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QUESTIONS OF INVESTIGATIVE INTEREST AND IMPACT**

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Abstract

How can a large scale, multi-state, collaborative workforce development project be evaluated? This article describes the evaluation process of the Midwest Center for Information Technology (MCIT). The project uses “impact threads” to connect the outcomes of the project to strategic evaluation questions. The MCIT project, involving 10 public two-year colleges located in Nebraska, Iowa, South Dakota, and North Dakota, strives to assist partner colleges in enhancing information technology training and related degree programs. The MCIT was funded as a regional center within the Advanced Technological Education (ATE) program of the National Science Foundation (NSF). This article details the evaluation plan for the center, including how selected data is systematically mapped to impact threads and further illustrates the evaluation process by providing some examples of MCIT's progress.

Introduction

Workforce development today can be challenging. Workforce development in the information technology (IT) field can be particularly daunting. Few people would disagree that human knowledge and the technologies supporting such knowledge development are expanding at an amazing rate. A quick review of the history of the Internet will represent this rapid knowledge expansion and recent estimates of Internet growth suggest there are now over one billion users (Internet World Stats, 2006). However, even with such impressive expansion, the employment field represented by the information technology workforce has suffered considerably in the past decade (Hagedorn, 2005; Sargent, 2004). Setbacks from various national events, including the terrorist attacks of September 11th, the collapse of various dot-com organizations, and an end to work related to Y2K have challenged employment opportunities in the IT field. It is a complex world where needs in the national IT workforce struggle to be heard over other issues such as national security, health reform, and disaster relief (such as with Hurricane Katrina). Yet IT workforce development has been recognized as critical to the overall health and economy of the United States and calls for confronting a “digital workforce crisis” have resonated loudly from our federal and state policy makers (ITAA, 2005; National Policy Association, 2002).

The worker who enters the information technology field today finds a profession with a wide range of occupational demands (Hagedorn, 2005). A strong background in selected technical skills is no longer adequate for such an occupation and IT professionals are increasingly challenged in various soft skill areas such as personal communications, leadership, teamwork, and dynamic problem solving (Bailey & Stephaniak, 2002). Although the federal government is working hard to support IT workforce development, it is the individual states that need to most directly address this important workforce development area. Historically, technology based economic development has been the responsibility of state and local governments” (U.S. Department of Commerce, 1999, 2002). Community colleges and other two-year educational institutions are now at the forefront in addressing IT workforce development needs within the states (California State Legislature, 2002; Kerr, 2002).

Despite the economic employment recession attributable to September 11th and the other challenges mentioned, employment within the information technology fields is once again growing. Employment projections published by the Federal Bureau of Labor Statistics (2005), through the year 2014, document that IT careers comprise 40% of the top 10 fastest growing occupations. Despite the demand, student enrollments in IT courses are not keeping pace. Many professional organizations, such as the Information Technology of America (ITAA), are now calling to more than double the IT workforce within the next 10 years and to assist educational institutions at all levels in better meeting this demand (ITAA, 2005). Such calls for workforce development efforts also include addressing an under-representation of women and minorities within the IT field (Congressional Commission on the Advancement of Women and Minorities in Science, Biology and Technology Development, September 2000; Margolis & Fisher, 2002). The importance of IT workforce development is growing and some authors are now identifying this increasingly important national effort as an evolving “war for talent” (Kaihla, 2003; Smith, 2006) that is facing our nation.

The challenging professional context represents the complexity of information technology workforce recruitment and education. Increasingly, 2-year educational institutions are finding it difficult to go it alone in IT workforce development and realizing that effective collaboration may be necessary. It was in such a dynamic environment that 10 public two-year colleges in the four states of Nebraska, Iowa, North Dakota, and South Dakota came together in 2001 to form a collaborative initiative and organization entitled the “Midwest Center for Information Technology.”

