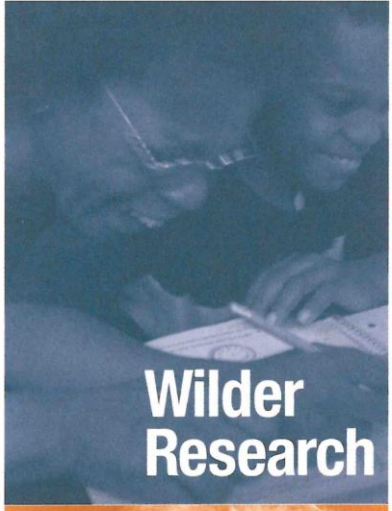

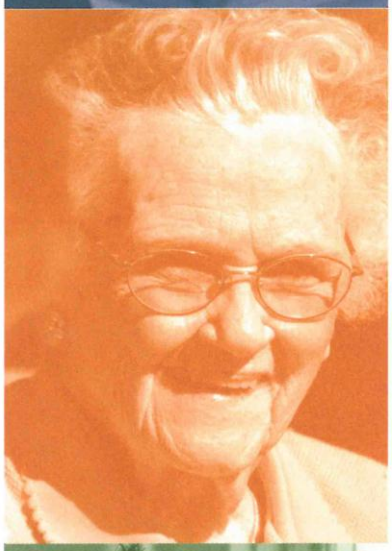

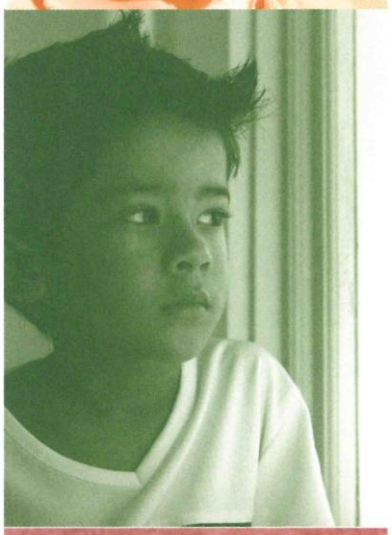

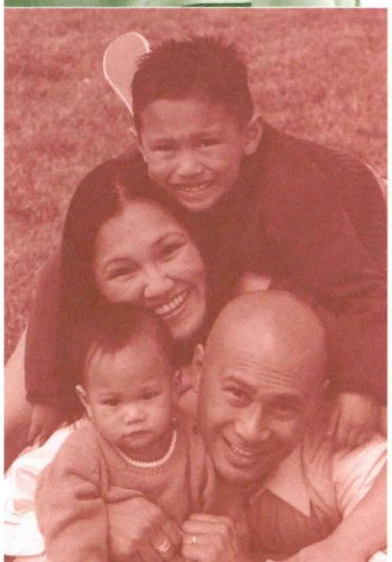

2011 Evaluation of the Centers of Excellence

Entities established within the Minnesota State Colleges and Universities system

AUGUST 2011

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Summary

Four Centers of Excellence were created in 2005 as part of the Minnesota State Colleges and Universities system. They were an initiative of the Governor and enacted by the legislature with initial funding of $10 million per year for the first four years. The four Centers are:

- 360º Manufacturing and Applied Engineering Center of Excellence (lead university: Bemidji State University)
- Minnesota Center for Engineering and Manufacturing Excellence (MNCEME) (lead university: Minnesota State University, Mankato)
- Advance IT Minnesota (lead university: Metropolitan State University)
- HealthForce Minnesota (lead university: Winona State University)

The Centers are charged with multiple purposes. With their unique structure they can accomplish a number of important functions that are less readily accomplished by traditional institutions. These distinctive capacities align closely with the strategic directions of the system, as shown in the figure below.

ALIGNMENT OF THE STRATEGIC DIRECTIONS OF THE SYSTEM AND THE DISTINCTIVE CAPACITIES OF THE CENTERS

Strategic directions of the system	Distinctive capacities of the Centers
1. Increase access, opportunity, and success	Help learners discover and prepare for careers in center aligned fields
2. Achieve high-quality learning through a commitment to academic excellence and accountability	Encourage cross-campus activity to strengthen courses, programs, and learning opportunities
3. Provide learning opportunities, programs and services to enhance the global economic competitiveness of the state and its people	Strategically expand and strengthen pathways for communication among all partners including industry, education, and learners Identify industry opportunities and the related workforce preparation these opportunities require
4. Innovate to meet current and future educational needs	Champion changes in the content and delivery of educational programs and services
5. Sustain financial viability during changing economic and market conditions	Produce revenue and leverage additional resources

Summary of conclusions

The findings of the 2010-2011 evaluation support the following conclusions about the operations and impacts of the Centers to date.

Outreach work continues to expand in scale and strengthen in effectiveness

- Besides strong outreach to traditional students, efforts are growing to reach out to nontraditional learners (dislocated and incumbent workers).
- The engineering component of Project Lead the Way may be approaching a tipping point in its level of adoption. Efforts should be continued to further integrate the curriculum into the K-12 standards and recognize its college-level rigor.

Centers continue to engage a strong set of industry partners

- Centers have different structures for engaging industry. No single model appears to be most effective. Hands-on industry participation to identify needs and help to prioritize (but not design or dictate) solutions appears to be most helpful in maintaining energy for ongoing participation.

Centers are helping to increase institutional collaboration across the system

- Cross-campus relationships are growing stronger and expanding. New institutions are becoming involved even if they are not formal partners, bringing more of the resources of the system into play to meet industry needs.
- Center-to-Center partnerships are expanding from sharing ideas to also include joint projects.

Centers' status independent of specific programs and departments helps them promote innovation

- They are able to use their position to be neutral conveners and arbiters.
- They can use funds to promote priorities that are essential to an industry sector but do not rise to the top for any individual institution.
- They can use funds to cover early risks, incubate innovations during a period of piloting and development, and allow them time to grow and take hold.

Fiscal arrangements are not yet consistent

- Non-standard job descriptions for Center staff make it hard to appropriately rate positions for competitive pay. This, combined with the inability to guarantee multi-year job availability, makes recruiting Center staff challenging.

- Most financial arrangements (through host universities) appear to be working smoothly. However, the reliance on standard policies can sometimes limit Centers' ability to innovate to become more self-funding.

Champions matter for innovation, and are needed at both institutional and systemwide levels

- Centers function both within and next to institutions. This allows them to act as quasi-peers to promote innovation at the program and institutional levels, with the partnership of faculty and administrators who help champion the work.

- An increasing share of Center efforts now have system-wide impact and depend on follow-through at the system level. Center and institutional staff are less effective as champions at this level.

- Research on innovation in industry shows it is important to have high-level leadership that manages the relationships between standard and innovative parts of the overall organization. This leadership is also needed to help support the mainstreaming of successfully piloted innovations into the wider organization.

- Since the formation of the Centers, many staff in the system office have worked with Centers and their academic partners and helped to support their work. Given the continued evolution of the Centers, and the reduction in central office staff, this would be a good time to re-examine what kinds of system-level capacity and relationship with the Centers would best serve the Centers' and system's needs going forward.

Findings on 2010-2011 impacts

Strategic Direction 1: Increase access, opportunity, and success

This strategic direction includes outreach to K-12 educators and students, development of career and technical education opportunities, and outreach to non-traditional and underserved students.

Centers continue to increase the scope and variety of outreach efforts, both to traditional and non-traditional students. Based on surveys of participants, 2010 summer camps were more effective than 2008 camps in increasing students' confidence in science,

technology, engineering, and mathematics (STEM) skills, interest in the field, and awareness of careers in the field.

Strategic Direction 2: Achieve high-quality learning through excellence and accountability

This strategic direction includes efforts in joint training and industry outreach, as well as internship opportunities and work to promote the development, articulation, transfer, and sharing of courses and programs.

Except at one Center (360°) the pace of creation of new courses appears to have slowed slightly over the past two years. However, new programs have been created at an increasing pace, and these new programs are increasingly coordinated across institutions.

Most new programs are too new to have produced graduates to date. However, in the courses that Centers helped to create or modify, enrollments since 2006 have totaled over 2,200 students.

Strategic Direction 3: Provide learning opportunities to enhance global economic competitiveness

This strategic direction includes the Centers' system-wide role in addressing issues for their own industry sectors, facilitating responses including program development to meet industry workforce needs, and convening industry and educational groups as needed. Activities for 2011 included development of online multi-campus courses and programs; development of specialized "middle-skills" offerings; and convening of multi-institutional meetings between industry and academic representatives.

Centers continue to expand their relationships to industry and public agencies. The processes for working with these partners vary greatly among Centers, reflecting differences in industry sectors and Center histories and cultures.

One measure of industry support for Centers is the level and type of their engagement. In 2010, 199 organizations contributed a total of 4,381 hours to Centers' work. Besides donated time, 32 donated equipment or other in-kind resources, 4 made cash financial contributions, 11 hosted student interns, and 8 requested research or consultation.

Strategic Direction 4: Innovate to meet current and future educational needs

This strategic direction includes strategic, peer-reviewed support for innovations and expansion of effective practices and support for new and/or shared delivery modes. Centers' support for innovations was assessed this year through case studies, described in a later section.

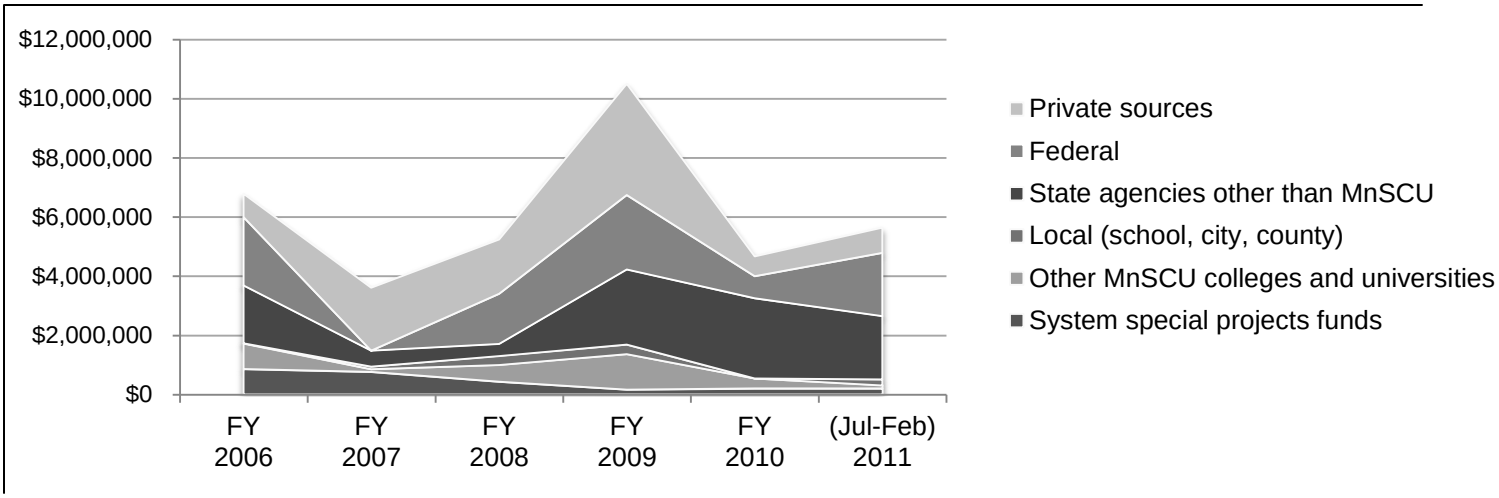
Strategic Direction 5: Sustain financial viability during changing economic and market conditions

This strategic direction is of interest to the system office in order to support funding diversification within each Center.

Centers continue to bring in, or help their partners bring in, more outside dollars than the amount awarded in the base funding from the Board of Trustees. (Figure below.) Two Centers (360° and Advance IT) are showing more success than the others in securing funding that can support ongoing Center operations, while the other two report that most of the leveraged funds go to specific activities of Center partners.

The total amount of leveraged funding, and the mix of sources, continues to vary considerably from year to year. Based on funds received through the first eight months of 2011, the Centers had already exceeded 2010 totals and appeared to be on a pace to have their second-most successful year since they began.

LEVERAGED AND MATCHED FUNDS BROUGHT IN BY OR BECAUSE OF CENTERS, BY YEAR AND TYPE OF SOURCE



Findings on innovation

As part of the 2010-11 evaluation, Wilder Research undertook a "mini-case study" in each Center. Each examined an initiative that could be considered an incubator, representing a new approach at a small scale, with the potential for expansion. Case studies explored the process of innovation including its context, challenges encountered, and factors that helped promote success. The initiatives described in the case studies are the following:

- **360°:** Development and implementation of a suite of online, cross-campus courses, organized into new certificate programs, and offered as part of a multi-campus partnership called "eTECH."
- **MNCEME:** A new collaboration between two-year and four-year instructors within the civil engineering field in which students at both levels gain hands-on experience with the contracting process and how each type of professional adds value to the other's work.
- **Advance IT:** The SAP (Systems, Applications, and Products in Data Processing) Partnership and Curriculum Project, a response to an urgent industry need for workers trained in a rapidly emerging content area.
- **HealthForce:** The process of developing the Health Science Associate of Science broadfield degree, a statewide common curriculum plan that allows students to transfer 60 credits of coursework in the general health sciences and general education to a four-year program in a specific healthcare discipline.

Factors that promote innovation

The following factors were observed in multiple case studies as helping to promote innovation. A combination of these factors seems to be most effective in moving innovation forward:

- Relationship building through networking
- Having an "insider" as a leader within the system who is also a neutral point of contact to bypass political issues
- Collecting and using good data to better understand industry needs, partners' attitudes, successful approaches elsewhere, etc.
- Access to additional and/or external resources that can be dedicated to needed areas. The access may require specific skills, relationships, time, and/or logistics

Barriers to innovation

The barriers to innovation were more varied than the supportive factors, and depended more on the specific type and location of the effort. The following factors were observed as slowing or limiting the success of innovative efforts:

- Scarcity of resources, particularly staff time
- Difficulty maintaining adequate coordination and momentum of multiple partners over an extended period of time
- Limits to how widely the potential partners share a sense of priority or urgency for the innovation; loss of enthusiasm when the project requires changes in resource allocation or bureaucratic requirements
- In some but not all cases, fear of increased cost or loss of revenue

Adoption of new curriculum or new delivery methods also requires faculty and students – and ultimately employers – to think differently about when and how learning occurs, and the conditions needed for the acquisition of high-quality skills. Change in these attitudes is likely to take considerable time. It will be helped by successful results from initial efforts such as those described in the case studies.

Unique features of Centers that make a difference

The case studies illustrated certain unique features of the Centers that allow them to advance innovations within the system that other entities (institutions or departments) are less well positioned to accomplish on their own:

- Centers have time, resources, and staff dedicated to specific goals related to industry workforce needs and promoting relationships and innovation. Institutions and departments have other primary obligations.
- Center leaders combine knowledge of the higher education system with knowledge of their specific industry sector. This combination helps them facilitate relationships and information sharing among the different sets of partners.
- Centers can use their own funds when needed to reduce risks in the early stages of new projects. At least two, and possibly more, of the innovations studied would likely have been cancelled early in their development if institutional partners had had to bear the costs or the risk of losing funds on an undersubscribed offering. The Center can use its funds as venture capital to help keep early stage efforts afloat until they reach a tipping point and can operate with only the usual sources of support.

A review of the research literature found that lessons learned from innovation in industry align remarkably well with what we have learned from the work of the Centers of Excellence since 2006. These include:

Recognize the importance of innovation

The Centers of Excellence have been an important voice within their associated programs and institutions for collecting information on the needs of industry. They have helped elevate partners' awareness of the urgency of industry's need for innovation in educational programs and processes. They also facilitate the link to economic development efforts called for by many national policy researchers.

Generate new ideas by connecting across groups

All the Centers have created new networks spanning groups not previously in regular contact. Besides within their governing bodies, this is happening through other kinds of regular and ad hoc gatherings. Examples include Advance IT's faculty-industry symposium, and the convening organized by 360° to strengthen the articulation of PLTW work into the higher education curriculum. Faculty typically report that such cross-campus gatherings are stimulating and useful.

Separate innovative structures and processes

The research literature recommends separate, parallel processes to facilitate innovation by freeing it from standard control and funding processes. The Centers are hybrid organizations, partially embedded in the system's mainstream institutions but separate from the regular departments and programs. As predicted in the research, this has led to some frictions between new and regular operations. However, it has also generated a number of innovations to date, including significantly increased outreach to potential students, new and updated courses and programs, and increased alignment between programs across campuses.

As the Centers continue to develop more varied sources of income, friction around funding is likely to become more salient. To help manage this tension, the research recommends that the separation of processes include those for reviewing and approving funding for innovation.

Manage the tensions between parallel structures

The research finds that frictions can be reduced, and successful innovations more readily be brought to scale, with leadership at a level above the two parallel processes, helping to manage the relationships between them.

