, we draw a couple of conclusions for the evaluation of the Minnesota Centers of Excellence.

- Seeking to measure the impact of the Centers on final measures of economic activity can be done, but is quite unusual in the field.
- Any assessment of the economic impact of the Minnesota Centers needs to take into account the actual mix of activities at each Center and the priorities given to those activities.

# The Minnesota economic context

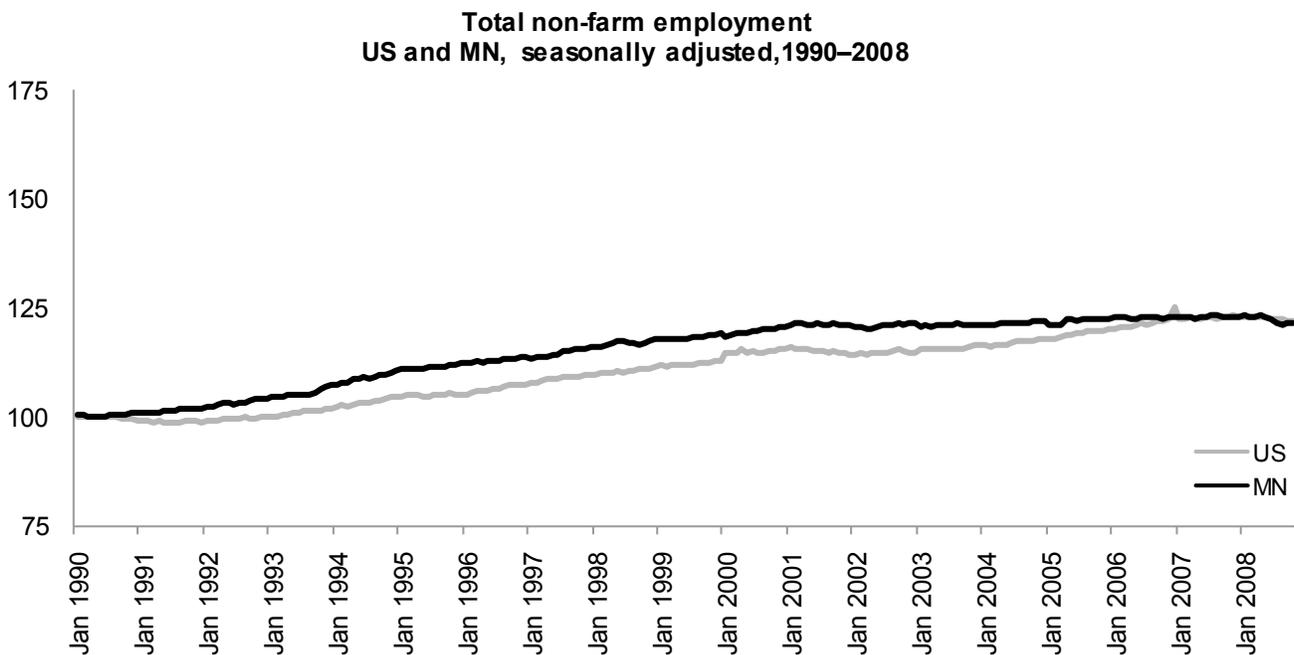
## *Minnesota and the nation*

Overall employment in Minnesota grew faster than the nation throughout the 1990's, but this trend has reversed since then. This can be seen graphically in Figure 1 which shows total non-farm employment, indexed to its January 1990 level. The steeper slope of the Minnesota graph until about 2000 shows higher growth than in the rest of the nation, but the situation reversed in the current decade. In fact, the previous difference in growth in employment has been essentially wiped out – the overall growth rate over the 1990 to 2008 period is virtually the same for Minnesota and the U.S.

Similarly, unemployment was lower in Minnesota than in the U.S. until 2007, though the gap between them has narrowed since the early 1990's. Figure 2 shows the seasonally adjusted unemployment rate in Minnesota and the U.S. from 1990 through 2008. The most striking feature of this graph is that, unlike most of the previous two decades, Minnesota's unemployment rate has been essentially the same as the national rate since the beginning of 2007. The difference in unemployment that may have buffered Minnesota somewhat from the effects of the last two recessions does not seem to exist at the beginning of the current recession.