The Midwest Center for Information Technology

The information technology workforce development crisis has been well recognized in the Midwest, by the Applied Information Management (AIM) Institute. AIM is a 501(c)(3) non-profit organization located in Omaha, Nebraska. It is run like a for-profit business and dedicated to assisting economic development related to the integration of information technology and technology innovations across the Midwest region. When the National Science Foundation's Advanced Technological Education program published a call for proposals for establishing Regional Centers related to Information Technology Workforce Development and Education, AIM contacted 10 public two-year colleges within a four-state region (of Nebraska, Iowa, South Dakota, and North Dakota) and submitted a proposal. Subsequently, NSF funded the formation of MCIT. The 10 participating colleges, ranging from small to large, rural to urban, and vocational/technical to comprehensive and included: Central Community College (NE); Iowa Western Community College (IA); Metropolitan Community College (NE); Mid-Plains Community College (NE); North Dakota State College of Science (ND); Northeast Community College (NE); Southeast Community College (NE); Southeast Technical Institute (SD); Western Iowa Technical Community College (IA); and Western Nebraska Community College (NE). These diverse colleges educate approximately 50,000 students annually. This represents 43% of the public two-year college student population of the entire four-state region.

The Applied Information Management Institute serves as the fiscal agent and general project facilitator for the four-state consortium of public two-year colleges comprising the Midwest Center for Information Technology. In order to address the region's shortage of information technology professionals and the growing needs in this critical career field, the MCIT provides an integrated series of activities that focus on curriculum adaptation, faculty development, workforce development, articulation, and dissemination. A Site Coordinator (faculty member), working under the direction of the Chief Instructional Officers from each participating college, along with the NSF grant's Principal Investigators and a business-driven Advisory Committee, direct the implementation of project activities. Five aggressive objectives were carefully planned and initiated from the very beginnings of MCIT (2001), which included: (a) to increase the number of MCIT college faculty who held industry-validated information technology certification, (b) to increase the number of high school students articulating to MCIT college IT programs, (c) to increase the number of MCIT college students completing IT programs of study, (d) to increase the MCIT college graduates who articulate to 4-year college and university IT programs, and (e) to decrease the number of unfilled IT positions.

An Evolving Evaluation Strategy

The Midwest Center for Information Technology proposal to the National Science Foundation included an original objective-based evaluation process that was initially undertaken by the MCIT leadership and used for the first three years of project funding. This strategy sought to examine each objective, collect data relative to that objective, and then to report on the progress of each individual objective and activity. This evaluation process was very common across the NSF's Advanced Technologies in Education (ATE) program for funded projects and was helpful in starting the project and establishing a formative evaluation process. However, the NSF leadership of the ATE program, as represented by various program officers within that program, observed that such objective-based evaluations were not truly providing the sort of analyses that might lead to refereed publications and more general manuscripts that could inform the professional literature. In addition, such objective-based evaluations did not make it very easy for participating two-year colleges to contribute to the professional literature. Faculty at two-year colleges (ATE requires some level of two-year college leadership) were generally less experienced in developing research-based publications, and thus less likely to go from their objective-based evaluation report, to the publication of a manuscript based on that report. To address this perceived dissemination need, in the Fall of 2006, the ATE program officers held an evaluation conference for regional and national centers that encouraged each of these centers to establish their own focused research questions of investigative interest. These questions were to be of interest to the individual project leadership, and strive to more strategically encompass some of the existing project objectives and data collection efforts. The revised evaluation plans associated with these questions could then become a model for the overall ATE program and the process shared beyond the regional and national ATE Centers. Consistent with these ATE program requirements, the MCIT leadership team revised its evaluation process and established four key questions of investigative interest.

The questions were carefully developed with input from the 10 participating public two-year colleges in MCIT, along with AIM and the external evaluation team. The development process consisted of a series of six careful steps, which collaboratively moved the investigative questions from initial conceptualization to formal integration into the evaluation process. These steps included the following.