To date, a number of Center-led innovations have been incorporated into regular department and program operations. The scale of innovations is growing: from courses to entire programs; from linkages between pairs of programs to entire multi-institutional consortiums; and from incorporating new equipment or software into existing programs to re-thinking the entire model of how courses and programs are delivered to students.

As this scale increases, the challenges of bringing innovations into the mainstream operations also increase. This is likely to create additional responsibilities for the leadership of the overall system to manage the frictions resulting from those challenges.

Evaluation methods and data sources

Data for this report come from four main sources:

- Using a common template, each Center provided reports on their industry involvement, outreach and marketing activities, leveraged funding, noncredit activities, and curriculum development.

- Data from the system-wide records system was provided by the Office of the Chancellor to show student enrollment numbers in new courses, and graduates and awards in new programs, for those courses and programs developed with the assistance of the Centers.

- Measures unique to each Center, documenting completion of activities specific to their own work plan for 2011, were provided by Center staff from Centers' own documents. These include reports they compiled, web statistics, records of funds awarded for various purposes, and narratives based on their own or others' personal involvement in activities.

- The mini-case studies were compiled based on information gathered by Wilder Research staff through telephone interviews during February and March, 2011. Selection of initiatives to study, and informants to be interviewed, were determined jointly by the Center directors and Wilder evaluators. Four to six interviews were completed for each case study.

Background and introduction

Established in 2005, four Centers of Excellence were created as part of the Minnesota State Colleges and Universities System, funded by a state appropriation of $10 million per year for the first four years. The Centers were an initiative of the Governor and enacted by the legislature with multiple purposes, including creating distinctive capacity within the system, leveraging resources across multiple institutions, providing career ladders with multiple entry and exit points to encourage the growth of the workforce in key industries, and strengthening the state's economy.

The four Centers are described below.

360° Manufacturing and Applied Engineering Center of Excellence

360º Manufacturing and Applied Engineering Center of Excellence is an enterprise dedicated to *building the future workforce for advanced manufacturing in Minnesota through innovative and collaborative education.* 360º seeks to build a pipeline of talented individuals for the advanced manufacturing industry by promoting the industry and providing career information to individuals at all levels from middle school age to adult workers. The 360º Seamless Career Pathway aligns existing curriculum at the member institutions, shows that manufacturing offers a career with no dead ends, and is developing new curriculum to help learners start on the Seamless Career Pathway.

Institutional partners: Bemidji State University (lead university), Central Lakes College, Lake Superior College, Minneapolis Community and Technical College, Northland Community and Technical College, Northwest Technical College, Pine Technical College, Riverland Community College, St. Cloud Technical and Community College, and Saint Paul College

Minnesota Center for Engineering and Manufacturing Excellence (MNCEME)

MNCEME focuses on: filling the K-12 pipeline with future engineers and engineer technologists through Project Lead the Way and other K-12 outreach activities; investing in equipment to enhance and develop curriculum; and working with industry to provide research experts, workforce education, student interns, teaching institutes and long-range recruitment strategies for engaging students in science, technology, engineering, and math. By providing a competitive edge to Minnesota's workforce, the Center helps to ensure the future strength and vitality of Minnesota's economy.

Institutional partners: Minnesota State University, Mankato (lead university), Alexandria Technical College, Anoka Technical College, Hennepin Technical College, Normandale Community College, Northeast Higher Education District, and South Central College

Advance IT Minnesota

The rapidly evolving capability of information and communication technology requires an equally rapid evolution of knowledge and skills. Advance IT Minnesota seeks to engage learners, educators and information technology professionals to develop a more robust IT community in Minnesota. It provides unique business, career development and networking opportunities in collaboration with both business and institutional partners.

Institutional partners: Metropolitan State University (lead university), Inver Hills Community College, and Minneapolis Community and Technical College

HealthForce Minnesota

HealthForce Minnesota is a collaborative partnership of education, industry and community that focuses on transforming health care education and delivery across the state of Minnesota.

Institutional partners: Winona State University (lead university), Century College, Inver Hills Community College, Lake Superior College, Minneapolis Community and Technical College, Minnesota State College-Southeast Technical, Normandale Community College, North Hennepin Community College, Pine Technical College, Ridgewater College, Riverland Community College, and Rochester Community and Technical College

Methods and data sources

For the 2010-2011 academic year, the evaluation of the Centers of Excellence has taken a new approach, which coincides with a new approach the Centers used in planning their work for the year.

In the summer of 2009, based on input from college and university presidents, other administrators, faculty, trustees, system office staff, and industry stakeholders, a core set of Center roles was identified. These represent distinctive capacities of the Centers to meet needs of higher education and industry partners that no other entity within the system is equally well-positioned to accomplish. These were validated in the fall of 2010 in a summit of institutional presidents and other administrators, faculty, Center directors, trustees, system office staff, industry representatives and other external stakeholders. Participants agreed that these distinctive capacities align closely with the strategic directions identified for the Minnesota State Colleges and Universities system, as shown in Figure 1 below.

1. System strategic directions and corresponding distinctive capacities of the Centers of Excellence

System Strategic Directions	Center distinctive capacities
1. Increase access, opportunity, and success	Help learners discover and prepare for careers in center aligned fields
2. Achieve high-quality learning through a commitment to academic excellence and accountability	Encourage cross-campus activity to strengthen courses, programs, and learning opportunities
3. Provide learning opportunities, programs and services to enhance the global economic competitiveness of the state and its people	Strategically expand and strengthen pathways for communication among all partners including industry, education, and learners
	Identify industry opportunities and the related workforce preparation these opportunities require
4. Innovate to meet current and future educational needs	Champion changes in the content and delivery of educational programs and services
5. Sustain financial viability during changing economic and market conditions	Produce revenue and leverage additional resources

For the 2010-2011 year, the Centers prepared work plans that identified intended activities in each of the system's strategic priorities. Directors, staff in the system office, and evaluators also identified a set of measures that all agreed would adequately represent the Centers' accomplishment of the most important elements of the work plans. However, it is recognized that the Centers engage in a wide variety of activities that are too numerous to be described or measured in their entirety by these means.

The selected measures include a combination of common measures that apply to all four Centers and unique measures that provide information more specific to the particular efforts of individual Centers.

The report is organized according to the five strategic directions. Under each one is listed each Center's primary activity for that area and other relevant activities as applicable. These are followed by the results for each Center on the common measures, and then by each Center's unique measures (if any were relevant in that area).

No common measure was identified for the strategic direction related to innovation. Instead, a specific innovative activity of each Center was selected, and Wilder Research staff conducted a mini-case study to explore what it takes to introduce innovation, and what can be learned about factors that restrain and promote innovation.

Data sources

Common measures

Common measures were reported by Center staff, based on information from Center records as well as information provided by institutional and program partners. It was reported in a common format on worksheets provided by Wilder Research. Most of these are the same measures used in previous years of the evaluation, with a few slight modifications. They are:

- Organizations involved with the Center
- Outreach activities (including to K-12 and nontraditional students)
- Curriculum development (including new courses, courses significantly modified, and new programs)
- Leveraged funding
- Noncredit activities

Student records data

Data from the system-wide Integrated Statewide Records System (ISRS) were provided to show student enrollment numbers in new courses developed with the assistance of the Centers, and numbers of graduates and awards to date in new programs developed with the assistance of the Centers.

Center-provided documentation

Most unique measures were provided by Center staff from Centers' own documents. These include reports they compiled, web statistics, records of funds awarded for a variety of purposes, and narratives based on their own or others' personal involvement in activities.

Interviews by Wilder Research

The mini-case studies were compiled based on information gathered through a series of interviews. These were conducted by Wilder Research staff over the telephone during February and March, 2011. Initial interviews with Center directors used a common set of questions for all and identified the purpose of the innovation, the primary actions taken to accomplish it, factors that promoted or impeded its success, and what was accomplished. Additional informants for each study were selected by the researcher and the director jointly, based on the informant's involvement in the project under study and his or her ability to provide information from a different point of view. Four to six interviews were completed for each case study. Each director reviewed his or her Center's draft report for factual accuracy.

Findings on the strategic directions

For Academic Year 2011, Centers were asked to develop specific work plans, with activities grouped according to the five strategic directions approved by the trustees of the Minnesota State Colleges and Universities system. Each strategic direction was to include one primary activity, for which the Center's accomplishment was considered most important for the evaluation of its performance during the year. Additional activities could be included in each area, but were not required. Measures of success were also specified in the work plans.

This evaluation report is based on data collected during March and April and represents only a portion of what the Centers will actually accomplish over the course of the full year. The reader should also bear in mind that Centers are expected to be nimble and quickly responsive to changing conditions and opportunities. "Failure" to complete a planned activity may thus represent any of a variety of scenarios, including a discovery that conditions were not as favorable as expected to complete the work, or the unexpected occurrence of a different and higher-priority opportunity, requiring the diversion of resources from the original plan.

In each strategic direction (with one exception) Centers provided data on one or two common measures, which are shown below in tabular form where possible. In addition, where Centers' work was not fully represented in the common measures, the Centers provided additional documentation of their accomplishments.

In previous years, evaluations have primarily reported on accomplishments during the most recent complete academic year. Because of the emphasis on accountability for the current year, the 2011 evaluation report provides common measures not only for Academic Year 2010 in its entirety, but also for 2011 through the month of February. Unique measures for individual Centers are only for 2011.

Strategic Direction 1: Increase access, opportunity, and success

This strategic direction includes outreach to K-12 educators and students, development of career and technical education opportunities including Perkins program pathways, and outreach to non-traditional and underserved students. It aligns with the Centers' distinctive capacity to help learners discover and prepare for careers in Center-aligned fields.

Below is a thumbnail description of the expected activities of each Center to increase student access, opportunity, and success during the current year (AY2011), as planned at the start of the academic year.

360°

- ***Primary activity:*** Support K-12 outreach programs aimed at middle school and high school learners. These programs include single-day and multi-day technology camps and career fairs with a strong emphasis on manufacturing.

- ***Other 2011 activities:*** Dissemination of information to teachers and guidance counselors; Development of "Adopt-a-School" guide to assist industry involvement with local schools.

MNCEME

- ***Primary activity:*** Outreach to fill the pipeline in engineering and engineering technology, through Project Lead the Way (PLTW) and camps.

- ***Other 2011 activities:*** Provide leadership for outreach for middle-school (grade 4-8) students through PLTW and camps; convene a conference on best practices in camps to interest K-12 students in engineering careers; initiate a longitudinal study of PLTW.

Advance IT

- ***Primary activity:*** Re-launch an updated version of the web site "Minnesota IT Careers.org," in partnership with I-SEEK (launch in October 2010).

- ***Other 2011 activities:*** After School Tech Academy (in partnership with Inver Hills Community College); "Discover IT: It's Everywhere" career exploration materials (version 2.0 beginning in October 2010); Cyber Security Treasure Hunt and Cyber Skills Bootcamp (spring/summer 2011).

HealthForce

- ***Primary activity:*** Offer Scrubs Camps for both youth and adult participant groups.

- ***Other 2011 activities:*** Perkins Leadership in Health Sciences Career and Technical Education.

Findings: Overview

Centers continue to increase the scope and variety of outreach efforts, both to traditional and non-traditional students. Results from surveys completed by a partial sample of summer camp participants appear to show increased effectiveness, compared to 2008 camps, in increasing students' confidence in science, technology, engineering, and mathematics (STEM) skills, interest in the field, and awareness of careers in the field.

Center-provided documentation related to primary activities shows significant accomplishment of goals for the year (to the extent that the intended activity was scheduled to be completed by March 1).

Common measures

Two types of common measures were collected. One set describes outreach efforts to K-12 students (both directly to students themselves, and indirectly through teachers, counselors, and others) and to potential adult students. The second set is the responses of students attending Center-sponsored camps to a survey about their career interests and the effects that attending the camp had on a variety of attitudes.

Outreach activities

The outreach activities carried out or co-sponsored by the Centers are extremely varied. They include low-intensity but high-volume activities such as mailing hundreds of brochures about careers and program opportunities. Intermediate intensity activities include career fairs, conference presentations and booths, in-class presentations, one-time industry or college tours. Higher intensity activities include a variety of student contests (where the outreach may include coaching and other help to students during the preparation stages), multi-day summer camps, and after-school or weekend academies. Figures 2 and 3 summarize some of the outreach activities during the past year and a half. Note that participant numbers and demographic characteristics were not available for all events.

2. K-12 and adult outreach during AY 2010

	360°	MNCEME	Advance IT	Health Force	Total 2010	Total 2009
1-day events or shorter (e.g., career day, industry tour, presentation)						
# events	8	6	16	2	32	19
# participants	582	2,655	618	188	4,043	2,974
Multi-day events (e.g., course, camp)						
# events	7	10	7	6	30	25
# participants	376	1,238	193	777	2,584	1,395
# of participants non-Caucasian [(a)]	61	236	434 (54%)	242	973	
# of participants non-majority-gender [(a)]	384	202	306 (38%)	233	1,125	
Outreach to potential adult learners						
# events or activities		7[(b)]		5	12[(b)]	6
# participants	0	> 775	0	264	>1,039	603

(a) Demographic information not known for all participants.

(b) Counts as one "event" a series of bi-weekly one-hour meetings at WorkForce Center, January – June.

3. K-12 and adult outreach during AY 2011 (through February)

	360°	MNCEME	Advance IT	Health Force	Total
1-day events or shorter (career day, industry tour, contest)					
# events	1	10	2	6	17
# participants	Not avail.	1,990	52	406	> 2,397
Multi-day events					
# events			6[a]	4	23
# participants	0	0	140	544	684
# of participants non-Caucasian[b]	Not avail.	245 Hispanic	81	91	417
# of participants non-majority-gender[b]		79	57	36	172
Outreach to potential adult learners					
# events	2	2		6	10
# participants	105	2,600[c]	0	68	2,773

[a] *Counts as one "event" a series of 3 online modules totaling 24 hours, taken asynchronously by 152 students in 12 high schools and/or school districts participating in the Cyber Foundations Competition.*

[b] *Demographic information not known for all participants.*

[c] *Includes general community, students, and business people (tour of manufacturing and county fair booth). Does not include meetings held to plan outreach activities, conferences to discuss outreach, or noncredit training for adult learners.*

Numerous other outreach activities were too varied to be summarized in table format. Not represented above is significant additional outreach to potential traditional and non-traditional students directly, through information packets, presentations at schools, student and professional conferences, and STEM day at the Minnesota State Fair. Indirect outreach was carried out through information distributed to teachers and counselors, youth-serving organizations, workforce centers, and employers. A very significant activity, especially for MNCEME and HealthForce, was help with professional development of K-12 educators and counselors relating to technical and career education in pre-engineering and healthcare.

A comparison of the 2010 outreach numbers with those in the 2009 report shows growth in the number of events and participants, both for traditional and non-traditional students. A comparison to the part-year numbers for 2011 is more difficult because Centers each have a somewhat different mix of outreach strategies, and different types of events happen at different times of year. For example, except at Advance IT, most multi-day events are summer camps that have not yet taken place. With these cautions in mind, however, it appears the Centers are on a pace to increase outreach numbers again in 2011.

Camp surveys

During the summer of 2010, before evaluation measures for this report had been selected, some Center partners elected to administer surveys to participants in their camps, using a common survey developed for the overall evaluation in 2008. Not all camps used this survey, and Advance IT offers its more intensive outreach in afterschool and weekend formats rather than through camps, so the results shown in Figure 4 below are not a complete representation of the impact of the Centers' more intensive outreach activities. However, both in their own right and in comparison to 2008 results they are of interest.

First, in keeping with findings about outreach in general, even these partial surveys represent more campers than the more complete sample collected during 2008. Second, the surveys collected during 2010 tend to be for a slightly older mix of students (quite possibly because the survey was found to be less easy for younger students to complete and therefore was less likely to be used when it was not required). Third, in both years only one-quarter of campers reported having participated in any kind of organized activity relating to science, technology, engineering, or mathematics (STEM) during the previous school year, suggesting that the camp offered an experience they were not otherwise apt to take part in. Fourth, the vast majority of those report that they expect to attend to college, and a majority (between two-thirds and three-quarters) express a strong interest in majoring in "the field" (the wording on the survey was "math or science" for the manufacturing and engineering Centers and "math, science, or healthcare" for HealthForce).

Two-thirds report they get "a lot" of encouragement from their parent(s) for their interest in "the field." However, fewer than half have a parent who actually works in the field, and this proportion is lower than in 2008. Since family influences are a strong contribution to career choices, this change may indicate greater success in reaching out to students who might otherwise have been less likely to consider the Center's field of study.