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### 1. Total employment



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## 2. Unemployment



### *Target industries*

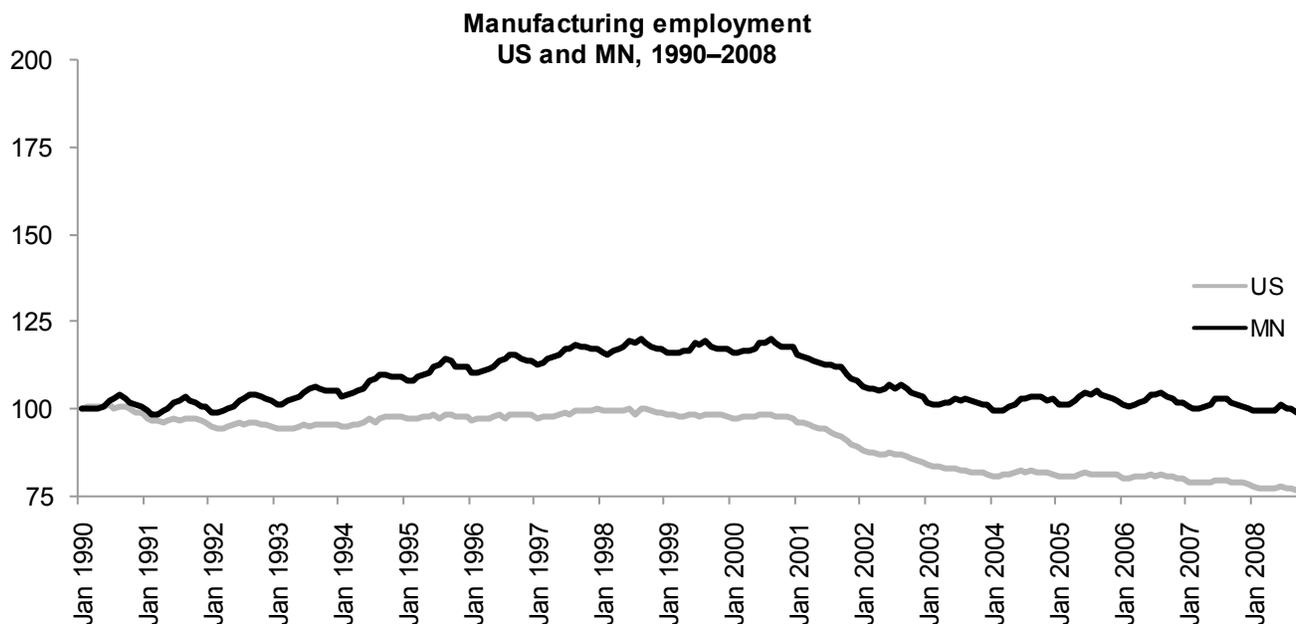
We want to consider how employment in Minnesota has compared to the U.S. in the industries most likely to benefit from the activities of the Centers. To do this, we have used data on employment in the broad classes of Manufacturing, Information Services, and Health Care and Social Assistance. While these employment statistics are not exactly aligned to the Centers and their graduates, they do reflect the industries we believe are most likely to benefit from the activities of the Centers.

In these three classifications, Minnesota has experienced very different employment growth since 1990 and each classification showed distinct differences between Minnesota and the U.S. These trends and differences can be seen in the graphs below, where each series has again been indexed to its January, 1990 level to show growth from that point.

Unlike the U.S. as a whole, manufacturing employment grew in Minnesota during the 1990s. It has since fallen back to about 1990 levels in Minnesota while manufacturing employment in the U.S. has continued to decline since 2000. As Figure 3 shows, while manufacturing employment in Minnesota has struggled, the difference between employment growth in Minnesota and employment growth in the U.S. has been significant and in favor of Minnesota.

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### 3. Manufacturing employment

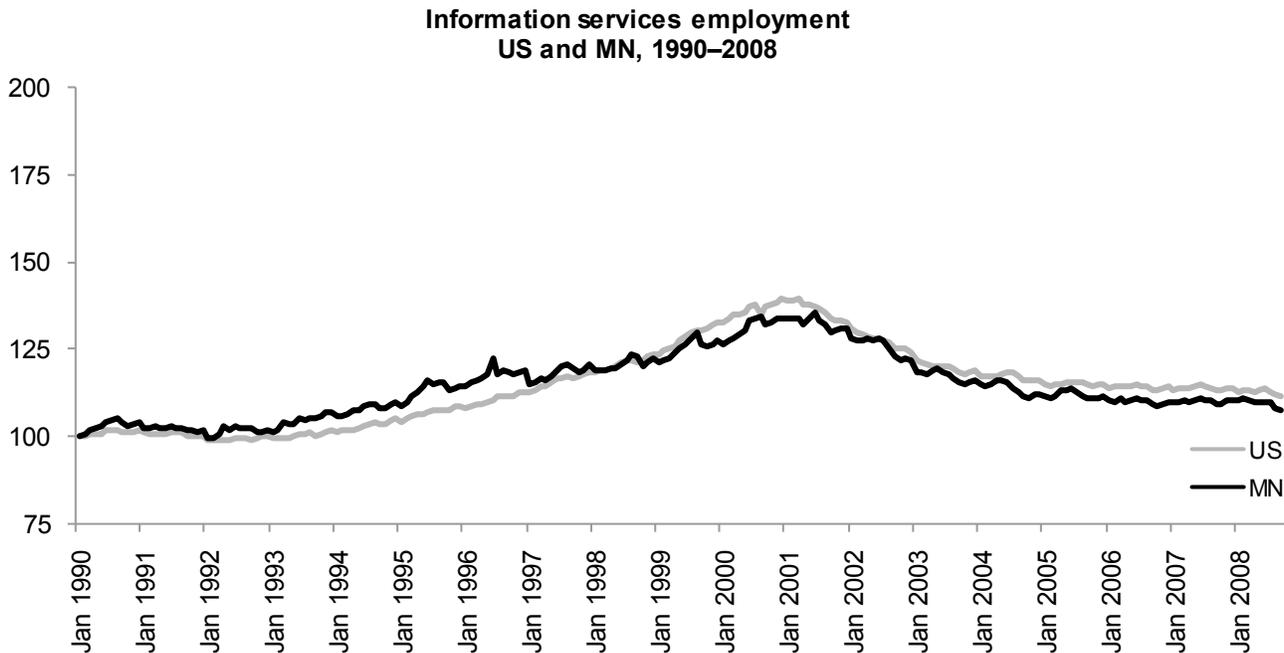


Employment in information services increased rapidly in the 1990's and has since fallen, though not quite back to the 1990 levels. This is true both for the U.S. and for Minnesota, as Figure 4 illustrates. Although the differences between the U.S. and Minnesota are not very large, there was a period in the early 1990's when Minnesota employment in these industries was growing faster than the U.S. This has since reversed and since 2002, Minnesota employment in these industries has been falling faster than the U.S.