1. A careful review was undertaken related to the existing MCIT initiatives, the current data sources, and how these data sources were being mapped to each of the project objectives. This review process lasted several months and included various discussions within the site facilitator meetings as well as the MCIT leadership meetings. The group meetings generally focused upon what the individual institutions were most interested in finding out related to the MCIT interventions.
2. The MCIT leadership and the site facilitators then brainstormed specific questions of investigative interest that encompassed the various initiatives and potential data sources within MCIT, focusing again on what the institutions were most interested in finding out within the overall evaluation process. These questions also sought to link the various data sources to help examine possible sequences of project impact (or impact threads).

3. Site facilitators then shared these evolving questions with their college's administration, to obtain feedback and suggestions.
4. Using the feedback from the individual institutions, the external evaluators further refined the questions within an afternoon meeting of the site facilitators and the MCIT leadership team. The evaluators and MCIT leadership also eventually agreed to limit the number of investigative questions to four, to help ensure a more integrated use of the questions within the evaluation process. An impact thread of relevant data sources, represented as a graphical logic model, was also established for each of the four questions.
5. The four questions and the impact thread logical models were then presented to the MCIT site facilitators, further discussed, and refined slightly at several group meetings.
6. The four questions and their related impact thread logic models were then officially adopted by MCIT with a consensus of the external evaluators, the leadership team, and the 10 site facilitators, and then formally submitted to MCIT's ATE program officer, who formally approved the questions for use within the project evaluation process.

This collaborative effort by the 10 participating colleges and the leadership team of the Midwest Center for Information Technology eventually resulted in four investigative questions that were of considerable interest to both the project leadership and the 10 participating colleges. These questions were purposefully targeted to be more compatible with a research context (as desired by ATE), so that the answers to these questions could better contribute to possible publications and thus the potential replication of key elements of the MCIT initiatives. These MCIT evaluation questions of investigative interest included the following four questions:

- Question 1: How is the MCIT Working Connections IT Faculty Development Institute meeting the training needs of participating faculty?
- Question 2: How do women students who participate in the MCIT Bridge programs (where women students are systematically involved IT support groups) compare in program retention, achievement, and career awareness with those students who do not participate in the MCIT Bridge program?
- Question 3: What do the usage patterns of a student-run call center (or technical help-desk) imply for the long-term viability of such a multiple institution outreach service?
- Question 4: How do faculty participating in the MCIT case-based learning initiative change their instructional strategies within their respective coursework and how do their students perceive these changes?

Almost two years after the modifications of the MCIT evaluation process, each of the four investigative questions are now underway and in various stages of investigation. The Working Connections Faculty Development question is particularly well established and the related logic model is fully operational. Question 2, related to the Bridge Program, is also operational, and becoming a rich context for the 10 participating institutions to better understand how to support women and minorities at their respective institutions. Question 3, related to the Call Center, is just starting to become operational, since it is a newer MCIT initiative, but it is already documenting a strong interest and effort among several of the participating colleges who are seeking to examine the cost

effectiveness of this collaborative help-desk initiative. Finally, Question 4, related to case-based learning, is also steadily documenting emerging efforts and data across faculty coursework. This MCIT initiative was also recently expanded to include a wider national partnership.

The four investigative questions and their related logic models, as envisioned by the Advanced Technologies in Education program, have indeed significantly assisted the discussion of project impact and how such impact might be documented. As an illustration of the way that one of these four evaluation questions are now being carefully investigated and used to help interpret potential project impacts, the first MCIT evaluation question, related to the Working Connections faculty development institute, is now described in detail.