Three questions on the survey focus on changes in interest and awareness as a result of the camp. The answers show that participants believe the camps have a strong impact on them. The comparison to 2008 results also suggests that the Centers and their partners have identified and promoted effective practices in the camps, as the impacts are all stronger in 2010 than in 2008. In each year, the impacts are strongest for the oldest grades, so some of the apparent increase is due to the slightly older ages of 2010 campers. However, separate comparisons for each age group show increased impact for 2010 even when the age differences are held constant. The greatest gains in impact were among high school participants' awareness of careers, high school participants' interest in careers, and middle school participants' confidence in their abilities.

4. Summer campers' reports of changes in career awareness, confidence, and interests, and prior exposure to help with college preparation

	360°	MNCEME	HealthForce	Total 2010	Total 2008
# completed surveys	56	51	147	254	213
Grade levels of campers	5-10 (most gr.7)	6-12 (most gr.7 or11)	7-12 (most gr.10-11)	5-12 (most gr.11)	5-12 (evenly spread)
Participated in any organized STEM activity outside of school, previous year	16%	39%	21%	23%	24%
Expect to go to college (% Yes)	88%	96%	98%	95%	96%
(If yes) Very interested in pursuing a college degree in the field	51%	73%	80%	73%	67%
Get "a lot" of encouragement from parent(s) for interest in the field	67%	78%	80%	77%	61%
Have a parent who works in the field	45%	50%	43%	45%	65%
As a result of camp…					
… "a lot" more aware of possible careers in field	44%	55%	86%	71%	55%
… "a lot" more confidence in abilities in the field	41%	51%	56%	52%	35%
.. "a lot" more interested in the field	40%	53%	70%	60%	48%

Note: *2010 results do not represent all students participating in summer camps in 2010.*

Articulation between K-12 and higher education

Centers supplement their outreach to K-12 with a variety of efforts to ease new students' transition into higher education. To date, except for Perkins work[1] by one Center (HealthForce), these efforts do not appear to be strongly tied to system-wide initiatives or to efforts of the Department of Education.

- MNCEME and 360° joined forces in AY2011 to bring together higher education faculty and administrators in engineering and manufacturing fields to explore the high school Project Lead the Way (PLTW) curriculum in detail and begin to identify how to move high school students who have completed this challenging career education material into appropriate higher education courses.

[1] The Carl D. Perkins Vocational and Technical Education Act establishes a federally-funded program, administered in Minnesota by the Minnesota State Colleges and Universities system. Its purpose is to help high school students prepare for careers as well as for higher education, and to align high school and postsecondary educational programs with each other and with industry workforce needs.

- HealthForce is working with regional Perkins consortia on the career pathway in the health sciences. In addition, some of the projects that have received funding through HealthForce have included the development of bridge programming to help non-traditional students prepare for and succeed in their initial year in higher education.

- High school students who enroll in Computer Geek U (offered by Inver Hills Community College) can qualify for postsecondary credit in fields affiliated with Advance IT through credit by examination.

Unique measures

360°

The primary activity of 360° in this strategic direction was supporting K-12 outreach programs for middle school and high school learners, including camps and career fairs. In addition to outreach efforts shown in the figures above, the Center sent information packets to people who responded to online surveys on the 360° and *Dream It. Do It* web sites. From July 2010 through February 2011, 163 packets were sent to 360° web site users and 132 were sent to *Dream It. Do It* site responders. Significantly more will be sent to *Dream It. Do It* site users after materials are redesigned.

360° has also developed an "adopt-a-school" guide for industry, which will be done by the end of May. Its purpose is to help industry become involved and engaged with local K-12 systems, and it will include a number of national, regional, and local best practices. It is anticipated that this guide will be distributed to manufacturing businesses through three large manufacturing associations, Tri-State Manufacturers' Association, Central Minnesota Manufacturers Association, and Arrowhead Manufacturers and Fabricators Association, as well as the *Dream It. Do It*. and 360º websites. 360° has also been asked to provide a copy to The Manufacturing Institute for use as a resource for all *Dream It. Do It*. campaign sites and other national efforts.

Other K-12 activities funded by the Center during AY 2011 include expansion of Northland Community and Technical College's "ROBOStorm" camp in partnership with Bemidji State University and Northwest Technical College; a regional VEX Robotics Competition started by Northland and involving teams from eight schools in northwest Minnesota, which provides further engagement and challenge for previous ROBOStorm campers; and provision by Northwest Technical College of a rotating set of equipment needed for a PLTW course, so that individual high schools do not have to purchase the expensive equipment themselves.

MNCEME

MNCEME's primary activity in this strategic direction was outreach to fill the pipeline through PLTW and camps. MNCEME's many activities to support PLTW are only hinted at in the figures above. As Figure 5 shows, the Center's support has stimulated and supported much growth in the number of schools teaching PLTW. In just the past year and a half, this growth has accelerated greatly, particularly in the number of schools becoming certified in recognition of the quality of their programs. In addition, the Center has stepped up the training of school counselors to help students and their parents become aware of the program and its value and enroll in it, and help students understand how they can continue this interest into their postsecondary careers.

5. Growth in Project Lead The Way: Participating schools, certified schools, counselors trained, and students eligible to receive college credit

	Base figures: Oct. 1, 2002 – Sept. 30, 2009*	July 2009-June2010	July 2010-March 2011
Number of middle schools offering PLTW Gateway	89	95	110
Number of high schools offering PLTW Pathways	92	100	107 (includes 5 PLTW – Biomedical)
Number of "Program of Distinction" middle schools**	0	3	8
Number of high schools certified**	28	49	58
Number of students eligible for college recognition**		1, 627	(testing has not taken place yet)
Number of counselors trained (cumulative total, all years)	81	242	337
Number of counselor conferences	3 (cumulative, all years 2002-2008)	2 (larger conference facilities added)	8

Source: *Data provided by MNCEME from Project Lead The Way records.*

* *Numbers of schools as of September 2009; PLTW was first offered in 2002.*

** *Only certified schools can provide eligibility for college recognition/college credit awarded credit. "Programs of Distinction" indicate middle school programs offering comparable quality of implementation.*

To understand the added value to PLTW from its connection with the Center of Excellence, Wilder Research conducted a virtual focus group by telephone with six PLTW teachers on May 3, 2011. Focus group participants see MNCEME's support as important. They don't feel that the Center is necessarily the only organization that could support the initiative in Minnesota. However, they also don't see any other organization stepping forward to do the work, and a similar level of support was not provided when the leadership was housed elsewhere. One teacher also commented that no individual college is in a position to bring all the partners together and link many different postsecondary institutions to PLTW programs across the state.

Other than information sessions for prospective PLTW teachers and grants made to a couple of schools for equipment, MNCEME itself is relatively invisible to teachers, but through its promotion of PLTW it is making a significant difference by advocating for the importance of technical education, increasing connections between high school and higher education, and helping establish grounds for PLTW students to receive college credit. The Center is also helping to promote the new nature of 21st century manufacturing as a high-skill field.

The growth in the number of districts and students participating is also helping to move the program toward a tipping point for credibility, awareness, and impact. The teachers also feel that, as the word is getting out, the program is not only increasing the skills of students who enroll, but also attracting higher-performing students than in earlier years.

Remaining issues to be addressed include greater integration of PLTW curriculum into the overall K-12 scope and sequence, and recognition of how it helps advance a variety of graduation standards. MNCEME has now raised the funds necessary to hire a second PLTW outreach coordinator, making it more possible to help advance this purpose as well as work with higher education institutions to more systematically provide college recognition of the courses, which are comparable in rigor to Advanced Placement.

Advance IT

The Center created an IT careers website in 2007 as part of its overall outreach and career development efforts. That site became increasingly difficult to maintain and develop so in the spring of 2010 the Center entered into a partnership agreement with ISEEK Solutions to combine and refine related content from both their sites. The Minnesota IT Careers site was re-launched in October 2010. Features of the new site include:

- Segmentation of IT occupations into four broad categories based on underlying interests and aptitudes: infrastructure and support; programming and development; information assurance, databases and informatics; and management.

- More site navigability: greater interactivity, easier-to-understand groupings and navigation structure.

- Nearly ten-fold increase in content from the original Minnesota IT Careers site.

The site is designed for students, advisors, and workers in transition. Web usage statistics (replicated in Figure 6 below) show a sharp rise in web hits, with 2,456 unique visitors in the first five months since the re-launch, and fairly steady traffic at the new level.

6. Usage statistics for the Minnesota IT Careers web site since re-launch, October 2010 – February 2011

Source: *Web usage statistics provided by Advance IT.*

Note: *"Bounce rate" is the percentage of visitors who enter the site and leave it without viewing other pages on the site.*

The Center plans to create additional interactive elements for the site to enhance its value, including a structured set of activities to help users systematically explore the rich content of the site. This will function as an IT career development "course" that can also be used by faculty and counselors to supplement academic courses or units in IT career planning.

HealthForce

The primary activity identified by HealthForce in this strategic direction was support for Scrubs Camps for adults and youth. These have not yet been held. However, they are fully enrolled with 180 campers registered for the summer of 2011. HealthForce has also become the host for the biomedical component of Project Lead The Way. Unlike the engineering component of PLTW, this program does not have extensive private foundation support and is thus more limited in its opportunities for implementation.

Strategic Direction 2: Achieve high-quality learning through a commitment to academic excellence and accountability

This strategic direction includes efforts in joint training and industry outreach, as well as work to promote the development, articulation, transfer, and sharing of courses and programs. It aligns with the Centers' distinctive capacity to encourage cross-campus activity to strengthen courses, programs, and learning opportunities.

Below is a thumbnail description of the expected activities of each Center to promote high-quality learning through academic excellence and accountability during the current year (AY2011), as planned at the start of the academic year.

360°

- ***Primary activity:*** Lead the development of PLTW articulation to Minnesota State Colleges and Universities institution programs and courses. This activity will be open to all Minnesota State Colleges and Universities institutions that wish to participate.

- ***Other 2011 activities:*** Sponsorship and support for Tour of Manufacturing event in Alexandria in partnership with Alexandria Technical College and Minnesota State Community and Technical College (M-State); expansion and update of 360º Memorandum of Understanding (MOUs) to include Riverland and Lake Superior Colleges, incorporate eTECH and curriculum changes, and put the articulation agreements into standard system articulation agreement forms.

MNCEME

- ***Primary activity:*** Work on development of a broadfield[2] engineering degree: fund curriculum development and implementation acceptable for all campuses.

- ***Other 2011 activities:*** None.

Advance IT

- ***Primary activity:*** Expansion of Maverick Software Student Employment Model (led by MSU-Mankato).

- ***Other 2011 activities*:** Three to five curriculum development projects; National Collegiate Cyber Defense Competition in February.

HealthForce

- ***Primary activity:*** Develop completion degree in the Health Sciences fields (Clinical Laboratory Science), a new four-year completion in Health Sciences, and Masters degree in nursing expansion for Minnesota State Colleges and Universities faculty in programs seeking accreditation.

- ***Other 2011 activities:*** Implementation of the Health Science broadfield degree.

Findings: Overview

Except at one Center (360°) the pace of creation of new courses appears to have slowed slightly over the past year and a half. However, new programs have been created at an increasing pace, and these new programs (those already open for enrollment and those still under development) are increasingly coordinated across institutions. Most new programs are too new to have produced graduates to date. However, in the courses that Centers helped to create or modify, enrollments since 2006 have totaled over 2,200 students. Three of the Centers' primary activities focused on curriculum development and/or articulation, and one focused on student internship opportunities. Most planned work has been accomplished, although unanticipated barriers have delayed some aspects of the work for two Centers (360° and MNCEME).

[2] The broadfield A.S. degree is a cross-campus core curriculum that ultimately prepares students for a four-year degree (rather than ending with a two-year technical degree). The "broadfield" name reflects its design as a broad preparation for a number of separate but related baccalaureate degrees. Is is analogous to the preparation that a general education program of study provides as groundwork for a range of baccalaureate degrees in the liberal arts and sciences.

Common measures

Two common measures were collected. The first is an itemization of new curricula that the Centers have helped academic departments and programs to develop since they were founded. The second is enrollment data for new courses and graduation data for new programs.

New curriculum developed with the help of the Centers

Figure 7 below summarizes new courses developed with the help of the Centers. The nature of this help varies from funding support for release time, to direct administrative support to help convene groups of faculty to discuss how courses can be shared across multiple institutions. In particular, new courses developed at 360° after 2009 were all designed for incorporation into the programs of all ten institutional partners. These shared courses for 360° are even given a new "virtual department" name in each hosting institution: CMAE, Center for Manufacturing and Applied Engineering. All the new courses developed with MNCEME help are also shared and/or recognized across multiple institutions.

7. New courses developed with the help of the Centers

Center	Institution	Department	Number of new courses	Number shared or linked (with what institution/s)
360°	All colleges*	CMAE	23	23 (All colleges)
	Bemidji State University	Tech Studies	7	-
	Total		30	23
MNCEME	Minnesota State University, Mankato	Engineering	12	12 (Iron Range Engineering at Itasca Community College and Mesabi Range Community and Technical College)
	Alexandria Technical College	Mechatronics	5	5 (St. Cloud Technical and Community College, South Central College, MinnWest, Century College)
	Normandale Community Collage	Nano	5	5 (Minnesota State University, Mankato, St. Cloud State University, University of Minnesota)
	Total		22	22
Advance IT	Metropolitan State University	MIS	8	-
	Inver Hills Community College	CNT	5	-
	Minneapolis Community and Technical College	ITEC	4	-
	Total		17	-

7. New courses developed with the help of the Centers (continued)

Center	Institution	Department	Number of new courses	Number shared or linked (with what institution/s)
HealthForce	Winona State University	Nursing BA, Nursing MA	8	6 (St. Scholastica)
	Riverland Community College	Patient Care Associate	3	-
	Minneapolis Community and Technical College	Math	1	-
	Total		12	6
Grand Total			81	51

Source: *Lists of new courses provided by Centers and academic partners; calculations by Wilder Research.*

Note: *"All colleges" at 360° are Central Lakes College, Lake Superior College, Minneapolis Community and Technical College, Northland Community and Technical College, Northwest Technical College, Pine Technical College, Riverland Community College, St. Cloud Technical and Community College, and Saint Paul College*

When examined year by year (not shown in the figure), the data show an accelerating pace of curriculum development, particularly in the engineering and manufacturing Centers. Due to problems with Center records in early years, the actual number of new courses at HealthForce is likely underrepresented in these numbers.

The Centers' contribution to strengthened curriculum is not limited to support for the development of new courses. Center support has also helped academic partners modify and update existing courses. Often, this modification has incorporated the use of new equipment. Figure 8 shows the number of these revisions. Years are not shown separately because Centers were not always able to obtain specific dates of revision from their academic partners. As with new courses, it is likely that these numbers also under-represent the actual impact of HealthForce in curriculum revision.

8. Existing courses significantly revised with the help of the Centers

	Revised courses	Number of institutions	Number of courses that are shared or linked to at least one other Institution
360°	103	7	-
MNCEME	17	2	1
Advance IT	10[(a)]	1	-
HealthForce	3[(b)]	1	1
Total	133	11	2

Source: *Lists of revised courses provided by Centers and academic partners; calculations by Wilder Research*

Note: *(a) Advance IT also helped with development of 19 modules for security training for campus technical staff (each representing 2-3 hours of class time) (b) Does not include all courses modified with the help of HealthForce.*

In some cases, Centers helped programs and departments modify how courses are delivered, especially by supporting a conversion to online or hybrid availability. This is summarized in the section for Strategic Direction 4.

Figure 9 shows total enrollments to date in courses that have been created or modified with the help of the Centers. The data show a growing impact in each year so far, with a total of 1,864 students (unduplicated count) who have benefited from the infusion of industry-focused curriculum or updated delivery methods. Because of problems in Center records in early years, we do not know when modifications took effect for courses offered by HealthForce partners, so these totals do not include students in those courses. The Appendix shows the distribution of these students by individual institution.

9. Enrollments in new and modified courses developed with the help of the Centers, by year course was first offered

	2006	2007	2008	2009	2010	Unduplicated total
360°	0	9	195	303	581	**976**
MNCEME	0	171	260	251	223	**791**
Advance IT	82	70	98	156	194	**459**
Total	82	250	553	710	998	**2,226**

Source: *Lists of new courses provided by Centers and institutional partners; enrollments provided by ISRS; calculations by Wilder Research.*

New programs

Figure 10 shows the contributions of the Centers to the development of new programs among their partner institutions. The programs include 14 new certificate programs, three new diplomas, five new associate degree programs, five new bachelor degree programs, and two graduate certificates. The new credentials are offered at 20 different institutions.

At 360° most recent activity has focused on new online and hybrid programs that are shared among all institutional partners. HealthForce has also promoted cross-campus programs, including the Clinical Laboratory Science bachelor's completion program and a Health Support Specialist certificate offered at three colleges. HealthForce also contributed to the development of the Health Sciences broadfield A.S. degree that was approved during 2011, and MNCEME helped with the development of two-year broadfield pre-engineering programs that will articulate with the four-year programs throughout the system. Already approved is the "Iron Range Engineering" program whereby students can complete a four-year engineering degree awarded by Minnesota State University, Mankato, while remaining in their home communities and taking the junior and senior years at Itasca Community College. The articulation agreement for this program will be signed in the fall of 2011.