Health care employment has seen the largest growth of these classifications since 1990. And this is true for both the U.S. and Minnesota. While growth in Minnesota was lower than the U.S. until 2002, it has since been significantly higher, as shown in Figure 5.

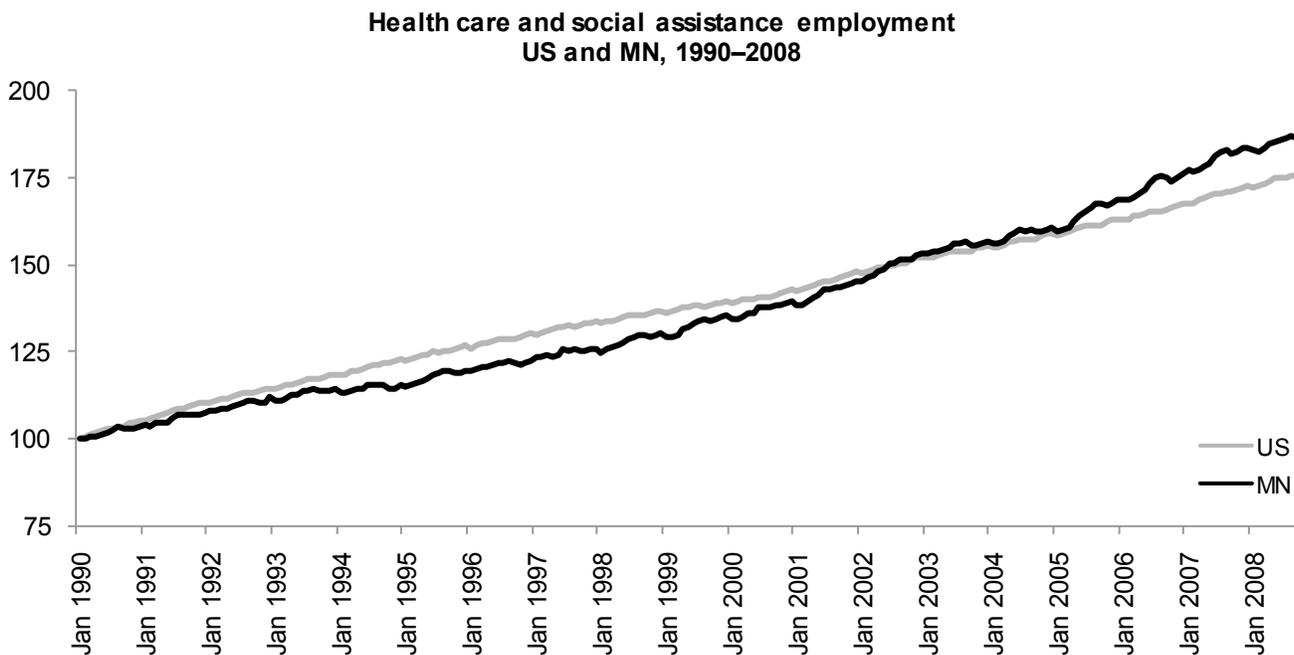
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#### 4. Information services employment



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#### 5. Health care and social assistance employment



## *Implications for the Centers of Excellence*

These three areas, manufacturing, information services, and health care, are important to Minnesota's success. Together, they account for over a quarter of employment in Minnesota. While information services has the smallest employment directly, we believe that graduates with skills in this area are employed in all other sectors as well and expertise in this area is one key to future comparative advantage.

Minnesota enjoys better employment growth in manufacturing and in health care than the U.S. and relies on these industries more than the rest of the country for our economic health. It is in Minnesota's interest to find a way to better coordinate industry employment needs with training in these areas.

For the Centers, this also means that graduates are more likely to find jobs in these fields in Minnesota than in the rest of the country.

---

### **6. Employment in target industry classifications in Minnesota and the U.S., September 2008**

|                                   | <b>Minnesota</b> | <b>Pct</b> | <b>US</b>   | <b>Pct</b> |
|-----------------------------------|------------------|------------|-------------|------------|
| Total non-farm                    | 2,769,549        | 100%       | 137,476,000 | 100%       |
| Manufacturing                     | 334,191          | 12%        | 13,443,000  | 10%        |
| Information Services              | 56,588           | 2%         | 2,966,000   | 2%         |
| Health Care and Social Assistance | 384,152          | 14%        | 15,861,000  | 12%        |

*Sources:* MN Department of Employment and Economic Development – Current Employment Statistics and Wilder Research calculations.

# A model for assessing the Minnesota Centers of Excellence

An approach to measuring the impact of the Centers of Excellence needs to take into account the differing activities of the four centers and the connection of those activities to the Minnesota economy. In this section, we first discuss the different channels through which a Center's activities could affect the state's economy and the expected amount of time for effects to become visible and measurable.

## *Channels of influence*

There are a number of potential channels through which the centers could promote the profitability and growth of businesses in Minnesota. Figure 7 includes the main ones arranged in ascending order with regard to the expected time until measurable effects would be achieved.