Evaluating MCIT's Faculty Development Institute

The Working Connections faculty development summer training institute has been one the more defined interventions of the Midwest Center for Information Technology. This week-long workshop represents an extensive, high quality and collaborative training opportunity for faculty from the 10 participating institutions, as well as other area faculty, secondary school IT teachers, and representatives from business and industry interested in attending. Training opportunities within the institute have been carefully planned and the instructional topics of the institute have been selected using surveys of faculty, who recommended specific training topics and formats. Many MCIT area faculty members have routinely participated in the institute, with 84 faculty members attending during the Summer of 2004, 89 faculty during the Summer of 2005, 94 faculty during the Summer of 2006, and 163 faculty attending during the summer of 2007. The investigative question established for this important initiative was: How is the MCIT Working Connections IT Faculty Development Institute meeting the training needs of participating faculty?

To examine the potential impact of the Working Connections Institute associated with this question, a logic model to connect possible threads of data representing potential impact was created during discussions with the MCIT site facilitators. The Working Connections impact thread model seeks to examine the potential impact of the institute on the instructors themselves (such as in their own professional skills and knowledge), leading to potential impact on the curriculum, with further potential impact on students. These impacts are then examined in the context of business leader perceptions of progress. The logical progression for these related analyses are now presented.

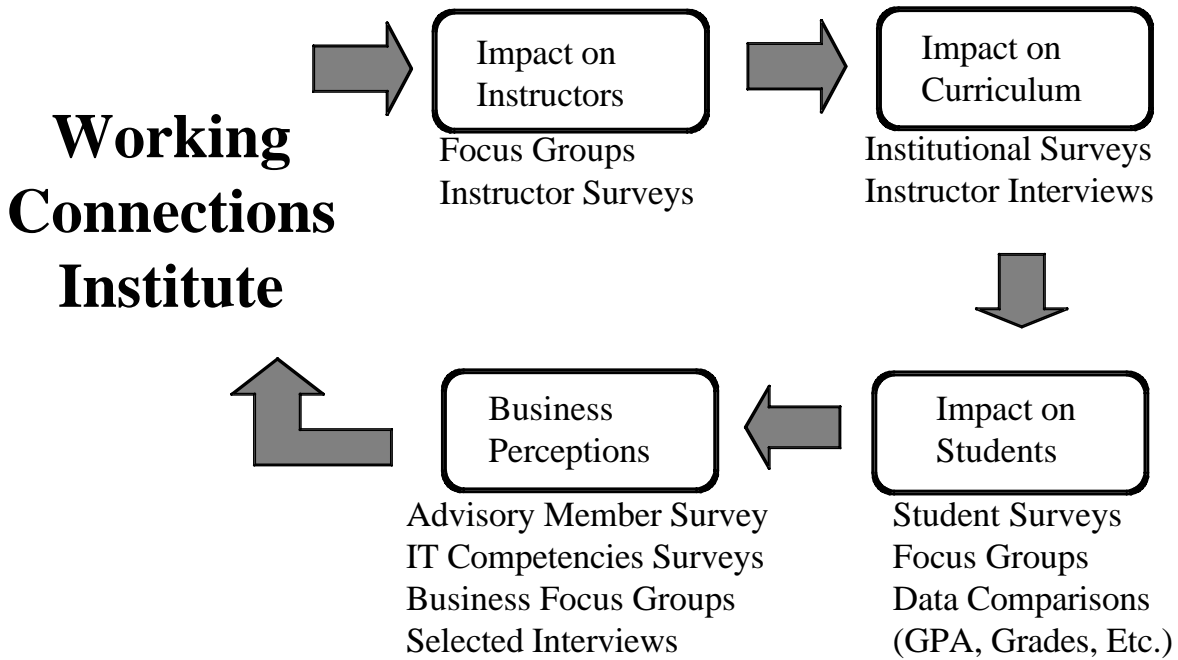


Figure 1. Working Connections Institute evaluation process impact threads

The Working Connections Information Technology Faculty Development Institute has been held yearly for the past four years, and the feedback from the attendees was consistently used to refine the topics and process of the conference. However, this feedback was not integrated into a wider look at impact until the new investigation question of interest associated with the Working Connections Institute was posed in 2006. Evidence of potential impact for the Working Connections Institute was then reexamined using the impact thread focus, with various sources of data retrieved from instructors, curriculum, students, and business leaders.