More new programs are under development. HealthForce is currently assisting in the development of three baccalaureate completion degrees at Winona State University in the Allied health area. MNCEME is assisting with the development of a two-year pre-engineering program at South Central College. Another one is in the exploratory stage at Normandale Community College, where it is hoped students will also be able to complete the baccalaureate component through Minnesota State University, Mankato.

The Information Technology and Security industry is less concerned with specific academic credentials, and more interested in increased professional skills. As a result, Advance IT's work has focused more on internship opportunities and modules that can be incorporated into existing courses and programs (as described above). However, they have also assisted with new programs, including two new graduate certificates.

10. New programs developed with the help of the Centers

Center	Program name	Award	Institution(s)	Year approved	Graduates to date
360°	Engineering Technology	BS	Bemidji State University	2007	2
	Applied Engineering	BAS	Bemidji State University	2008	
	Manufacturing Technology – Prototyping Gunsmithing	Diploma	Pine Technical College	2008	
	Manufacturing Technology – Prototyping and Reverse Engineering	Certificate	Pine Technical College	2008	
	Energy Specialist	AAS	St. Cloud Technical and Community College	2009	
	Manufacturing Technology	Diploma	Northwest Technical College	2009	
	Manufacturing Technician	Certificate	Northwest Technical College	2009	
	Energy Specialist	AAS	St. Cloud Technical and Community College	2010	
	Production Technologies	Certificate	All Colleges[(a)]	2010	
	Machine Technologist	Certificate	All Colleges[(a)]	2010	
	Automation Technologies	Certificate	All Colleges[(a)]	2010	
	Welding Technology	Certificate	All Colleges[(a)]	2010	
MNCEME	Civil Engineering Technology	AAS	South Central College	2009	13
	Mechatronics Engineering Technology	AAS	South Central College	2010	
	Iron Range Engineering (AS to BS pathway)	AS / BS	Itasca Community College, Mesabi Range Community and Technical College, Minnesota State University, Mankato	2010	
	Multi Axis Machining Advanced	Certificate	Anoka Technical College	2011	
	Engineering Fundamentals	AS	South Central College	in process	
	Engineering	AS/BS	Normandale Community College, Minnesota State University, Mankato	Exploratory stage	
Advance IT	Information Assurance	Graduate Certificate	Metropolitan State University	2009	
	Open Source Developer	Certificate	Minneapolis Community and Technical College	2010	
	Database Administration	Graduate Certificate	Metropolitan State University	2010	
	Mobile Application Development	Certificate	Minneapolis Community and Technical College	2011	

continued on next page

10. New programs developed with the help of the Centers (continued)

Center	Program name	Award	Institution(s)	Year approved	Graduates to date
HealthForce	Clinical Laboratory Science	BS	Winona State University	2008	1
	Health Sciences (AS to BS pathway)	BS	Winona State University	2008?	
	Medical Assistant	Diploma	Central Lakes College	2009	
	Nursing Assistant[(b)]	Certificate	Northland Community College	2009	
	Physical Therapist Assistant[(c)]	AS	Lake Superior College	2010	
	Health Support Specialist	Certificate	South Central College, Hennepin Technical College, Century College	2010	
	Nursing Assistant[(d)]	Certificate	Minneapolis Community and Technical College	2010	

(a) "All colleges" at 360° are Central Lakes College, Lake Superior College, Minneapolis Community and Technical College, Northland Community and Technical College, Northwest Technical College, Pine Technical College, Riverland Community College, St. Cloud Technical and Community College, and Saint Paul College

(b) This certificate program is specifically for students from the White Earth Reservation.

(c) This certificate is a bridge program specifically for military veterans.

(d) This certificate program is specifically for students in the Roosevelt High School Health Career Programs.

Non-credit education and training activities

To date, non-credit activities remain largely the separate activities of individual colleges. The revenues generated by customized training are a valuable asset for colleges that have developed significant programs in their regions, and there is little incentive to share this activity. Centers were asked to report on non-credit training activities made possible by their support during 2010 and 2011. Two Centers reported such activities. Winona State University (of HealthForce) offered two Critical Care Nursing Prep courses in 2010, with nine participants. Advance IT provided five Application Security and Encryption trainings in 2010 and 2011 for system employees and staff of the state's Office of Enterprise Technology. Total enrollment in these five classes was 197. (Centers were not asked to provide an unduplicated total number of participants.)

Unique measures

360°

On November 29, 2010, 360° co-hosted a PLTW workshop for Minnesota State Colleges and Universities faculty, staff, and administrators. It was attended by 24 individuals from 14 institutions, including 12 people from institutions associated with 360°, 10 associated with MNCEME, and two others from institutions not associated with either Center. At the workshop they reviewed PLTW curriculum and how it aligns with postsecondary courses. They also discussed models for articulation of PLTW credit to the higher education curriculum. The original work plan for the year assumed the hiring of a Center Associate Director who would help with the implementation of articulation plans; the inability of the Center to hire for this position has slowed progress on this effort and left it to the individual institutions to identify specific articulation arrangements. At least one institution (South Central College) has made some efforts to articulate college courses to PLTW as a result of this workshop.

360° has continued to work with faculty to determine which college courses articulate with PLTW courses. The Center is in the process of updating its Memorandum of Understanding-Articulation Agreement (MOU-AA) that is specific to PLTW. This has resulted in adding at least one new program to the MOU-AA for PLTW. To ensure that newly-hired faculty at Bemidji State University are included in the process, the final agreements and signatures are planned for the fall of 2011.

MNCEME

Work to date on the broadfield degree development has included helping two-year colleges examine what they offer and identify how it articulates with the four-year program at Minnesota State University, Mankato. The articulation is complicated by the requirements the four-year program must meet for national accreditation through the Accreditation Board for Engineering and Technology (ABET), including that all engineering courses are based on calculus-level mathematics. By contrast, two-year engineering technician programs typically enroll students who have only taken college algebra and trigonometry. As a result, courses taken for the two-year degree cannot usually be used to fulfill the first two years' requirements for the four-year engineering program.

In 2011, MNCEME helped institutions approach the issue from a different angle, focusing on learning outcomes for students, helping two-year institutions align their courses with those required for the four-year program, and helping university instructors understand the two-year curriculum. To lead this work, MNCEME created and posted a new position description for a Program Director, Engineering and Manufacturing Articulation.

The Center has also helped in the development of bilateral alignments. With MNCEME support, an Iron Range Engineering program has been established at the Northeast Higher Education District colleges, offering a general engineering degree that will be awarded by Minnesota State University, Mankato. Normandale Community College is also working to establish a general engineering degree program that will have a completion program articulated through Minnesota State University, Mankato.

Center support also helped South Central College create a fabrication lab for its new pre-engineering program to support the education pathway from two-year to four-year engineering programs through transfer articulation. It also worked with the engineering/ manufacturing program of study and pathways project with the Minnesota State Colleges and Universities to support their efforts and the efforts of the Department of Education in developing skill standards.

Advance IT

Project Maverick began in 2006 with nine student interns at Minnesota State University, Mankato. Student interns in this program work part time and earn optional academic credit while gaining real-world experience while serving the software development and testing needs of Thomson Reuters. It has since grown to 82 student interns at four university locations (adding Iowa State University, University of Wisconsin-Madison, and the University of Minnesota). All work assigned by Thomson Reuters to this program, totaling several millions of dollars, was diverted from a set of projects that were slated to be sent offshore. In AY2011, Advance IT was able to leverage existing business and faculty relationships to set the stage for expansion within the Minnesota State Colleges and Universities system. The Center partnered with St. Cloud State University, Metropolitan State University, and Winona State University to expand this opportunity.

Setting up a new site requires securing a new major corporate client, developing agreements between Maverick and the universities, creating lease arrangements, acquiring equipment, recruiting students, and other logistics. The Center's goal was to have one additional site by spring 2011, and two additional sites by the end of December 2011. The first new contract was signed with Digital River in February 2011 and the site will be online in May in downtown Minneapolis with 12 students. A second client, Merrill, was signed in March and eight students will be working on site at Merrill, also beginning in May. It is estimated that these students will earn at least $13,000 each over the next year, a total payout in excess of $230,000. Another contract in St. Cloud is expected by June, and with momentum growing from early success and publicity, opportunities will be sought for another site in Winona.

Student earnings and practical experience are only part of the benefit to students. Another benefit is the expected job placement results. From 2007 through 2010, for the three sites in existence long enough for meaningful job placement results to be collected, every student who worked in the program has obtained a full time job within one year of graduation. This represents a total of 120 jobs acquired during the worst hiring environment in the past 30 years. Advance IT is initiating a research project to discover the factors underlying this success rate.

Advance IT has also worked with another consulting company, IQS, to recruit students for a similar model focused entirely on quality and security testing. Over 20 students have been employed in this project over the past year, obtaining not only pay for their work but also training in application testing, industry-administered skill certification, and full-time permanent employment for at least two of the interns.

HealthForce

In conjunction with the U.S. Department of Labor grant to build and expand capacity in the state's clinical laboratory workforce, the Center has supported the development of an online bachelor completion program in Clinical Laboratory Science (CLS). In 2011 an initial cohort of incumbent workers in Allina clinics began the program. One hundred employees were contacted. Twenty-six had their competency tested in the needed mathematics and chemistry skills. Twelve were fully prepared and enrolled in the program, while the others were referred for the appropriate prerequisite classes.

Adult learners articulating from technical programs appreciated the opportunity to have their skills evaluated in the laboratory for advanced placement of technical credits into the university's CLS program. Because the skill competence was evaluated by faculty, additional credits beyond the historical limit of 16 were validated for the 12 Allina employees who were able to begin the program with no prerequisites. As of May 2011, an additional 18 two-year laboratory technicians have applied to the Winona State University program for the fall of 2011.

Strategic Direction 3: Provide learning opportunities, programs and services to enhance the global economic competitiveness of the state and its people

This strategic direction includes the Centers' system-wide role in addressing issues for their own industry sectors, facilitating responses to and program development for industry workforce needs, and convening industry and educational groups as needed. It aligns with the Centers' distinctive capacity to strategically expand and strengthen pathways for communication among all partners, including industry, education, and learners.

Below is a thumbnail description of the expected activities of each Center to promote learning to enhance competitiveness during the current year (AY2011), as planned at the start of the academic year.

360°

- ***Primary activity:*** Offer accelerated, partnered, online courses that meet the needs of industry across multiple (greater than three) Minnesota State Colleges and Universities institutions.
- ***Other 2011 activities:*** Represent system and state at national and international events. Share best practices learned with partners and industry.

MNCEME

- ***Primary activity:*** Develop middle-skills program based on each campus/region strengths & needs; delivery through specialty short courses designed for those who already have 2-year degrees ("last mile" for specific job).
- ***Other 2011 activities:*** Connect middle-skills curriculum to broadfield degree; identify areas of commonality to include in more general curriculum.

Advance IT

- ***Primary activity:*** Annual IT Faculty-Industry Symposium (February/March).
- ***Other 2011 activities:*** New website section for faculty community (October/November 2010): Conduct a feasibility study on a Shared Virtual Lab for Minnesota State Colleges and Universities Networking Programs.

HealthForce

- ***Primary activity:*** Convene Healthcare Education Industry Partnership Council quarterly.
- ***Other 2011 activities:*** MN Simulation Users group reengaged (MSHEP); the Clinical Coordination Project (TCCP).

Findings: Overview

Centers continue to expand their relationships to industry and public agencies. All Centers provided documentation on activities undertaken to learn about industry needs and work with partners to develop responses to meet those needs. The processes for doing so vary greatly among Centers, reflecting differences in industry sectors and Center histories and cultures.

Common measure

The common measure for this strategic area was the extent of industry involvement in each Center. Figure 11 shows the different kinds of involvement that have been documented by the Centers. This information reflects the amount of time and resources that businesses are prepared to devote to their involvement. As the Centers have matured they have developed an increasing variety of ways in which businesses become involved.

Different Centers have very different structures through which their industry partners are involved. For example, HealthForce includes healthcare providers as members of its Executive Alliance (overall governing body including college and university presidents), 360° has a separate Business Advisory Council, and Advance IT has found it more useful to the Center and attractive to its business partners to engage them in four strategic leadership teams, focused on specific Center priorities. MNCEME also has a business advisory board. Its role has been a contentious topic in recent years, which has led to large turnover during 2011 in what had previously been a relatively small and stable group of business partners. These different structures partly explain differences in patterns of business involvement. In particular, there are very different numbers of hours of time donated by business representatives to Center activities.

In addition to donations of time or other resources, industry and the Centers contribute to each others' success through opportunities for student internships, applied research or consultation, and specific arrangements for employee training. These also vary among the Centers, reflecting different sector and Center priorities. In 2011, while the role of the MNCEME Advisory Board was in flux, the Center instead experienced a large increase in business participation through internships, research and consultation, and financial and non-cash contributions.

11. Types of industry involvement, 2010 and 2011 (July through February)

	2010					2011 (July - February)				
	360°	MNCEME	Advance IT	Health Force	Total	360°	MNCEME	Advance IT	Health Force	Total
Hours for Advisory Board	73	348	[a]	175	596	77	348	[a]	57	482
Hours for all other activities	1,186	232	1,519	848	3,785	807	232	575	807	2,421
Total hours	1,259	580	1,519	1,023	4,381	884	580	575	864	2,903
Hosts student interns	0	9	2	0	11	4	27	0	0	31
Requested research, consultation	0	6	2	0	8	0	14	0	0	14
Financial contribution	0	4	0	0	4	0	15	2	0	17
Agreement to send employees to for-credit educational opportunities	0	0	0	0	0	0	0	2	1	3
Donated equipment or other in-kind	0	30	0	2	32	0	13	3	1	17

Source: *Data provided by Centers and institutional partners; calculations by Wilder Research.*

Note: *(a) Advance IT has four Strategic Leadership Teams in place of a single Advisory Board. SLT hours are included here with "other activities."*

Figure 12 shows the numbers of organizations involved by year, both for the Centers overall and for each individual Center. Several trends are evident. First, there is a general trend toward an increasing number of individual firms involved per Center per year. Second, the partial year of 2011 so far shows the largest number of organizations and associations to date (the total already equals the complete year of 2009). This is important because associations (such as the Minnesota High Tech Association or the Minnesota Nurses Association) provide a way of reaching out more broadly and more efficiently than is possible when partnership is solely with individual businesses or providers. Third, there is a general trend toward greater partnership with government entitles and departments (such as local or regional economic planning organizations or state agencies). This is important because it helps coordinate the Center's (and therefore the system's) work with other larger scale initiatives that can be mutually reinforcing. Each of the Centers has had active involvement from the Minnesota Department of Employment and Economic Development (DEED) in at least one year, and all except Advance IT have partnered with it in both 2010 and 2011.

The total number of organizations ever involved in the Centers is shown in the column labeled "Any year." This total is much larger than the number for any single year, reflecting the fact that different organizations are involved in different years. The extent of turnover varies considerably among Centers. There is more stability among individual businesses and producers who are involved with MNCEME and HealthForce, and more year-to-year variation depending on specific activities with 360° and Advance IT.