---

### **7. Channels of potential impact of Centers of Excellence on the Minnesota economy**

| <b>Channel of impact</b>                                  | <b>Timing</b> |
|---|---------------|
| Training existing workers                                 | 2 to 3 yrs    |
| Producing more and better trained graduates               | 3 to 5 yrs    |
| Consulting with existing businesses                       | 3 to 5 yrs    |
| Applied research  | 5 to 10 yrs   |
| Entrepreneurship, innovation, and forming new enterprises | 10 to 15 yrs  |

While all of these are channels through which any of the Centers may have impact, the relative importance of these may vary as the focus and the activities of the Centers evolve over time.

### **Training existing workers**

The constant enhancement and upgrading of the skills of the existing workforce is of concrete and immediate benefit to Minnesota companies as they cope with competitive pressures and technological change. System institutions already have numerous contracts to do customized training for Minnesota employers. The centers can expand the training of existing workers in their economic sectors in at least two ways. They could:

- encourage additional customized training through industry contacts and coordination among system institutions, and/or
- add new course offerings for which workers would register in order to build important jobs skills.

These activities will benefit Minnesota companies in a number of ways. They would raise the productivity of the existing workforce, reduce the need for companies' internal training, and reduce companies' labor turnover. Recent research has shown a connection between customized training and labor turnover at Minnesota companies. Lower turnover translates in lower costs of recruiting, hiring, and training new workers, dollars that immediately improve the bottom line of Minnesota companies.

If the center provides customized training for existing workers, the economic effects produced through this channel should be the first to emerge. Workers will be more productive at their jobs and, in some cases, move to new levels of responsibility and compensation. While it is very difficult to trace the increased productivity directly, increased wages of workers provide good evidence of this effect.

### **Producing more and better trained graduates**

A second channel of influence is the production of more highly-trained graduates whose skills are more in line with the needs of Minnesota employers in key economic sectors. The advantages for Minnesota companies are obvious. These graduates can be more productive, require less training, and hiring costs should be lower as companies work with the Centers and come to rely on them more heavily as sources of trained workers.

The graduates produced by MnSCU could cover the whole spectrum from certificate programs, through associate and bachelor's degrees and even, in some cases, to graduate degrees. Coordination between the Centers and business partners could also mean that more internship and part-time employment opportunities are developed so that graduates would have significant real-world experience that would make them more valuable to Minnesota employers. As a matter of fact, when businesses involved with the Centers were surveyed as part of the second-year evaluation, the two potential benefits rated most critical were a better qualified pool of employees and an increase in the number of available employees.

Since all of the Centers have a strong focus on producing more quality graduates, this channel should be important to all four. Surveys of businesses connected with the Centers reflect their view that this is an important conduit through which they expect the Centers to add economic value. In those surveys, the businesses state that they expect effects in about three to five years from the beginning dates for the Centers. This accords

with common sense that it takes four years, or more, to produce graduates with four-year degrees. A measure of impact through this channel could eventually be generated by measuring the trend in graduates hired in the target industries and using appropriate multipliers to gross up their wages and business impact.

### **Consulting with existing businesses**

The Centers could facilitate consulting contracts between college and university faculty and Minnesota companies in their chosen sectors. In particular, it would be possible that collaborations could spring up over the course of years that would provide ongoing beneficial information to Minnesota businesses, enabling them to compete even more effectively in national and international markets. These consulting arrangements could either be made directly between faculty members or through a formal entity allied with a specific institution or with the Center itself.

The expected timing for the development of these types of consulting relationships is, of course, highly variable and dependent on a matching of specific company needs and faculty capabilities. It is also plausible that the formation of such relationships will intensify as companies have more experience with the Centers, as more existing workers get training through the Centers, and as graduates are placed at businesses in the sector the Center serves. If this channel becomes an important part of a Center's activities, it is reasonable to expect measurable effects in the five- to ten-year range after the Center's inception.

### **Applied research**

Beyond consulting which would involve the sharing of existing knowledge, it is hoped that the Centers would facilitate the production of new knowledge focused on the needs of Minnesota companies. Such research might grow out of a consulting relationship or result from a company approaching a Center with a question or problem.

It is envisioned that, over time, the faculty allied with Centers would develop expertise that would give them a comparative advantage at providing research relevant to the economic sectors that the Centers serve. This expertise and a possible research partnership with private industry could shorten the time for technology transfer to take place, thereby producing measurable impact on the state's economy sooner.

Like the growth of consulting relationships, the growth of applied research will be highly variable and dependent on a number of factors. Five to ten years is also a reasonable estimate of the time needed to produce measurable impact on the state's economy through this channel.

## **Entrepreneurship, innovation, and the formation of new enterprises**

Finally, over time, it is conceivable that the ultimate effect of the Centers would be to foster the formation of new companies in their areas of industry focus. For this to occur there would have to be a critical mass of companies and workers in given sectors. Moreover, it would take some time for the graduates from the institutions to work in industry and potentially contribute to expansions and startups in Center-related industries.

Examples of industry clusters that develop momentum and generate formation of new enterprises are easy to identify after the fact, hard to predict, and even harder to induce through conscious, focused effort.

Effects on the state economy through this channel of influence are likely to take the longest time to become evident. A reasonable estimate would be 10 to 15 years before it might be clear that a Center was having a substantial effect on the state economy and, even then, it would be challenging to attribute the growth to the Center itself.

## ***Final measures of economic impact***

After sufficient time has elapsed for the Centers of Excellence to be having significant impact, it will be possible to measure that impact in final economic outcomes. The outcome measures should be statewide rather than regional, as discussed above. Here is our list of recommended measures for assessing statewide impact when the Centers have matured.