Evidence from Instructor Focus Groups

Faculty members who had attended every year of the MCIT Working Connections Information Technology Faculty Development Institutes were each invited to attend focus group events offered at the 2006 and 2007 institutes. Enticed by a pizza dinner and a small door prize (USB flash drive), 27 faculty members were able to attend and participate in the focus groups. The focus group sessions yielded five key observations from the attending participants:

- Focus group faculty mentioned (100% of the participants) that the Working Connections Institute was a valuable opportunity for quality professional development and that such training opportunities were not otherwise regionally available due to the considerable travel costs and distances of other training opportunities.
- Participants further identified (100%) that the informal sharing that occurred between faculty members at the institute was just as important to them as the formal training sessions. Curricula and curriculum revision ideas were often discussed in these informal sessions.

- Focus group participants felt that their training sessions had led directly to institutional impact (93%). For example, one faculty member mentioned that after taking the wireless training session during the 2005 institute, he had provided leadership in moving his whole community college to a wireless operation.
- Focus group participants suggested that the institute should include more business involvement when possible (81%). Recommendations from the focus group included more aggressively inviting business attendees, marketing directly to business, and encouraging more business sponsorships.
- Faculty agreed (78%) that the new technologies and innovations theme of the Institute was particularly beneficial and helpful, since many of the faculty had leadership and decision making responsibilities that depended on such knowledge of new technologies.

Evidence from Wider Faculty Surveys:

In preparation for each summer's Working Connections Institute, all MCIT information technology faculty members within the 10 participating two-year colleges were invited to complete a pre-Institute planning survey. This survey was first sent electronically to the site facilitators who then forwarded it by e-mail to their faculty colleagues with a strong request for these faculty members to complete the survey. The response rates for these yearly surveys were very strong, averaging an 89% return rate. The faculty respondents were asked about their preferred training topics for the next summer institute and to reflect upon the impact of the past institutes. One question in particular asked about the perceived impact of the institute and attempted to map faculty participation in the institute to curricular change in the classroom as part of the impact thread investigation process. The question was: "If you have attended a past Working Connections Institute, how much has this training contributed to the improvement of the curriculum coursework that you teach?" (AIM, 2007, p. 52). The response to the 2006 faculty survey illustrated the strong endorsement of the faculty for the potential impact of this conference. In that survey, of the 118 faculty responding ($N=118$), 34% indicated significant impact, 26% indicated somewhat of an impact, 4% were unsure of the impact, and only 3% indicated no impact. Another 33% of the respondents indicated that they had not attended.

The evidence from the focus group and the faculty survey consistently suggested that the Working Connections Institute was indeed an important resource to the information technology faculty at the MCIT institutions. Further impact related to the curriculum was also available from the post-institute feedback forms.

Evidence from Post-Institute Attendee Feedback Forms:

In addition to the potential curriculum impact that was suggested by the general faculty surveys prior to each Working Connections Institute (as represented earlier) other evidence related to the institute was also examined, to try to determine if the Working Connections Institute was making a difference in the faculty's overall IT curriculum. In particular, an analysis of the post-institute feedback forms submitted by conference attendees was found to represent some of this potential evidence.

Post-institute evaluation forms were given at the end of each Working Connections Institute asking attendees how effective they believed that the institute was for their own professional development. In general, the feedback forms suggested that the Working Connections Institute was an effective faculty training resource. Several questions identified this in particular, as suggested by the following table. A four-level Likert response scale was used on the feedback forms, with 1 representing strongly disagree, 2 representing disagree, 3 representing agree, and 4 representing strongly agree. The results of questions asking about the personal and professional benefits of the institute were well into the agreement ranges and reflected a consistent endorsement by the faculty for the institute activities.