12. Organizations directly involved with the Centers of Excellence, 2006-2010 and through February 2011

	2006	2007[a]	2008	2009	2010	2011[b] (partial)	Any year[b]	*Multiple years*[b]
All Centers combined [c]								
Businesses and producers	130	100	120	121	147	142	405	*161*
Organizations and associations	25	8	33	39	34	39	87	*41*
Government entities and departments	8	4	14	11	18	12	36	*16*
Total	**163**	**112**	**167**	**171**	**199**	**193**	**528**	***218***
360°								
Businesses and producers	43	41	42	56	70	27	149	*56*
Organizations and associations	11	1	11	11	11	11	30	*12*
Government entities and departments	3	2	4	4	2	2	8	*3*
Total	**57**	**44**	**57**	**71**	**83**	**40**	**187**	***71***
MNCEME								
Businesses and producers	27	19	16	29	24	41	65	*32*
Organizations and associations	3	4	6	7	6	7	10	*6*
Government entities and departments	0	1	2	0	2	3	4	*2*
Total	**30**	**24**	**24**	**36**	**32**	**51**	**79**	***40***
Advance IT								
Businesses and producers	41	43	55	30	39	38	137	*64*
Organizations and associations	3	3	5	5	7	2	17	*10*
Government entities and departments	1	2	8	5	7	1	13	*6*
Total	**45**	**48**	**68**	**40**	**53**	**41**	**167**	***80***
HealthForce								
Businesses and producers	22	-	9	10	16	40	61	*13*
Organizations and associations	9	-	9	14	10	20	34	*12*
Government entities and departments	4	-	2	3	9	9	16	*7*
Total	**35**	**-**	**20**	**27**	**35**	**69**	**111**	***32***

Source: *Data provided by Centers and institutional partners; calculations by Wilder Research.*

[a] *2007 does not include complete numbers for HealthForce.*

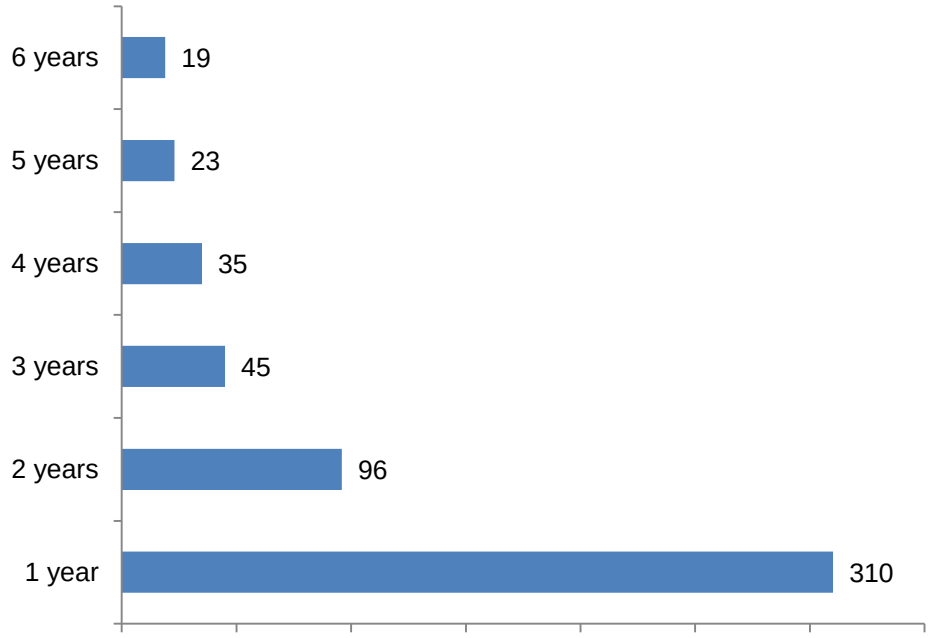
[b] *"Any year" and "Multiple years" include partial numbers for the beginning of 2011 (July through February).*

[c] *Section for all Centers combined shows unduplicated totals of organizations.*

Figure 13 graphically displays the distribution of organizations according to the number of years in which they have participated with one or more Centers. By far the most organizations (310) have been involved for only a single year, and the distribution follows a very typical curve from that high point to a more slowly diminishing number involved for each additional year up to all six years.

The pattern documents a stable core of participating organizations, which is important for continuity of vision and strategies, combined with a more fluid constellation of shorter-term partners, whose larger number helps increase the visibility of the Centers more widely.

13. Number of organizations involved in Centers, by number of years involved



Source: *Data provided by Centers and institutional partners; calculations by Wilder Research.*

Unique measures

360°

As part of its National Science Foundation grant, 360° conducted a series of face-to-face interviews with 54 advanced manufacturing employers throughout the state. Employers were asked to answer questions about the eTECH program being launched by 360°, and how the program may or may not meet specific needs of their business. Interview results show strong agreement that 360° programs fit employers' needs for employee education. Over one-third believe that their employees would enroll (and another quarter thought employees might enroll). Thirty-eight percent believe the programs offer a solution to their employee succession plan. Two-thirds of the businesses interviewed sponsor

employee education, and many felt they would support employees' enrollment in 360° programs, especially if they were offered outside the regular work day. They were most encouraging about prospects for online and/or hybrid methods of delivery.

MNCEME

During AY2011, MNCEME collected information about industry's needs with respect to middle-level skills. These are skills beyond the level of the first credential (certificate or associate degree) but less than bachelor level. This was done through conversations with Deans of associated colleges, and also polling of colleges' Industry Advisory Boards. Through this process the Center learned that industry's middle skill needs are highly variable, with no "core" either in types or levels of skills that are needed. They are also very specific to each individual firm and, in bigger firms, are also specific to divisions within the firm.

In response to this discovery process, MNCEME funded a variety of projects to assist each college in meeting unique needs of the industries with which they had existing relationships. These included:

- Development of a new "virtual training center" lab at Hennepin Technical College, where students can use virtual equipment for the majority of their training needs, freeing up the more expensive equipment for higher priority use (and also allowing less experienced students to practice on less expensive equipment); this also allows the program to increase its training capacity.

- Development of a digital electronics course at Normandale Community College to serve as a foundational course for a one-year engineering technology certificate as well as a two-year associate of applied science degree in manufacturing.

- Expansion of three existing programs at Mesabi Range Community and Technical College through purchase of hardware to monitor wind speeds, using sonic detection and ranging methods; the technology will prepare students to be more competitive within the industry.

- Expansion of the CNC Manufacturing Program at Anoka Technical College through purchase of new equipment that can be used in credit-based courses, customized training, and the Secondary Technical Education Program (STEP) for high school students that articulates into postsecondary programs. The purchase leveraged additional college investment in updated software and simulation technology, new curriculum, and expanded off-site training for dislocated and incumbent workers.

- Support for Alexandria Technical and Community College's development of an integrated approach to developing career interest, curriculum development options that generate revenue, and work with industry to prepare for growth in industry demand for new products and applications in alternative energy.

Advance IT

In the fall of 2009, the Center began pursuing a strategy to impact curriculum development on a larger scale than previous efforts, which consisted of providing resources for program-level course and program development at partner institutions. The new approach features an annual IT Faculty-Industry Symposium to address topics that broadly impact IT-related programs and curricula. It is planned and managed in cooperation with Minnesota State Colleges and Universities' Center for Teaching and Learning, and with guidance from the Center's Education Strategic Leadership Board, one of four governance groups created to solicit industry direction and involvement for Center initiatives.

The symposium provides the impetus for faculty projects aimed at improving student learning outcomes, especially in the featured topic area of the symposium. The April 2010 Symposium featured information assurance and security across IT disciplines, a major emphasis of the Center since its inception. Attendees included faculty from four state universities and 14 two-year colleges and industry participants representing 12 different employers.

The symposium resulted in submission of four proposals for faculty-led projects, three of which were funded:

- Advancement of the Maverick student employment project mentioned above, led by faculty from Mankato and in partnership with faculty from St. Cloud, Metro State, and Winona state universities.

- Development of three information security online modules on emerging topics that are to be shared across the system. The project was led by a faculty member from Mankato working with faculty from St. Cloud and Inver Hills.

- Participation in an IT case study competition, led by a faculty member from Metro State and involving faculty from Moorhead and Winona state universities.

The second annual symposium was held April 7, 2011, with a focus on clarifying and developing strategies to help students acquire the competencies most frequently cited as deficient by employers: the nontechnical skills. The goal of this symposium was the creation of an online repository of instructor guides and student resources, designed to help faculty more easily embed nontechnical skills into both teaching and assessment.

The repository will be based on the Department of Labor's nationally validated Industry Competency Model. It will focus on two categories of skills in high employer demand: personal effectiveness (interpersonal skills and teamwork, integrity, professionalism, ethics, adaptability and flexibility, dependability and reliability, lifelong learning, and listening and speaking) and workplace competencies (critical and analytic thinking, collaboration, planning and organizing, innovative thinking, problem solving and decision making, working with tools and technology, and business fundamentals).

The focus on these nontechnical skills reflects communications from the information technology industry. Compared to the engineering, manufacturing, and healthcare fields, information technology expresses less urgency for increased numbers of students in the workforce pipeline and less emphasis on new credentials. By comparison, they are more concerned about the fit of students' experience to specific workplace needs – among which the nontechnical skills are most often cited as a missing piece.

HealthForce

The merger of HealthForce with the Healthcare Education Industry Partnership (HEIP) brought considerable new industry links to the Center. In the partial year of AY2011 through February, the Center logged involvement from 40 different industry organizations, compared to 16 in the full year 2010, and 20 industry associations compared to 10 in the previous year. Hours of industry participation also increased significantly, from 848 in all of 2010 to 807 in just the first two-thirds of 2011. Overall benefits to the health care providers from the merger include greater efficiency due to now having one integrated agency coordinating efforts on behalf of the statewide system.

Strategic Direction 4: Innovate to meet current and future educational needs

This strategic direction includes support for innovations and expansion of effective practices, and support for new and/or shared delivery modes. It aligns with the Centers' distinctive capacity to champion changes in the content and delivery of educational services.

Below is a thumbnail description of the expected activities of each Center to innovate to meet current and future needs during the current year (AY2011), as planned at the start of the academic year.

360°

- ***Primary activity:*** Financially support institutional innovations and the expansion of best practices at the 360º partner institutions through a documented, defined, and refined peer review and allocation system.

- ***Other 2011 activities:*** Champion Quality Matters (an independent program of quality assurance for online and blended courses) with Distance 360º faculty.

MNCEME

- ***Primary activity:*** Connect middle-skills development and the broadfield engineering major to industry, emphasizing areas of emerging technology. Provide startup funding for the broadfield degree, with an emphasis on the non-traditional workforce.

- ***Other 2011 activities:*** None.

Advance IT

- ***Primary activity:*** Given the overlap among strategic directions, this strategic direction is addressed by activities already described above. The expansion of the Maverick Software Student Employment model brings an innovative practical student experience that also promotes job placement. The IT Faculty-Industry Symposium and related implementation projects are an innovative way to bring diverse industry and higher education stakeholders together to address industry needs and plan responses to meet them.

- ***Other 2011 activities:*** None.

HealthForce

- ***Primary activity:*** Expansion of the regional clinical coordination partnership, helping specific geographic regions identify and implement solutions to increase capacity in clinical education experiences.

- ***Other 2011 activities:*** Nursing program accreditation.

Findings: Overview

Centers' support for innovations and expansions of effective practices are too diverse to be captured in a single common measure. Instead, individual case studies were undertaken to illustrate the processes by which Centers introduce innovation into a variety of higher education settings and the factors that affect the success of innovative work. The case studies also shed light on unique features of the Centers that help them succeed in advancing system priorities less readily accomplished by individual institutions. Findings from the case studies are summarized in a separate section below.

Common measure

No common measures were collected that are specific to this strategic direction. However, the Centers' information on new and modified curriculum included descriptions of the Centers' support for modifying existing courses for online delivery. According to lists provided by the Centers and academic partners, this included nine courses modified with the help of Advance IT in 2008 and 2010, one course both revised and offered online with the help of HealthForce, and one course, shared among ten partners, in process of online conversion with the help of 360°.

Findings: Unique measure

360°

In addition to its case study, the 360° Center also identified a primary activity in this strategic direction: documentation of its peer review and allocation system to support institutional innovations and expansion of best practices. During this fiscal year, $603,574 was allocated to member institutions, distributed to support:

- Program improvements (equipment and software), 69%
- K-12 outreach, 12%
- Release time for faculty and staff involvement in 360°, 10% (salaries)
- Professional development for faculty, 3% (trainings and conferences)
- Travel and other, 6%

Notable K-12 activities funded by this process during AY 2011were cited under Strategic Direction 1. Another innovation promoting cooperation among partners is a project in which students from Saint Paul College's tool and die making program will build the tools (molds) needed for the Northwest Technical College injection molding machine. This will allow students from both programs to better understand the previous and next steps in the process. The Center is also beginning to see innovative proposals for student projects, including one funded in this cycle to help students at St. Cloud Technical and Community College manufacture and install solar cells on campus.

The peer review and allocation system is itself reviewed as part of the Center's continuous improvement process. In spring 2011 it became apparent that colleges were applying different internal screens of potential requests. The process will be discussed in the spring and summer in preparation for adjustment before the FY12 allocation process, with a focus on how the colleges' Programs of Distinction are defined, the role of energy

and construction programs in the "core" of 360°, and the priority that should be used for new and advanced technology versus current and existing technology.

Other Centers

Each of the Centers uses a portion of its funding to support innovative activities of its academic partners. Many of these have been described in earlier sections. No other Center included unique measures related to these or other additional activities related to Strategic Direction 4.

Strategic Direction 5: Sustain financial viability during changing economic and market conditions

This strategic direction is of interest to the system office in order to support funding diversification within each Center, plus any collective Center efforts to leverage resources, including coordinated grants and shared activities. It aligns with the Centers' distinctive capacity to produce revenue and leverage additional resources.

Below is a thumbnail description of the expected activities of each Center to sustain financial viability during the current year (AY2011), as planned at the start of the academic year.

360°

- ***Primary activity:*** 360º will continue to diversify its funding sources to support direct and related activities.
- ***Other 2011 activities:*** Continue to identify foundation and federal grant opportunities that fit 360º and related initiatives; continue to utilize best practices and leverage collective system and 360º resources.

MNCEME

- ***Primary activity:*** Pursue grants around large state-wide initiatives like PLTW (sustainability grounded on partner campuses through Center support).
- ***Other 2011 activities:*** Each campus must leverage funds to sustain proposed programs based on the two major strengths that campus provides; develop a business plan for sustainability.

Advance IT

- ***Primary activity:*** Continue acting as a "hired agent" on behalf of the system to help subsidize personnel and other Center capabilities, including Campus Security Program and the CE/CT Lumens implementation program.

- ***Other 2011 activities:*** Increase earned revenue from external customers, including existing products and a new product-development process; submit Community Based Training grant based upon previously developed proposal to leverage Center funding.

HealthForce

- ***Primary activity:*** HealthForce innovative projects: Center funding, awarded competitively to innovative projects proposed by academic and industry partners.

- ***Other 2011 activities:*** Grant writing; work with other state agencies to apply for and receive grants that match the talents and mission of HealthForce Minnesota regarding workforce development and new programs.

Findings: Overview

Centers continue to bring in, or help their partners bring in, more outside dollars than the amount awarded in the base funding from the Board of Trustees. Two Centers (360° and Advance IT) are showing more success than the others in securing funding that can support ongoing Center operations, while the other two report that most of the leveraged funds go to specific activities of Center partners. The total amount of leveraged funding, and the mix of sources, continue to vary considerably from year to year. Based on funds received through the first eight months of 2011, the Centers appear to be on a pace to exceed 2010 totals and have their second-most successful year since they began.

Common measure

As in each previous year, Centers provided information about funding secured by the Centers and their partners to leverage the basic level of support awarded by the Trustees. Results, summarized in Figure 14, show continued effort to secure funding from a variety of sources, including community nonprofit and for-profit partners, government grants, and local foundations, as well as ongoing support from institutional partners. A decreasing proportion of funding comes from Office of the Chancellor special project funds. The largest sources are state and federal grants. These show considerable year-to-year variation, with an increase in the share of funding coming from state agencies.

14. Leveraged funds, by type of source and year

	2006	2007	2008	2009	2010	2011 (to date)	Total
Office of the Chancellor special projects funds (e.g. online courses)	$860,490	$761,000	$424,486	$163,604	$192,463	$193,220	$2,595,263
Other MnSCU colleges and universities	$859,623	$84,525	$568,856	$1,196,672	$343,098	$108,166	$3,160,940
Local (school, city, county)	$5,000	$91,600	$306,065	$321,364	$2,800	$204,603	$931,432
Other state agencies (e.g., MnDOT, Job Skills Partnership)	$1,968,731	$549,283	$417,050	$2,551,095	$2,716,075	$2,145,015	$10,347,249
Federal	$2,303,373	$0	$1,695,043	$2,514,073	$743,946	$2,137,908	$9,394,343
Public sources, sub-total	$5,997,217	$1,486,408	$3,411,500	$6,746,808	$3,998,382	$4,788,912	$26,429,227
Private sources, combined	$794,908	$2,122,850	$1,827,114	$3,756,115	$669,357	$852,009	$10,022,353
Total amount	$6,792,125	$3,609,258	$5,238,614	$10,502,924	$4,667,739	$5,640,921	$36,451,580

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

Note: *Private sources include private corporations, industry associations, corporate foundations, and other foundations.*

Figure 15 shows sources in greater detail for 2010. It includes a breakdown of funds that Centers actually have control over, compared to those that flow directly to partners for affiliated programs and activities. As in 2009, the percentage under Center control is very different from one Center to another. In 2010, only one Center (360°) received funds directly. MNCEME programs received particularly large amounts in state agency grants, including a $1.4 million grant from Iron Range Resources for the Iron Range Engineering program, and numerous research grants from the Department of Transportation to Minnesota State University, Mankato faculty.