### **Employment growth**

Employment should be measured in the industry sectors on which the Centers focus. In addition, employment should also be assessed in the occupations in which information services graduates work, since they will be spread throughout a large number of industry classifications. Even within more well-targeted industries, employment growth should be measured against national trends and sector employment in similar states.

### **Higher incomes**

The incomes of program graduates should be compared with the incomes of other graduates and estimates of starting incomes of workers in the industries of focus. If the Centers are producing quality workers, this will eventually be seen in starting wages.

## **Production and exports**

In the manufacturing sectors, it will also be possible to measure production and, possibly, exports of manufactured goods. Obviously, this is not possible for health services or information services.

## **Investment in research and development**

Eventually, as the Centers mature, it will be possible to track research and development spending by certain industrial sectors. In particular, this information should probably be collected by surveying the businesses that have contact with the Centers through training, consulting, research, or hiring. This measure will be most applicable to the manufacturing and information services Centers. Perhaps, impact in the healthcare area can be measured by consulting if such activity develops.

## **Survival and establishment of businesses**

Finally, the Department of Employment and Economic Development now charts the birth and death of firms in the state. Eventually, it will be useful to examine the data on firms in the areas on which the Centers focus to see whether they are having impact through this channel. As stated above, measurable impact through this channel probably takes the longest time to become evident.

## ***Other measurement strategies***

In addition, the Centers may find other ways to have impact on their chosen industries beyond the channels discussed here. For example, the Centers might become leaders in the analysis of change in their industries, providing information that helps businesses anticipate and adapt to change more quickly. The Centers could also become important partners to industry in ways that we may not fully imagine at this time.

As the Centers evolve, additional measures that capture their impact on their focus industries may be developed. It is hard to anticipate how this might happen and some of these measures might be significantly different from one Center to the next.

# Intermediate indicators of economic impact

To assess the likely impact of the Center of Excellence at this early stage in their life cycle, the most appropriate strategy is to examine available data that sheds light on whether the Centers are developing in such a way as to have impact along some or all of the channels enumerated above. We present several of these intermediate measures.

## *Customized training*

Data on the type and volume of customized training provided by the four Centers were collected and analyzed. Training is provided in both credit and non-credit classes on a contract basis with individual employers. A summary of the customized training provided by programs included in three of the Centers of Excellence is included in Figure 8. (The fourth Center reports very little training of this type.)

### 8. Customized training at Centers of Excellence

|                           | 2006       | 2007       | 2008       | Change      |
|---------------------------|------------|------------|------------|-------------|
| <b>360°</b>               |            |            |            |             |
| Number of course sections | 76         | 69         | 41         | -46%        |
| Registrations in          |            |            |            |             |
| Credit courses            | 209        | 162        | 150        |             |
| Non-credit courses        | 782        | 623        | 297        |             |
| <b>Total Enrollment</b>   | <b>991</b> | <b>785</b> | <b>447</b> | <b>-55%</b> |
| <b>MNCEME</b>             |            |            |            |             |
| Number of course sections | 69         | 43         | 56         | -19%        |
| Registrations in          |            |            |            |             |
| Credit courses            | 75         | 101        | 371        |             |
| Non-credit courses        | 642        | 375        | 366        |             |
| <b>Total Enrollment</b>   | <b>717</b> | <b>476</b> | <b>737</b> | <b>3%</b>   |
| <b>HealthForce</b>        |            |            |            |             |
| Number of course sections | 33         | 30         | 32         | -3%         |
| Registrations in          |            |            |            |             |
| Credit courses            | 12         | 108        | 118        |             |
| Non-credit courses        | 451        | 439        | 395        |             |
| <b>Total Enrollment</b>   | <b>463</b> | <b>545</b> | <b>513</b> | <b>11%</b>  |

**Source:** Office of the Chancellor; calculations by Wilder Research.

As the data show, total registrations in customized training classes at MNCEME and HealthForce increased, while registrations declined at 360°. It should be noted that the demand for these courses is affected by industry conditions and the business cycle in general. An economic slowdown began late in calendar year 2007 which may explain why demand for training at 360° fell off in the latest academic year.

Conversely, the economic slowdown is not reflected in demand for customized training at MNCEME. Perhaps, the employers requesting training from MNCEME are in less cyclically sensitive industries than those working with 360°. It is also interesting to note the rapid growth in enrollment in credit courses at MNCEME, a change which represents a shift in the mix of courses rather than an increase in the overall numbers.

The growth in registrations at HealthForce is not surprising given the relative strength of employment growth in the healthcare sectors of the national and state economies. There also, it appears that there is growing interest in credit courses.

In summary, it appears that the Centers of Excellence continue to provide valuable customized training to employers in their sectors of focus, even though the economy is weakening in the near term.

### ***Degrees and other awards***

We analyzed the number of awards of different types at the Centers. The total numbers of awards by Center and by type are included in Figure 9 below. Total awards declined slightly at the four Centers as a group. Total awards grew dramatically at 360°, slightly at MNCEME and declined at the other two Centers between 2006 and 2008.

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## 9. Changes in numbers of graduates and award majors

|                        | 2006         | 2007         | 2008         | Change     |
|------------------------|--------------|--------------|--------------|------------|
| <b>Awards</b>          |              |              |              |            |
| 360°                   | 277          | 384          | 384          | 39%        |
| MNCEME                 | 480          | 531          | 503          | 5%         |
| CSITS                  | 163          | 185          | 162          | -1%        |
| HealthForce            | 2,315        | 2,142        | 2,112        | -9%        |
| <b>Total</b>           | <b>3,235</b> | <b>3,242</b> | <b>3,161</b> | <b>-2%</b> |
| <b>Awards by level</b> |              |              |              |            |
| Certificate            | 1,259        | 1,006        | 836          | -34%       |
| Diploma                | 698          | 787          | 801          | 15%        |
| Associate              | 734          | 930          | 988          | 35%        |
| Bachelor               | 466          | 452          | 461          | -1%        |
| Graduate level         | 78           | 67           | 75           | -4%        |
| <b>Total</b>           | <b>3235</b>  | <b>3242</b>  | <b>3161</b>  | <b>-2%</b> |

**Source:** Office of the Chancellor; calculations by Wilder Research.

It should be expected that, in the first few years of operations, the Centers would have more impact on the number of shorter-term awards - certificates, diplomas, and associate degrees – than on bachelor’s and graduate degrees. And that appears to be the case. Associate degrees granted grew by 35 percent between 2006 and 2008 and the number of diploma awarded rose by 15 percent. The overall number of certificates awarded dropped dramatically, but that change was the result of a policy change at one Center rather than a pervasive shift across all four.

### Associate degrees

A Center-by-Center comparison of the data on these three awards, associates degrees, diplomas, and certificates yield some interesting patterns across the Centers. Figure 10 shows changes in the number of associate degrees at the four Centers.

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## 10. Changes in numbers of associate degrees

|               | 2006       | 2007       | 2008       | Change     |
|---------------|------------|------------|------------|------------|
| <b>Awards</b> |            |            |            |            |
| 360°          | 25         | 56         | 81         | 224%       |
| MNCEME        | 160        | 182        | 190        | 18%        |
| CSITS         | 20         | 27         | 33         | 65%        |
| HealthForce   | 529        | 665        | 684        | 29%        |
| <b>Total</b>  | <b>734</b> | <b>930</b> | <b>988</b> | <b>34%</b> |

**Source:** Office of the Chancellor; calculations by Wilder Research.

The numbers of two-year degrees granted to students enrolled in programs included in the Centers rose at all four Centers of Excellence between 2006 and 2008. The growth ranged from 18 percent at MNCEME to more than tripling at 360°. This result is especially promising because additional two-year degree graduates can be especially productive in the workplace, often with minimal additional training by the hiring firm. Several directors of other Centers of Excellence who were interviewed felt that their main contribution to industries in their states was in producing a large number two-year graduates rather than just a few more four-year grads.

## Diplomas

The overall number of diplomas awarded by the Centers grew 15 percent and three of the four Centers showed relatively similar growth, from 12 percent at HealthForce to 25 percent at 360°. <sup>1</sup> Diploma programs are usually shorter than an associate degree, often one year in length. Figure 11 contains the data on the numbers of diplomas granted.

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## 11. Changes in numbers of diplomas

|               | 2006       | 2007       | 2008       | Change     |
|---------------|------------|------------|------------|------------|
| <b>Awards</b> |            |            |            |            |
| 360°          | 125        | 162        | 156        | 25%        |
| MNCEME        | 110        | 169        | 128        | 16%        |
| CSITS         | 5          | 3          | 4          | -20%       |
| HealthForce   | 458        | 453        | 513        | 12%        |
| <b>Total</b>  | <b>698</b> | <b>787</b> | <b>801</b> | <b>15%</b> |

**Source:** Office of the Chancellor; calculations by Wilder Research.

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<sup>1</sup> The fourth Center, CSITS, grants such a small number of diplomas that its decline is not significant and is reported here only for completeness.

The recipients of these diplomas, like the associate degree holders, will be useful and productive in industry settings and the increase in these awards is likewise an indication that the Centers are having a positive effect on the supply of qualified labor in the focus industries.

## **Certificates**

Figure 12 shows the numbers of certificates awarded by programs included in the four Centers.

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### **12. Changes in numbers of certificates**

|               | <b>2006</b>  | <b>2007</b>  | <b>2008</b> | <b>Change</b> |
|---------------|--------------|--------------|-------------|---------------|
| <b>Awards</b> |              |              |             |               |
| 360°          | 55           | 94           | 73          | 33%           |
| MNCEME        | 61           | 49           | 62          | 2%            |
| CSITS         | 31           | 43           | 24          | -23%          |
| HealthForce   | 1,112        | 820          | 677         | -39%          |
| <b>Total</b>  | <b>1,259</b> | <b>1,006</b> | <b>836</b>  | <b>-34%</b>   |

**Source:** Office of the Chancellor; calculations by Wilder Research.

The overall drop in certificates was almost completely the result of a drop in certificates at HealthForce. That drop was the result of a conscious decision by the institutions in the Center to reduce enrollment in certain certificate programs because of a change in job market conditions. Certificates rose at 360° and were essentially unchanged at the other two Centers.

Taken as whole, the changes in the numbers of awards and the concentration of the growth in associate degrees and diplomas indicate that the Centers are having the desired impact on the labor pool available to their target industries. In later years, it will be interesting to see if the number of four-year graduates and graduate degrees will grow, as well.