15. Leveraged and matched funds received in 2010, by Center and whether funds flow through Center budgets or not

	Overall leveraged funding		360°	MNCEME	AdvanceIT	Health Force	TOTAL
Public sources of funding	Office of the Chancellor special projects funds	Center	-	-	154,152	38,311	192,463
		Non-Center	-	-	-	-	-
		Total		-	$154,152	$38,311	$192,463
	Other MnSCU colleges and universities	Center	-	-	-	-	-
		Non-Center	105,000	60,000	-	178,098	343,098
		Total	$105,000	$60,000	-	$178,098	$343,098
	Local (school, city, county)	Center	-	-	-	-	-
		Non-Center	-	-	-	2,800	2,800
		Total	-	-	-	$2,800	$2,800
	Other (non-MnSCU) state agencies	Center	1,000	-	26,627	-	27,627
		Non-Center	-	2,657,744	-	30,704	2,688,448
		Total	$1,000	$2,657,744	$26,627	$30,704	$2,716,075
	Federal	Center	179,404	-	5,000	-	184,404
		Non-Center	-	510,000	12,000	37,542	559,542
		Total	$179,404	$510,000	$17,000	$37,542	$743,946
	Total from public sources	***Center***	**180,404**	**-**	**185,779**	**38,311**	**404,494**
		Non-Center	**105,000**	**3,227,744**	**12,000**	**249,144**	**3,593,888**
		Total	**$285,404**	**$3,227,744**	**$197,779**	**$287,455**	**$3,998,382**
Private funding	Scholarships or sponsorship (e.g. camps or seminars)	Center	5,000	-	-	-	65,500
		Non-Center	17,294	500,000	-	22,300	539,594
		Total	$22,294	$500,000	-	$22,300	$605,094
	In-kind donations or equipment	Center	-	-	-	-	-
		Non-Center	-	64,263	-	-	64,263
		Total	-	$64,263	-	-	$64,263
	Other grants, contracts, or funding	Center	57,500	-	-	-	-
		Non-Center	-	-	-	-	-
		Total	$57,500	-	-	-	-
	Total from private sources	***Center***	**65,500**	**-**	**-**	**-**	**65,500**
		Non-Center	**17,294**	**564,263**	**-**	**22,300**	**603,857**
		Total	**$82,794**	**$564,263**	**-**	**$22,300**	**$669,357**
Total		**Center**	**245,904**	**-**	**185,779**	**38,311**	**469,994**
		Non-Center	**122,294**	**3,792,007**	**12,000**	**271,444**	**4,197,745**
		Total	**$368,198**	**$3,792,007**	**$197,779**	**$309,755**	**$4,667,739**
		Center%	**67%**	**-**	**94%**	**12%**	**10%**
		Non-C%	**33%**	**100%**	**6%**	**88%**	**90%**

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

Figure 16 shows the same information for the partial year of July 2010 through February 2011. This shows the Centers on a pace to exceed the 2010 totals, and two Centers (360° and Advance IT) receiving a very high proportion of funds directly in support of Center operations. Again MNCEME partners received substantial public funding (from both federal and state sources) for the new Iron Range Engineering program, and also substantial research grants from the Minnesota Department of Transportation.

Since the Center reports of leveraged funding were sent to Wilder for compilation, MNCEME has received notice that it has received nearly a half a million additional dollars from the Kern Family Foundation and some large employers, specifically to support a second Project Lead the Way position for three years.

In summary, the leveraged funding data shows a continued high level of effort to secure support from diverse sources. Results for both 2010 and 2011will exceed the funds given to the Centers by the basic system funding, although only in two of the Centers are the leveraged funds in a form that can help to support the Center's own ongoing operations (rather than the activities of affiliated departments and programs).

16. Leveraged and matched funds received in 2011 (to date), by Center and whether funds flow through Center budgets or not

	Overall leveraged funding		360°	MNCEME	AdvanceIT	Health Force	TOTAL
Public sources of funding	Office of the Chancellor special projects funds	Center	-	-	99,270	29,120	128,390
		Non-Center	32,350	-	-	32,480	64,830
		Total	$32,350	-	$99,270	$61,600	$193,220
	Other MnSCU colleges and universities	Center	-	-	-	-	-
		Non-Center	-	-	2,000	106,166	108,166
		Total	-	-	$2,000	$106,166	$108,166
	Local (school, city, county)	Center	-	-	-	-	-
		Non-Center	-	204,603	-	-	204,603
		Total	-	$204,603	-	-	$204,603
	Other (non-MnSCU) state agencies	Center	-	-	-	-	-
		Non-Center	-	2,096,946	-	48,069	2,145,015
		Total	-	$2,096,946	-	$48,069	$2,145,015
	Federal	Center	871,951	-	5,000	-	876,951
		Non-Center	-	1,172,765	-	88,192	1,260,957
		Total	$871,951	$1,172,765	$5,000	$88,192	$2,137,908
	Total from public sources	***Center***	**871,951**	**-**	**104,270**	**29,120**	**1,005,341**
		Non-Center	**32,350**	**3,474,314**	**2,000**	**274,907**	**3,783,571**
		Total	**$904,301**	**$3,474,314**	**$106,270**	**$304,027**	**$4,788,912**
Private funding	Scholarships or sponsorship (e.g. camps or seminars)	Center	7,500	-	-	-	-
		Non-Center	52,241	600,200	30,000	31,070	661,270
		Total	$59,741	$600,200	$30,000	$31,070	$661,270
	In-kind donations or equipment	Center	-	-	-	-	-
		Non-Center	-	127,098	-	-	127,098
		Total	-	$127,098	-	-	$127,098
	Other grants, contracts, or funding	Center	1,900	-	-	-	9,400
		Non-Center	-	1,800	-	200	54,241
		Total	$1,900	$1,800	-	$200	$63,641
	Total from private sources	***Center***	**9,400**	**-**	**-**	**-**	**9,400**
		Non-Center	**52,241**	**729,098**	**30,000**	**31,270**	**842,609**
		Total	**$61,641**	**$729,098**	**$30,000**	**$31,270**	**$852,009**
Total		**Center**	**881,351**	**-**	**104,270**	**29,120**	**1,014,741**
		Non-Center	**84,591**	**4,203,412**	**32,000**	**306,177**	**4,626,180**
		Total	**$965,942**	**$4,203,412**	**$136,270**	**$335,297**	**$5,640,921**
		Center%	**91%**	**-**	**77%**	**5%**	**18%**
		Non-C%	**9%**	**100%**	**23%**	**95%**	**82%**

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

No unique measures were collected related to this strategic direction. However, certain variations were evident that affect Centers' ability to acquire funds to support their own operations. The HealthForce Director was able to generate revenue for the Center by consulting with the Hennepin Health Foundation on educational visioning for their future staff development needs. This marked a new venture for the Center, and appears to be the first time any of the Centers has generated earned revenue through this kind of consulting.

Advance IT has also generated earned revenue through a variety of "products," including information security assessments, consulting and training; program management for system-wide adoption of a new noncredit continuing education business development application (Lumens Pro) and other smaller service agreements and noncredit offerings.

Managing some earned revenue streams can be atypical in the academic context, so some of these initiatives could not be implemented without special efforts to create non-standard agreements requiring attorney general review or to secure revisions to current university policy.

Findings on innovation

When the Centers of Excellence were organized as collaborative entities, one of their primary intended roles was to foster innovation in the system. This section of the report addresses that role in greater detail. Given the nature of innovation, which typically cannot be specified in advance, this section is more qualitative in nature than other sections.

As part of the 2010-11 evaluation of the Centers of Excellence, Wilder Research undertook "mini-case studies" of one initiative of each of the four Centers. In each case, Wilder reviewed an initiative which could be considered an incubator, representing a new approach at a small scale, with the potential for expansion.

Each project illustrates at least one example of how current practices, rules, structures, or ways of thinking affect the Center's implementation. Each case study looks at what is new or innovative about the project and seeks to understand the context behind it. In addition, each case study examines the challenges encountered in trying to do innovative work and strategies to initiate cross-campus engagement, and seeks to answer the questions, "What does it take to introduce innovation into the system?" and "What can we learn from the Center's experiences?"

The initiatives described in the case studies are the following:

- **360°**: Development and implementation of a suite of online, cross-campus courses, organized into new certificate programs, and offered as part of a multi-campus partnership called "eTECH."
- **MNCEME**: A new collaboration between two-year and four-year instructors within the civil engineering field in which students gain hands-on experience with the contracting process as well as deeper understanding of how their two different positions – civil technicians and civil engineers – work with each other and add value to each other's work.
- **Advance IT**: The SAP (Systems, Applications, and Products in Data Processing) Partnership and Curriculum Project, a response to an urgent industry need for workers trained in a rapidly emerging content area.
- **HealthForce**: The process of developing the Health Science Associate of Science broadfield degree, a statewide agreed-upon curriculum plan that allows students to transfer 60 credits of coursework in the general health sciences and general education to a four-year program in a specific healthcare discipline.

This section includes a three- to four-page case study for each Center. This is followed by a summary of the findings from the full set of studies about factors that help promote innovation, factors that hinder it, and features of the Centers that provide innovation capacity of the system that would be less likely to occur in their absence. The section concludes with some contextual information from research on innovation in industry and how that may be applicable in higher education.

360° case study

The mini-case study for the 360° Manufacturing and Applied Engineering Center of Excellence examines the development and implementation of a suite of online, cross-campus courses, organized into new certificate programs, and offered as part of a multi-campus partnership called "eTECH."

New innovations

The eTECH project simultaneously combines online cross-campus courses, communicates with industry, coordinates, and utilizes different resources from different institutions for manufacturing programs. In a field like manufacturing, which requires many hands-on learning components, carrying out a program that coordinates features like offering the same course with the same syllabi taught by different faculty in different institutions is a large undertaking. Such innovation requires a new way of thinking about higher education for all the different individuals involved, from students and faculty to administrators and industry. 360° was integral in helping individuals learn to think in new ways about where learning happens and how to work within a larger and more interconnected system in order to educate future manufacturing professionals.

Historical context

The need for eTECH emerged from the industry advisory council. The council articulated a need for education to be more accessible to working students, and for further credentials to involve less duplication in coursework. While there were some multi-state models for graduate work in health fields and consortiums that allowed for course substitution, there are no known precedents in the manufacturing field similar to the eTECH project, where a key intent is to increase accessibility for working students and provide better avenues on how to train the manufacturing workforce as a whole. Building on knowledge from previous efforts to put courses online, 360° staff identified the specific steps needed to address the issue and together they recommended collaboration within the consortium to put materials online for students.

Initial steps included the creation of a formal consortium agreement prior to initiating the proposal for academic approval; relationship building between faculty and administration across sites; and significant back office work from the Center to develop programs and coordinate program logistics. 360° staff led and coordinated all major efforts, including fleshing out the framework for program certificates; supporting faculty in their work; developing course outlines and sample syllabi; shepherding the academic approval process through the institutions and the Minnesota State Colleges and Universities system office; lining up faculty; and developing a system to register students across sites. Input was sought and received from all members of the consortium for a collaborative effort, with significant support and buy-in from faculty. Some programs made lectures and traditional bookwork available online, but maintained the in-person lab components.

Currently, all programs have been approved by all participating colleges, and six courses have been piloted online to date. Additional work is still needed to move the remaining programs online and improve low initial enrollments. As the problem of low enrollment is being studied and addressed, prior financial agreements underwritten by the Center allow a class to continue regardless of low enrollment. In this way, 360° helps to pay for the curriculum and offer support services until the arrangement is stable enough to be self-supporting. Additionally, the Center contracts with the Online Support Center (initially a consortium of four colleges) to use its existing capacity to coordinate student support services. The Online Support Center gives students a seamless entry point for taking advantage of the pooled capacity of multiple colleges, without having to interact separately with each.

A National Science Foundation grant to 360° effective August 1, 2010 also helps to support the Center's efforts for three years. Indication that the innovation has potential to spread further is exemplified by a faculty member at Northland Community College in Thief River Falls who modeled his courses after those developed by 360°, with the intention of increasing enrollment in his program. Given the challenges encountered with online delivery (described below) in the long term it is not clear whether he will continue to emulate both the delivery method and content, or only the content.

Challenges

360° has faced a number of interwoven challenges in implementing the eTECH project, including a lack of capacity to facilitate cross-campus work at the overall system level, scarcity of resources, and negative attitudes about online learning. These in turn contribute to challenges relating to the strength of participation from colleges, general communication and project management, student enrollment, and project implementation. Following are details regarding the overlap among these challenges:

- The overall Minnesota State Colleges and Universities system is not currently set up for consortiums or cross-campus online learning. (The system initiative, Students First, will provide modules to support this activity in the future.[3]) The eTECH project faced numerous other administrative hurdles. Individuals who had been involved in previous unsuccessful consortiums were hesitant to be a part of another. Some colleges struggled to meet the administrative requirements such as working through how to record partnered courses in the system-wide ISRS records system, how to handle financial aid, how students would pay tuition bills, and other procedural issues.

- Traditionally place-bound programs require intensive lab components and work with equipment. Most programs include an on-site requirement to ensure students develop and demonstrate the appropriate hands-on skills for that program. Transferring equivalent material online is feasible, but complicated.

- There is a scarcity of resources in the Minnesota State Colleges and Universities system to fully implement the project. Many colleges do not have the budget or the staffing to be as involved as they would like. Some did not want to participate and were not "early adopters" largely due to resource issues; they did not have a "champion to take ownership of the program" in order to overcome scarcity.

- Communication and project management challenges are tied directly to the difficulty in managing the joint work of several colleges, all of which have different levels of resources and ability. The program's lack of a unique link to a specific campus increases the difficulty of the task, especially regarding the timely provision of relevant information. Overall, regular communication has been difficult because 360° has a staff of two. The Center relies on campus representatives, who "do a good job" but are constrained by budget resources. Individual campus representatives are also less likely to have a comprehensive grasp of the overall program than the 360° staff.

- Student recruitment and enrollment issues are also affected by the fact that the target student population (incumbent workers) is very busy and cannot afford time for traditional in-class learning *or* online learning. Offering part of a course online with an in-person lab component may also not be feasible for working students. Due to these issues, it is more important than for traditional courses to actively market the

[3] The six modules in Students First are designed to facilitate (1) system-wide searching for institutions, programs, and courses; (2) a common application to one or more institutions; (3) identification of equivalent courses across the system and simultaneous registration at more than one institution; (4) access to graduation requirements and interactive planning including trying out different scenarios and sharing information with advisors; (5) single billing and single payment if students are enrolled in more than one institution; and (6) improved operational efficiencies for shared student services (such as application for financial aid) for students who enroll in multiple institutions. The first five of these modules were implemented at the beginning of July 2011, and the last has a schedule for gradual implementation.

courses and promote enrollments. However, because many colleges consider eTECH a "side project," the recruitment and enrollment work is likely to be pushed aside in favor of higher priority projects more specific to the individual institution.

- Within all stakeholder groups (faculty, students, administrators, and employers) there are negative attitudes about online learning for the manufacturing field. Not all people are skeptical, but many are uncomfortable with online or hybrid learning and consider the process "watered down," leading to the suspicion that the certificate earned through the courses is "not a real degree."

- For the same reasons that generate skepticism of online learning, implementing online components while maintaining course rigor is a concern. The industry advisory council is particularly concerned with this issue, as they are focused on sorting out the adjustments necessary between online offerings versus traditional face-to-face offerings. For instance, strict rules about giving tests may be needed to ensure academic honesty from students, but may also compromise accessibility for students if the particular test date or time occurs during working hours.

Effective strategies

Despite numerous challenges, 360° has employed a number of effective strategies that have either helped the Center sidestep challenges before they occur or alleviated the influence of aforementioned challenges. The success of these strategies is due to the consistency of their application throughout the entire project, prior to implementation, during implementation, and onwards. These strategies include:

- Creating a formal consortium agreement prior to project implementation. This step helped overcome any potential governance issues. Any issues that came up later on were easily resolved because the agreement was already signed out and finalized. The agreement also secured finances for the program, which has helped 360° avoid budget issues due to low enrollment.

- Building relationships between individuals. Overall individual participation and faculty cooperation is extremely important to making the program work. 360° worked to help faculty from different fields and colleges to get to know each other, which helped everyone gain understanding of one another's work as well as understanding of one another. The process was also important in helping individual schools work together instead of seeing one another as competitors. These factors helped to build trust between members of the consortium in order to move cross-campus efforts forward.

- Collaborative efforts. Individuals from all sides of the project worked together and gave feedback in multiple ways through meetings, surveys, etc. Feedback is often incorporated into project decision making or even products, such as the creation of a "Frequently Asked Questions" document based on online survey responses.

- Significant support work. 360° anticipates needs and maintains itself as a center of support for colleges, supporting communication, in particular, through site visits, creation of desk reference materials, and answering any questions to alleviate concerns. The Center's previous work putting courses online also helped to ease individuals' concerns.

- Using external resources. The Center is able to better support the project through an aforementioned National Science Foundation (NSF) eTECH grant as well as by utilizing existing resources. These include their contract with the Online Support Center and the TIME Center, a NSF Advanced Technical Education Regional Center from Baltimore, Maryland.

Lessons learned

This case study illustrates an innovation at significant scale which has been developed over a number of years. Lessons learned include the following:

- The initial development of memorandums of understanding among the institutional partners in 360° allowed each partner to become familiar with the courses and programs of the others, and to accept transfer of credits among them. This prior step, while a large one in its own right, was an important building block for the further large step of developing entirely new programs to be offered jointly by multiple partners.