## *Employment status of recent graduates*

Another intermediate indicator of the effect of the Centers of Excellence is the employment status of recent graduates. We analyzed data from follow-up surveys of recent graduates done by MnSCU during the year after a student receives an award. Data from those surveys is included in Figure 13.<sup>2</sup>

### **13. Employment status of recent graduates**

|                          | <b>2006</b> | <b>2007</b> | <b>2008</b> |
|--------------------------|-------------|-------------|-------------|
| <b>360°</b>              |             |             |             |
| Number of graduates      | 277         | 384         | 384         |
| Available for employment | 187         | 274         |             |
| Employment Rate          | 96%         | 98%         |             |
| Related Employment Rate  | 93%         | 95%         |             |
| <b>MNCEME</b>            |             |             |             |
| Number of graduates      | 480         | 531         | 503         |
| Available for employment | 318         | 326         |             |
| Employment Rate          | 98%         | 97%         |             |
| Related Employment Rate  | 90%         | 92%         |             |
| <b>CSITS</b>             |             |             |             |
| Number of graduates      | 163         | 185         | 162         |
| Available for employment | 62          | 63          |             |
| Employment Rate          | 74%         | 84%         |             |
| Related Employment Rate  | 61%         | 76%         |             |
| <b>HealthForce</b>       |             |             |             |
| Number of graduates      | 2,315       | 2,142       | 2,112       |
| Available for employment | 1,094       | 946         |             |
| Employment Rate          | 88%         | 96%         |             |
| Related Employment Rate  | 85%         | 91%         |             |

**Source:** Office of the Chancellor; calculations by Wilder Research.

**Note:** Employment rates are calculated as a percentage of the graduates who responded to the survey and were available for work, i.e., not continuing their education or otherwise unavailable.

<sup>2</sup> Survey data for students who graduated during the 2007-2008 academic year were not available at the time of this report.

As data in the figure show, a high percentage of graduates from all four Centers were employed within the year after graduation and almost all of them reported that they were working a field that was related to their degree or award. In fact, for three of the four centers, over 90 percent of the surveyed graduates who were available to work had found jobs related to their courses of study. Data from the surveys of 2008 graduates are not yet available and it is hard to discern a trend from the data for 2006 and 2007.

Success in the job market will always be affected by market conditions, so the percentage of graduates employed is expected to fluctuate. With the ongoing weakness in the economy, it would not be surprising to see a flattening or even a decline in the employment percentages in 2008 and 2009. As the Centers mature and businesses come to rely on them for workers, the absolute numbers will grow, hopefully, while employment percentages remain high.

### ***Beginning wages***

Another intermediate indicator of the success of the Centers is the wage levels at which their graduates are hired. We analyzed data from the Unemployment Insurance Wage Datafile maintained by the Minnesota Department of Employment and Economic Development (DEED). The System obtains actual wages and hours worked for its graduates from data that are reported to DEED for the state's unemployment insurance program.

The DEED records contain not only earnings and hours data for individuals, they also include codes designating the industries in which their employers are classified in the North American Industrial Classification System (NAICS). Using these NAICS codes, we partitioned the recent graduates of each Center into those whose records indicated they worked for employers in the industries on which the Center focuses and those who worked for other employers. We divided total earnings of each group by total hours worked to form estimates of hourly earnings. The results of our calculations are included in Figure 14.<sup>3</sup>

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<sup>3</sup> The calculations of these average wage rates used the same wage data that was used to calculate the wage rates found in Table 23 in the overall evaluation report for the Centers of Excellence, *Responding to Minnesota's evolving workforce needs*, but are not comparable for two reasons. First, mean values were calculated here compared to medians in the larger report. Second, these calculations are weighted by the number of hours worked by each individual rather than counting each worker equally.

## 14. Hourly earnings of recent graduates

|  | 2006    | 2007    | Industry median wage 2007 | Percentage of industry median wage 2007 |
|--|---------|---------|---------------------------|---|
| <b>360°</b>                              |         |         |                           |   |
| Graduates working in manufacturing       | \$16.16 | \$17.97 | \$19.09                   | 94.1%                                   |
| Graduates working in other industries    | \$16.03 | \$16.65 |                           |   |
| Difference                               | \$0.13  | \$1.32  |                           |   |
| <b>MNCEME</b>                            |         |         |                           |   |
| Graduates working in manufacturing       | \$18.79 | \$19.04 | \$19.09                   | 99.7%                                   |
| Graduates working in other industries    | \$17.57 | \$18.81 |                           |   |
| Difference                               | \$1.22  | \$0.23  |                           |   |
| <b>CSITS</b>                             |         |         |                           |   |
| Graduates working in information systems | \$27.12 | \$27.40 | \$23.13                   | 118.5%                                  |
| Graduates working in other industries    | \$22.68 | \$22.51 |                           |   |
| Difference                               | \$4.44  | \$4.89  |                           |   |
| <b>HealthForce</b>                       |         |         |                           |   |
| Graduates working in healthcare          | \$19.31 | \$20.47 | \$16.23                   | 126.1%                                  |
| Graduates working in other industries    | \$13.83 | \$14.04 |                           |   |
| Difference                               | \$5.48  | \$6.43  |                           |   |

**Source:** Office of the Chancellor and Minnesota Dept. of Employment and Economic Development; calculations by Wilder Research.

**Note:** The earning of recent graduates are mean values. Outlying observations in the DEED wage data were excluded before the calculations were made.

Several patterns can be seen in the data in Figure 14. First, the estimated average hourly earnings for the graduates of each Center rose between 2006 and 2007. The earning of graduates of 360° and HealthForce rose more dramatically but the graduates of all four Centers posted increases.

Second, those graduates who we classified as working in firms in the target industries had higher earnings than other graduates allied with the Centers. These differences were especially large at CSITS and HealthForce. (It should be noted it is especially difficult to separate CSITS students into industry groups because information systems are used so broadly through all industry groups. Only students who worked at information systems

firms, internet related businesses and engineering and consulting businesses were counted as working in the target industry for CSITS.)

Finally, the average wages of the graduates of all four Centers who began work in their target industries were close to or above the median wages for all workers in those industries as estimated by DEED.<sup>4</sup> For beginning workers to start at this level is indeed a strong showing. It indicates that graduates bring established skills to their work at those firms and are valued by the firms.

### ***Business outreach***

Businesses in the target industries are engaged in the Center's activities and supportive of the Centers. In a survey of business representatives in the fall of 2007, respondents were overwhelmingly positive about the potential benefits of the Centers for their industries. Figure 15 is reproduced from the 2007 Progress Report. As the data show, these businesspeople were consistently optimistic about the potential benefits of the Centers. Extremely high percentages (in fact, at or close to unanimity for the respondents involved with three of the Centers) rated the possible benefits of better qualified workers, more numerous workers, and the chance to influence curricula as being either critical or very important.

Even the least popular potential advantages such as better information to prepare strategies, networking opportunities with industry peers, and applied research to advance the field were seen as critical or very important by approximately half of the business respondents.

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<sup>4</sup> Strictly speaking, it would be better to compare our calculated mean wages to industry means rather than medians, but the Minnesota Department of Employment and Economic Development prefers to publish medians because wage data often include mistakenly large values that can bias calculation of means. Nevertheless, this approximate comparison shows that wages of Center graduates reflect the strength of the training they received.

**15. Which of these potential benefits that the Centers of Excellence might produce would you rate as critical or very important?**

|   | 360°<br>(N=15) |      | MNCEME<br>(N=15) |      | CSITS<br>(N=18) |     | HealthForce<br>(N=18) |      | Total<br>(N=66) |     |
|---|----------------|------|------------------|------|-----------------|-----|-----------------------|------|-----------------|-----|
|   | N              | %    | N                | %    | N               | %   | N                     | %    | N               | %   |
| A better qualified or educated pool of employees available to employers                 | 15             | 100% | 15               | 100% | 15              | 72% | 18                    | 100% | 61              | 92% |
| An increase in the number of employees available to employers                           | 14             | 93%  | 15               | 100% | 12              | 67% | 17                    | 95%  | 58              | 88% |
| Opportunity for industry to influence college curriculum                                | 14             | 93%  | 14               | 93%  | 11              | 61% | 17                    | 94%  | 56              | 85% |
| Upgraded skills of the workers who are currently in the industry                        | 11             | 73%  | 12               | 80%  | 14              | 78% | 15                    | 83%  | 52              | 79% |
| A more diverse pool of qualified employees  | 12             | 80%  | 10               | 67%  | 12              | 67% | 14                    | 78%  | 48              | 73% |
| Opportunities for industry to interact or become familiar with the work of K-12 schools | 12             | 80%  | 8                | 53%  | 6               | 33% | 13                    | 72%  | 39              | 59% |
| Applied research to advance the field and provide new industry practice                 | 7              | 47%  | 11               | 73%  | 8               | 44% | 8                     | 44%  | 34              | 52% |
| Networking opportunities with industry peers  | 8              | 53%  | 4                | 27%  | 12              | 67% | 9                     | 50%  | 33              | 50% |
| Better information to make projections and preparations for future business strategies  | 8              | 53%  | 8                | 53%  | 8               | 44% | 8                     | 44%  | 32              | 49% |

**Source:** Wilder Research, telephone survey of business representatives, fall 2007.

Additional data supplied by the Centers show that businesses got involved with the Centers and have remained involved in a variety of roles, including serving on advisory boards and subcommittees, donating hours to other activities, and providing other in-kind donations.

The numbers in Figure 16 show that the businesses continue to remain active and involved with the four Centers. And anecdotal evidence also supports the contention that enthusiasm for the Centers remains high.

**16. Industry involvement, by Center**

|                                     | 360° | MNCEME | CSITS | HealthForce | Total |
|-------------------------------------|------|--------|-------|-------------|-------|
| Number of business partners in 2008 | 59   | 29     | 79    | 20          | 186   |
| Number of partners in 2007          | 38   | 25     | 48    | 64          | 172   |
| Number of partners in 2006          | 63   | 31     | 45    | 35          | 172   |

**Source:** Data provided by Centers, with calculations by Wilder Research.

This continued business involvement and the outreach by the Centers holds the promise that additional consulting and research opportunities may develop as the Centers mature. To date, there has been only limited applied research and consulting, but the experience of other Centers around the country whom we interviewed supports the view that such activities may become increasingly likely as time passes and partnerships between the Center and industry businesses deepen.

For those partnerships to deepen and for the complete potential of the Centers to be realized, it is critically important that the activities of the Centers be continued and sustained in a way that builds business confidence. As businesses come to rely on the continued presence of the Centers, they will collaborate more readily and more often and start to include the Centers as permanent elements in their longer-term strategic plans.

### *Summary*

**Taken as a whole, these intermediate indicators show that the Centers have reached a point consistent with a vigorous start as measured in the third year of operation. Clearly, this is not the end point anticipated in the authorizing legislation, but it would be judged reasonable and appropriate by outside observers including industry partners.**