- Innovation on this large scale required significant additional resources. The NSF grant was a vital means of making it possible. With only existing system and campus resources, it would not have been possible to devote the considerable Center and institutional time required to plan, coordinate, and communicate as needed.

- The innovation involved financial risk, which became most evident when initial enrollments proved to be low. The ability of the Center to assume that risk was essential to preserving momentum and keeping implementation going while enrollment barriers continue to be studied and solutions sought. Had implementation been dependent on the resources available to individual campuses or to the Center through its base funding, many of the initial courses would have had to be canceled, making it impossible to test and refine the online instructional strategy and the cooperative enrollment and instruction.

- New ways of doing things may not immediately be attractive to stakeholders, and may require significant attitude shifts. This can be facilitated through sound evaluation that documents the value of the new way of doing things, but it may also require significant marketing to communicate that value to skeptics. When the innovation is not only new in its current setting but also has no model elsewhere to emulate, those managing the project need to start from scratch to understand attitudinal barriers and experiment to identify the most effective marketing strategies to address doubts. These are likely to be different for each stakeholder group (faculty, students, administrative staff, and employers), and to require significant resources to address.

MNCEME case study

The mini-case study for the Minnesota Center for Engineering and Manufacturing Excellence (MNCEME) examines a new collaboration between two-year and four-year schools within the civil engineering field. In this partnership students gained hands-on experience with the contracting process as well as with the ways in which civil technicians and civil engineers work with each other.

New innovations

Two professors at Minnesota State University, Mankato, a four-year university, and South Central College, a two-year college, cooperated in order to offer their civil engineering and civil technician students an opportunity to experience real world professional business collaborations. The partnership also addresses industry's need for employees with not only technical job competencies but also an understanding of the practical aspects of the job, including teamwork, communication, and how different components of the work relate to each other and to the whole process. Akin to the on-the-job responsibilities that students would experience upon graduation from their respective programs, the collaboration between schools brought expertise from two and four-year institutions together, was successfully led by individual professors rather than upper administration, and received support from both MNCEME and industry.

This was an innovation that required all the different individuals involved, from students and faculty to administrators and industry, to think differently about higher education. Students, in particular, were given the chance to experience more innovative ways of learning. MNCEME provided a connection for the colleges to communicate and become comfortable with the collaboration, thus helping individuals learn to think in new ways about where learning happens and how to work within a larger and more interconnected system, in order to educate future engineering professionals.

Historical context

The collaboration was initially unplanned, and illustrates the unique capacity of the Center to observe and take action based on unexpected opportunities. The idea came from a challenge that needed to be resolved for Mankato's civil engineering senior capstone project course. To complete the senior capstone, the students needed to complete a project for the Minnesota Department of Transportation (MnDOT), a component of which required data from on-site survey work. Since such work is typically conducted by civil technicians trained at two-year colleges, the capstone had previously relied on staff from MnDOT. On this occasion, however, MnDOT staff was unavailable to conduct the survey work, leaving Mankato in a bind. In discussion of the issue with MNCEME, the Mankato instructor was encouraged to contact the South Central College instructor to complete the survey data work. The two institutions previously considered one another's programs as competitors, but MNCEME helped bring the two together to communicate, advocating the benefits for both parties, and alleviating concerns about financial resources and skepticism about quality of work.

After this initial contact, the two instructors took ownership of the collaboration, without needing further direct involvement from MNCEME. The South Central instructor modified a course on the development of professional contracts in order to have his two-year students complete the required survey work while simultaneously completing course outcomes. This gave the students at South Central an opportunity to structure a real proposal and contract to be signed by Mankato. Students at both institutions were now required to plan expectations and participate on both sides of contract design. After a contract was agreed upon and signed, students from South Central completed the survey work needed for the Mankato students' capstone project.

After the field work for the current project was complete, the four-year students prepared the documentation and presented the results to MnDOT, with detailed documentation including the South Central students' surveying work as well as their own final engineering design work.

Both instructors acknowledge challenges as well as successes throughout the project. The instructors attempted collaboration on a different project in the past year, but it was complicated by poor weather and ground conditions. Surveying requires on-site work and with the long winter followed by muddy fields, this project was delayed by both the engineering technologists (in the two-year program) as well as the engineers (in the four-year program). However, the two instructors still hope to continue collaborations with future courses for future projects, using this initial collaboration as a model for standardization. They also plan to share the partnership model with their peers by submitting it at professional meetings and to professional journals for publication.

As a result of this initial collaboration at the level of individual courses, the college and university faculty developed a program-level articulation agreement that would allow the transferability of students from the college civil engineering technology program into the university civil engineering program. As of August 2011 this proposal is in review by the system office.

This project is seen as a model of how the two-year program's strength in surveying provides expertise and support to the university civil engineering program, for the mutual benefit of students in both programs. With this model in place and reported in the literature, it can inspire other similar collaborations and grow the potential within the system for college and university faculty and students to work together. It can also provide a valuable academic service and better serve private sector clients. Another similar project is currently under way in the area of mechatronics.

Challenges and strategies

MNCEME was successful in its role to connect parties from different institutions for collaboration by acting as a neutral point for communication. In this way, the project was able to bypass skepticism regarding quality of work as well as any financial concerns related to collaboration. The Center also helped bring faculty together on a broader scale to develop an articulation agreement between the two programs.

After MNCEME's involvement, the project itself faced challenges unique to carrying out real-world survey data work, and also faced challenges related to process, as noted by the instructors. The main challenges include providing students enough support to do the work and encouraging better communication and collaboration between students at the two- and four-year levels. The two-year instructor, in particular, notes that two and four-year students did not meet with each other, except when the two-year students met a couple of representatives from the four-year course while they were on-site to do the survey data work. This limited face time for students and was thus a missed opportunity for stronger communication and collaboration. Resolving these challenges would improve replication of future collaborations.

A third challenge was an unexpected delay in approval at the system level for the articulation agreement worked out by the two faculties. This proposal and the more general broadband degree development helped the system offices recognize that two different offices were interpreting the same credit transfer policy in different ways. As a result, the differences were resolved and a common interpretation was agreed to.

Lessons learned

This case study illustrates the Center's use of its unique position to recognize needs and opportunities among its institutional partners, and to leverage resources across institutions to fill needs and take advantage of opportunities. Lessons learned include:

- By having relationships with related departments and programs at multiple institutions, Center staff are able to identify the "best fit" to combine resources for maximum shared value.

- By being itself outside of any single department or program, the Center can be a neutral broker to convene parties with different perspectives and interests and help them develop a common purpose.

- The specific partnership on field work has the potential to become more institutionalized between the two original programs and institutions. The mechatronics replication will help to illustrate the extent to which this model has wider potential at a more system-wide level. At a minimum, broader discussion of this experiment among a wider range of departments might allow other faculty to perceive opportunities to adopt similar partnerships combining practical experience for students at two levels within the same field.

- Innovation often involves some risk. In this case, there was some financial risk (extra costs for South Central), which might have prevented the innovation being attempted if the Center had not been able to shoulder it. However, once the innovation has been tested and the benefits have been proven, the cost may be seen as worth the results, or other means may be found to pay the added costs. In either case, the Center's ability to assume the risk during the testing period is a critical factor making the innovation possible.

- The development of articulation agreements is a high priority for the Center and its academic partners. It is hoped that the experience with the development of the agreement arising from this project and the experience of working through the system-level approval process will lead to greater communication between the institutions, the Center, and the system office responsible for review of such agreements. This in turn should greatly facilitate the work of the Articulation Specialist soon to be hired by MNCEME.

Advance IT case study

The mini-case study for Advance IT Minnesota concentrates on the Center's SAP (Systems, Applications, and Products in Data Processing) Partnership and Curriculum Project, an effort to respond to an urgent industry need for workers trained in a rapidly emerging content area.

New innovations

SAP (Systems, Applications, and Products in Data Processing) is the dominant and growing enterprise level suite of applications in the business world. It is considered by many in the IT industry as a mission-critical application which integrates all business functions (e.g., accounting, human resources, and marketing) within a large organization. The purpose of the SAP Partnership and Curriculum Project, as carried out by Advance IT, is to solve the shortage of SAP talent in the Twin Cities with the hands-on SAP experience critically needed by all regional SAP clients.

This partnership provides both curriculum and system access necessary to train students and incumbent workers on the SAP modules. Elements of the project required participating faculty to think differently about how and what to teach. Advance IT was integral in helping individuals learn to think in new ways about how to work within a larger and more interconnected system in order to educate future and current IT and business professionals.

Historical context

Although the SAP Corporation has formal higher education partners in many states, it had none in Minnesota until Advance IT facilitated one with Metropolitan State University (Metro State). Through a previously established relationship with the owner of a Twin Cities area IT consulting and staffing agency, Advance IT staff was invited to join the Twin Cities SAP Roundtable, a private industry group created by that individual to gather "C" level leadership (CEOs, CFOs, COOs, etc.) in small, medium and large organizations using SAP. Through this membership, Advance IT was able to identify the extent of the need industry faced for employees with SAP skills.

With no higher education institutions in Minnesota addressing the SAP talent pipeline needs, Advance IT Minnesota first responded by researching ways in which the Minnesota State Colleges and Universities system could address the issue. Initial contact was also made with the SAP Corporation to determine whether the partnership with SAP would be feasible in terms of cost and other requirements of implementation. Staff then approached administrators and faculty with the opportunity and proposed solution of incorporating SAP curriculum within College of Management programs at Metro State.

Upon finding strong support for the project, Advance IT proceeded to submit an application for membership in the SAP University Alliances Partnership program and facilitated negotiation of a contract between SAP and Metro State. The contract negotiation proved to require significant persistence and patience over a nearly six-month process.

The process, from conception to approval of the contract, took place from the summer of 2009 until the fall of 2010, when Metro State gained access to SAP training, curriculum, and actual SAP modules. The initial group of faculty began attending SAP training in the winter of 2011. Faculty are currently incorporating SAP as their hands-on exercise platform into courses in multiple disciplines. Further steps will include continued training of faculty and creation of educational products designed for the incumbent workforce, such as a graduate certificate in SAP as well as offering SAP's "TERP10" certification training. Full integration of SAP into business courses (particularly management information systems courses) by the fall of 2012 is expected, providing both a significant competitive advantage for university programs as well as a substantial revenue stream for the Center from the TERP10 training and continuing education offerings designed for current professionals.

Challenges

Advance IT faced two main challenges in implementing the SAP Partnership and Curriculum Project. The primary barrier was reconciling conflicting administrative and legal requirements of two very large bureaucracies, which delayed implementation by several months. The SAP standard agreement, which was reported to have been accepted in other states, did not meet the requirements of the State of Minnesota, as represented by the Attorney General. The terms of the agreement eventually accepted by the Attorney General's office also created problems for operational and educational processes in implementing the project.

A second challenge was the resistance of some faculty members at Metro State who viewed adoption of the SAP platform as endorsement of the product as well as an educational tool. In addition, some faculty were also concerned that the curriculum developed elsewhere and shared by SAP is not an ideal fit for the current program, because not all disciplines can utilize the modules. This in turn limits the strength of participation in implementing SAP at Metro State, although over time it could be remedied through the faculty's development of its own more tailored curriculum. While these issues are still being addressed through other strategies, enough faculty were convinced of the overall value to launch the project.

Effective strategies

Despite these challenges, Advance IT has employed a number of effective strategies that have either helped the Center sidestep challenges before they occur or alleviate the influence of these challenges. These strategies include:

- Prior relationships that promoted the success of the project. In particular these included the relationship with industry, which led industry representatives to seek Advance IT's help to meet their needs through Minnesota State Colleges and Universities programs. This relationship also helped the Center to advocate for the curriculum.

- Conducting solid research prior to project implementation, improving faculty and administrator support for the project.

- A shared cost model between the Center and the College of Management (COM) that provided funding of up-front costs for licensing and module access by the Center and utilization of existing faculty development funds by the COM. The agreement provides for cost recovery through future shared revenue streams from continuing education offerings.

- Securing involvement of a "critical mass" of faculty, rather than seeking unanimous participation. Although not all faculty are on board, the project is still able to move forward as a result.

Lessons learned

This project illustrates the value of a portal for industry to which they can bring their concerns and needs, and which can advocate for the best use of system resources to meet their needs. In this case study, the need was identified as specific to the Twin Cities, resulting in a solution specific to the one metro area university. However, the learnings are applicable more generally.

- Innovation within the system may depend on the willingness to innovate outside of the system as well. In this case, to develop the new partnership with SAP it was necessary to persuade the state Attorney General's office to consider a different model for the contract.

- The success of innovation is thus dependent on resources within the system to advocate for the needed flexibility. Selection of the appropriate point within the system to do the advocacy may be important. It was in the interest of the Center to invest this effort, because meeting the needs of industry is one of the Center's

primary missions. It is not likely that this effort would have been as forthcoming (or as feasible) from an individual program or department. While the advocacy might have been equally effective coming from the system office, it is less likely that industry representatives would have had the relationships and knowledge to approach the right office at that level to secure what they needed.

- Faculty buy-in is essential for educational innovation, but some implementation can proceed with partial buy-in. This allows the creation of an incubator for innovation in which more skeptical staff can observe how the new idea works and, possibly, come on board at a later time. For innovation to be possible, it is helpful to operate in an environment which does not require unanimous agreement to take action.

HealthForce case study

The mini-case study for HealthForce Minnesota concentrates on the Center's efforts to develop the broadfield A.S. degree in health sciences, a statewide agreed upon curriculum plan that allows students to transfer two years worth of broad coursework in the healthcare discipline to a four-year program in a specific healthcare discipline.

New innovations

The broadfield A.S. degree is a cross-campus core curriculum that ultimately prepares students for a four-year degree (rather than ending with a two-year technical degree). The broadfield degree development was an initiative of the Office of the Chancellor, which contracted with HealthForce for assistance in the process of communicating with industry and coordinating and utilizing different resources from different institutions.

Such innovation requires a new way of thinking about higher education for all the different individuals involved, but particularly for those at four-year universities. Individual faculty at different institutions can become occupied with serving their own communities or their own regions; this project helped them understand what is happening in the field more broadly outside of their own communities or regions, and hence to think more broadly about how to strategize their impact. With help from the Center to come together and broaden their perspective, individuals across universities and across healthcare disciplines were then able to come to agreements for decision-making.

A task force consisting of a diverse group of faculty and leaders in higher education then created a statewide agreed-upon curriculum consisting of fourteen core courses. Unlike in traditional program transfers, the broadfield courses were articulated with upper-division curriculum to make it possible to determine how courses fulfill common competencies, rather than considering only the transfer of specific numbers of credits. The project also increases both flexibility and focus for students who may be interested in the general

health sciences field as freshmen, but still unsure of a specific healthcare field; this program allows students to explore specific healthcare fields while still moving forward with a common and transferrable core curriculum.

HealthForce staff was integral to helping rebundle and repackage current offerings to streamline how to work within this larger and more interconnected system in order to educate future healthcare professionals.

Historical context

A key intent of the health sciences broadfield program is to ease the process of transferring from a two-year program to a four-year program, helping students avoid common problems they would experience such as repeating courses that do not transfer as a complete package. Students would frequently take the "wrong" chemistry, biology, or mathematics course and would have to repeat similar material, costing them both time and money. Creating a common two-year core helps to resolve the issue.

The project vision came from the system office. It is based on an engineering broadfield program of a similar nature, in which students have a two-year common core before choosing a specific engineering field in which to complete the four-year degree. Industry partners supported the concept of the health sciences broadfield project vision immediately. They believed it would fill a gap, and wondered "why we didn't have it already?"

Prior to discussion of specific implementation details, HealthForce staff members researched similar models from other states that focused on curriculum alignment. The data from their research was brought to the task force for consideration. As different questions arose during the development process, this process would repeat itself, where HealthForce would do the ground work of conducting research, contacting individuals, designing plans, and go back to the task force for collaborative decision-making to move the process forward.

Initial steps included conducting a task force survey regarding what members would want to include in the broadfield program, disseminating and discussing results, and making decisions based on findings. HealthForce staff then pulled together course descriptions, while task force members weighed in on necessary competencies and content. All of this was accomplished through electronically shared working documents.

The last phase of the project included dissemination of information for individuals outside of the task force and across the Minnesota State Colleges and Universities system, with the purpose of sharing project updates and progress. HealthForce staff also spoke with the chief academic officers at each university to ensure that their feedback informed the broadfield program.

Currently, curriculum for the broadfield program has been defined, communication strategies have been identified, and a marketing plan for student recruitment has been prepared. The system office has approved the proposed program and it is set to be implemented in the fall of 2012. As part of the approval process, the system office adapted the system's articulation requirements to streamline the transfer process. In particular, a statewide articulation agreement was made, avoiding the requirement to separately create bilateral agreements between each pair of institutions involved.

Challenges

HealthForce addressed challenges throughout implementation of the health sciences broadfield program. These included administrative procedures, fear of revenue loss, and scarcity of resources, which contribute to issues with communication and full project implementation. These challenges did not affect the project significantly in the beginning, but did begin to affect the project's progress in later stages, particularly after the Center no longer had a role in the remaining changes that needed to be made at the system-wide level. Most of these challenges relate to the fact that the broadfield degree is a new model and its ramifications are not yet fully known. Following are the details regarding these challenges:

- The policy authorizing the broadfield degree calls for the transfer of students' initial 60 credits to be governed by "a statewide articulation agreement." The process for developing and approving such agreements is more time-consuming than the processes for simple arrangements between two institutions. Once the curriculum has been developed by the faculty, the proposed broadfield degree is sent to all chief academic officers in the system for review and comments. After these are received, and the faculty working group has made any revisions they feel are needed to the proposal, then all universities in the system that offer the relevant baccalaureate degree must review it again and indicate their agreement to accept the transfer credits into their programs. When that step is accomplished, two-year institutions can apply to participate. Although complicated, this procedure is more efficient than developing one-to-one agreements between all possible pairs of institutions. However, for faculty more accustomed to traditional articulation agreements, the extra time required for the process proved frustrating.

- The broadfield degree agreement can create uncertainty for implementation, because particular four-year programs have space for students to transfer into (e.g., public health, exercise physiology), but other programs may not have the space (e.g., nursing, dental hygiene). These differences in available space at the upper level may thus limit students' options. Although baccalaureate programs must accept students who

have completed the agreed-upon broadfield associate of science degree with satisfactory grades, they are not required to do so if there is not space in the program.

- Some individuals fear implementation of the health sciences broadfield program may have financial ramifications, particularly for four-year universities, if students are given the incentive to take two years worth of coursework at other schools. Universities would face potential revenue loss if more students began at two-year colleges and then transferred later to take only upper-division courses to complete their degrees. The innovation is broadly felt to be best for some students' interests and to offer a benefit to the system and state as a whole. However, its introduction could cause hardship to some institutions, especially in view of severe budget cuts that are being imposed by the state's financial crisis. This could in turn decrease institutions' openness to the Center and to cross-campus partnerships more generally.

- Scarcity of resources related to budget shortage, staff cuts, and a turnover in staffing at the system office has impacted effective communication and slowed down project implementation.

Effective Strategies

HealthForce staff employed effective strategies that have either helped the Center sidestep challenges before they occurred or alleviated the influence of aforementioned challenges, particularly during task force activities.

- Success in defining the curriculum is largely attributed to HealthForce staff leadership and strong commitment from diverse individuals on the task force.

- HealthForce staff contributed solid research and support for communication and collaboration within the task force.

- The Center Director's experience working within the system for two decades in multiple positions helped her to assume an "insider" but neutral role and anticipate how changes would affect different individuals and institutions.

- The level of committed among individuals on the task force. These included a mix of members representing the liberal arts, healthcare, two-year and four-year institutions, and both faculty and administrative members. Members also worked well together, were respectful of different college campus requirements, and focused on core competencies. According to case study informants, their ability to "honor unique differences and histories" was important to project collaboration.

In addition to these qualities, the expansion of HealthForce, by industry advisory council request, may have also benefited the project. Over the course of the project, the Center went from two staff members to seven staff members as a result of merging with the Healthcare Education Industry Partnership previously headquartered at Mankato. The expansion allowed for more resources and better communication during the beginning stages of the project, as the Center then became more easily connected to the Minnesota State Colleges and Universities system as a whole.

Lessons learned

In the work to develop and introduce the broadfield program in health sciences, initial buy-in and commitment from programs across the state was surprisingly high. However, HealthForce has faced challenges related to administrative procedures and scarcity of resources that still need to be addressed system-wide. Lessons learned include:

- Communication is vital to coordinated, cross-campus work, and especially so when the work is system-wide. Limited resources affected the system office's capacity to keep the Center informed of action on the system-wide approval process and its work to promote a wider view of the articulation process. As a result, the Center was not able to maintain a high level of communication with the task force about the project's status. This resulted in a decrease in energy that may affect commitment to implement the program now that it is approved.

- Innovation requires champions. HealthForce has been able to be a champion among institutions, and had no trouble recruiting champions among institutional representatives for the development work. However, the process of approval at the system level appears to have lacked a champion, and HealthForce itself was unable to be the needed champion at this level.

- The Center's mission to advance statewide interests does not always promote the best interests of individual institutions. In general, it is expected that each institution will accept that students' interests are most important, but it may require a champion from the system office to help promote the importance of the statewide perspective and ensure full participation in efforts that do not result in specific benefits to individual campuses.

Synthesis of findings across all four case studies

The following factors were observed in multiple case studies as helping to promote innovation.

- Relationship building through networking
- Having an "insider" as a leader within the Minnesota State Colleges and Universities system who is also a neutral point of contact to bypass political issues
- Collecting and/or using good data to better understand industry needs, partners' attitudes, successful approaches elsewhere, etc.
- Access to additional and/or external resources that can be dedicated to needed areas. The access may require specific skills, relationships, time, and/or logistics

A combination of these factors seems to be most effective in moving innovation forward.

The following factors were observed as slowing or limiting the success of innovative efforts. The barriers to innovation were more varied than the supportive factors, and depended more on the specific type and location of the effort.

- Scarcity of resources, particularly staff time (for staff in Centers, programs, and the system office)
- Difficulty maintaining adequate coordination of multiple partners over an extended period of time; loss of momentum after the initial design work if the logistics of implementation are protracted or must be handed off to others who were not part of the design
- Limits to how widely the potential partners share a sense of priority or urgency for the innovation, or enthusiasm for the agreed-upon outcome of the project but reluctance to address needed changes in resource allocation or bureaucratic requirements
- Another barrier seen in some but not all case studies was fear of increased cost, or loss of revenues, from the adoption of the innovation.

Adoption of new curriculum or new delivery methods also requires faculty and students – and ultimately employers – to think differently about when and how learning occurs, and the conditions needed for the acquisition of high-quality skills. Change in these attitudes is likely to take considerable time. It will be helped by successful results from initial efforts such as those described in the case studies.

The case studies illustrated certain unique features of the Centers that allow them to advance innovations within the system that other entities (institutions or departments) are less well positioned to accomplish on their own.

- Centers have time, resources, and staff dedicated to specific goals related to industry workforce needs and promoting relationships and innovation within educational partners. Institutions and departments have other primary obligations.
- Center leaders combine knowledge of the higher education system with knowledge of their specific industry sector. They are able to leverage this combination to facilitate relationships and information sharing among the different sets of partners.
- Centers are able to use their own funds when needed to reduce risks in the early stages of new projects. At least two, and possibly more, of the case study innovations would likely have been cancelled early in their development if institutional partners had had to bear the costs or the risk of losing funds on an undersubscribed offering. The Center can use its funds as venture capital to help keep early stage efforts afloat until they reach a tipping point and can stand on their own with only the usual sources of support.

Review of research literature on innovation

To provide some context for the case studies, the research team reviewed a sampling of recent research on effective models of innovation in organizations. Some of the reports result from a joint academic and industrial research project sponsored by the European Commission Information Society Technology (IST) programme, which is currently investigating "disruptive innovation." They define this as the development of new "products or services which were not available" to customers previously, which may also require entirely different capacities on the part of the producer. (2,5,7,8)[4] The results of this set of studies are consistent with those of the other, unrelated studies that were also consulted.

The research finds four main barriers to innovation that must be consciously addressed:

- Lack of awareness of the need or importance of innovation
- Inability to generate new ideas
- Funding routines that favor traditional activities and incremental change
- New product development processes that are unable to accommodate significant change

[4] Reports consulted for this review are listed at the end of this section (page 67). Numbers in parentheses indicate which report or reports were the source of the themes mentioned. The definition quoted in this paragraph is from page 1 of source #7.

The lack of awareness of the need for innovation is cited as one reason why much industrial innovation occurs in start-ups. Existing organizations have a history of success using already tried and true methods and products. This tends to inhibit exploration of new ideas. The studies find that new ideas tend to come not from the centers of an organization, but rather from the outer fringes where there may be less constraint and more regular contact with a variety of new ideas. (1,2,3) Identifying and nurturing these new ideas is best accomplished by deliberately bringing people together across traditional working units without hindrance from traditional hierarchies. (2,3,8) This helps collect and strengthen ideas by allowing them to be cross-fertilized by connections outside of usual networks. It also provides opportunities for ideas to be connected with potential sponsors that have the position and resources to help develop them. (8)

Once novel ideas have been identified for possible implementation, the organization must develop "break-the-mold" approaches while simultaneously maintaining regular processes. The studies we reviewed find that this requires a separate, parallel structure. (3,5) The separation is important because it allows the innovation to be freed from traditional control and funding processes. These processes, which help ensure quality control and efficiency in normal operations, generally support incremental change reasonably well, but typically rule out more radical innovation processes. (5,8) In particular, regular decision-making regarding funding tend to discourage new ideas, especially those that must start at a small scale for the pilot phase; focus mainly on risks and tend to downplay potential benefits because they are not within the usual cost and benefit calculations; and prefer familiar models over those that reflect rapidly changing environments. (8)

The existence of two "conflicting and contradictory" processes, priorities, and sets of principles within the same overall organization can easily cause significant friction. Managing the relationships between mainstream and innovative structures requires skilled leadership within the overall organization, as well as within the new structure. (3) The relationship between the parallel units can be helped by assigning regular organization staff to work on the innovations on a rotating basis, which helps build networks in the larger organization "instead of walls or silos." (3)

Once an innovative process or product has been developed and piloted, it must be moved into the mainstream organization. (3) This process requires advance planning. If regular staff have been involved in the innovative structure, the integration process will benefit from the appreciation they are likely to have developed for the value and potential of the innovation. Another way to help prepare the mainstream organization to be receptive to the innovation is to ensure that its leadership hears the voice of the customer for whom the innovation will add value. (1,3)

Implications of literature review and case studies

The research literature reviewed is specifically based on industrial examples of innovation. So far as we know, its principles have not been formally tested in the context of higher education. However, they align remarkably well with the lessons learned so far in the implementation of the Centers of Excellence since 2006.

Recognition of the importance of innovation

The Centers of Excellence have been an important voice within their associated programs and institutions for collecting information on the needs of industry. While the system overall does not lack an understanding of the need for innovation in educational programs and processes, the Centers have contributed significantly to the awareness of the urgency of those needs. A variety of national policy researchers have emphasized specific innovations that are needed, including a greater linkage between economic development efforts and higher education to better target workforce development efforts where they are most needed.

Generation of new ideas through connections across groups

All the Centers have created new networks spanning groups that were previously not in regular contact. In each, this is occurring at the level of governing bodies. A variety of other kinds of gatherings have been organized, either on a regular basis or for specific purposes. Examples highlighted in this year's report include Advance IT's faculty-industry symposium and the convening organized by 360° to strengthen the articulation of PLTW work into the higher education curriculum. In evaluations in other years, faculty have reported finding such cross-campus gatherings very stimulating and useful.

Separation of structures and processes

The Centers are hybrid organizations, partially embedded in the system's mainstream institutions but separate from the regular departments and programs. As predicted in the research, this has led to frictions between new and regular operations. However, it has also generated a number of innovations to date, including significantly increased outreach to potential students, new and updated courses and programs, and increased alignment between programs across campuses. As the Centers continue to develop more varied sources of income, friction around funding is likely to become more salient. The lesson from the research about separate processes for reviewing and approving funding for innovation will be important.

Leadership to manage the tensions between parallel structures

To date, a number of innovations have been incorporated into regular department and program operations. The scale of innovations is growing: from courses to entire programs; from linkages between pairs of programs to entire multi-institutional consortiums; from incorporating new equipment or software into existing programs to re-thinking the entire model of how courses and programs are delivered to students. As this scale increases, the challenges of bringing innovations into the mainstream operations also increase. This is likely to create additional responsibilities for the leadership of the overall system to manage the frictions resulting from those challenges.

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Synthesis and conclusions

The findings above support the following conclusions about the operations and impacts of the Centers to date.

Outreach work continues to expand in scale and strengthen in effectiveness

- Efforts are growing to reach out to nontraditional learners (dislocated and incumbent workers).

- The engineering component of Project Lead the Way may be approaching a tipping point in its level of visibility, due to the number of schools and districts using it and the growing number of trained counselors who can help students identify how to build it into a career trajectory. Efforts should be continued to further integrate the curriculum into the K-12 standards and secure greater recognition of its college-level rigor.

Centers continue to engage a strong set of industry partners

- Centers have adopted a variety of structures for engaging their industry partners, and no one structure appears to be most effective. Hands-on participation by industry representatives in identifying needs and helping to prioritize (but not design or dictate) solutions appears to be most helpful in maintaining energy for ongoing participation.

Centers are helping to shift practices to greater collaboration among institutional partners across the overall system

- Within-program and within-institution innovations were the first to be addressed. Examples include equipment upgrades, and revised or new curriculum for a single program or institution.

- Cross-campus relationships are growing stronger and expanding. New institutions are becoming involved in elements of the work even if they are not formal partners, bringing more of the resources of the system into play to meet industry needs.

- Since the beginning, Centers have shared strategies with each other for working effectively as industry-focused entities within a geographically-focused system. Now, however, we are seeing Center-to-Center partnerships in joint projects as well.

Centers' status as entities independent of specific departments and programs helps them promote innovation

- They are able to use their position to be neutral conveners and arbiters.
- They can use funds to promote priorities that are essential to an industry sector but do not rise to the top for any individual institution.
- They can use funds to cover early risks, incubate innovations during a trouble-shooting period, and allow them time to grow and take hold.

Fiscal arrangements are not yet consistent

- Non-standard job descriptions for Center staff make it hard to appropriately rate positions for competitive pay.
- This, combined with the inability to guarantee multi-year job availability, make recruiting Center staff challenging.
- Most financial arrangements (through host universities) appear to be working smoothly. However, the Centers' lack of legal standing to manage their own budgets continues to result in some fiscal decisions being made based on standard policies that may not be flexible enough for the innovative processes that are being developed. To date, these challenges appear to have been successfully resolved. However, it would be advisable to examine whether the fiscal arrangements that have served the Centers and the system up to this point will be the most effective approach for the continuing development of the Centers.

Champions matter for innovation, and are needed at multiple levels

- Centers function both within and next to institutions, and can act as quasi-peers to promote innovation at the program and institutional levels. Center staff and, increasingly, faculty and administrators who have been involved in Center work and understand its potential, are proving effective champions for change in many efforts within and among institutions.
- When implementation efforts depend on follow-through at the system level, Center and institutional staff are less effective as champions. An increasing share of Center efforts now have systemwide impact. It will be important to reconsider whether the system-level leadership and support for Centers should be modified to support the continued evolution of the Centers.

- The review of innovation literature shows it is important in industries to have high-level leadership that explicitly manages the relationships between standard and innovative parts of the overall organization. This leadership is also needed to help plan and support the mainstreaming of successfully piloted innovations into the wider organization. The research literature has not examined whether the same principle applies in higher education, but the experiences documented during the evaluation of the Centers of Excellence suggests that it likely does apply.

- Since the formation of the Centers, many staff in the system office have worked with Centers and their academic partners and helped to support their work. These staff are open to requests for help, but Centers rarely request it. Moreover, the Academic and Student Affairs unit has been reduced by 36 percent since 2008. Further discussions should be held to better understand what kinds of system-level capacity and relationship with the Centers would best serve the Centers' and system's needs at this time.

Appendix

Figure A1 below is a companion to Figure 9, showing the distribution by Center and institution of the students who have enrolled in courses that were created or significantly modified with the help of the Centers.

A1. Enrollments in new and modified courses developed with the help of the Centers, by year course was first offered, Center, and partner institution

	2006	2007	2008	2009	2010	Unduplicated total
360°	0	9	195	303	581	**976**
Bemidji State University	*-*	*1*	*45*	*72*	*73*	***177***
Pine Technical College	*-*	*8*	*11*	*21*	*33*	***61***
Saint Cloud Technical and Community College	*-*	*0*	*48*	*118*	*246*	***365***
Northwest Technical College –Bemidji	*-*	*0*	*0*	*0*	*34*	***34***
Central Lakes College	*-*	*0*	*23*	*23*	*40*	***67***
Northland Community and Technical College	*-*	*0*	*68*	*69*	*68*	***185***
Riverland Community College	*-*	*0*	*0*	*0*	*87*	***87***
MNCEME	0	171	260	251	223	**791**
Minnesota State University, Mankato	*-*	*171*	*211*	*195*	*158*	***621***
Normandale Community College	*-*	*0*	*49*	*56*	*65*	***170***
AdIT	82	70	98	156	194	**459**
Metropolitan State University	*82*	*62*	*81*	*139*	*175*	***413***
Inver Hills Community College	*0*	*8*	*17*	*17*	*19*	***46***
Total	82	250	553	710	998	**2,226**