Table 1
Mean Scores and Standard Deviations for Selected Questions on Attendee Feedback Survey

		2004	2005	2006	2007
Question 1: This Institute provided me with high quality IT training.	Means	3.48	3.73	3.57	3.54
	SD	0.68	0.64	0.67	0.67
Question 2: Overall, I considered the Institute a very valuable professional development experience.	Means	3.7	3.79	3.68	3.68
	SD	0.58	0.69	0.6	0.64
Question 3: I would attend another MCIT Working Connections Institute.	Means	3.75	3.87	3.74	3.74
	SD	0.64	0.66	0.65	0.65
Question 4: I would recommend an MCIT Working Connections Institute to a colleague.	Means	3.79	3.87	3.77	3.77
	SD	0.6	0.51	0.52	0.57
Sample Size (N)		58	63	70	135

An open-ended question on the feedback form also asked the attendees “How will you demonstrate that this learning has increased you capacity to impact student learning in this area? And how will you verify this impact?” (AIM, 2007, p. 60). Faculty were generally quite detailed and encouraging in their responses, as represented by the faculty member who stated: “I needed this course track to learn the product for teaching it. I now have examples and experiences from other instructors, who were also my classmates in

the track, that I can now share with my own students” (AIM, 2007, p. 61). Another example given by a faculty member was that one workshop class at Working Connections attended by group of faculty initiated a complete retooling of the college's Introduction to Information Technology course. Faculty attending worked together to develop a course where students, working in class teams, design and build a cyber-cafe. The activity is now one of the more popular courses and IT related assignments at that college.

Evidence of Impact from the Annual Site Facilitator Survey

The 10 Midwest Center for Information Technology site facilitators were frequent participants of the Working Connections Institute, and these faculty leaders also routinely fill out a separate survey each year on how their general involvement in MCIT has contributed to their leadership activities, professional backgrounds and skills. The most recent survey was of August 2006, and responses were very positive about the collaborative aspects of the MCIT, such as the Working Connections Institute. For example, on Question 24 of the survey, site facilitators responded to a reflection item that said: “My relationships with the other MCIT Site Coordinators have resulted in new opportunities for sharing resources” (AIM, 2007, p. 58). In response, all site facilitators either answered with agreement to that question. The site facilitators also had a consensus that their personal leadership skills, knowledge of information technology trends, and project management skills had all consistently improved in collaborative training efforts, such as the Working Connections Institute.

Evidence of Student Impact from the Adult Learning Inventory:

Evidence of potential impact on students leading directly from the Working Connections Institute was difficult to retrieve, since the institute had focused primarily on faculty. However, some student data was examined in an effort to connect potential student impacts to the faculty training efforts and the curriculum revisions undertaken by faculty. One student data source was a specialized survey (conducted in 2006) and taken by 1,319 students across all 10 MCIT institutions, called the Adult Learner Inventory (ALI), available from the Council for Adult and Experiential Learning. The ALI is a national student assessment instrument that examines students' perceptions of the importance of various campus programs and services, as well as their satisfaction with those programs and services. For the Midwest Center for Information Technology, this national assessment was used to examine the technology perceptions of students related to selected campus services, programs, and opportunities. Five MCIT-related questions were added to this instrument (2006). Two scales were included for each question: one on importance and one on satisfaction. The importance scale had seven levels ranging from very important (7) to not important at all (1). The satisfaction scale had seven levels ranging from very satisfied (7) to not satisfied at all (1). Three specific questions appeared to be of particular interest in the context of faculty professional development, which might be loosely connected to the Working Connections Institute's efforts to train faculty. These three questions are represented on Table 2.

Table 2*Adult Learning Inventory Importance and Satisfaction Ratings for MCIT Questions*

		Importance	Satisfaction
Question 1: I receive the help I need to improve my technology skills.	Means	6.11	5.46
	SD	1.44	1.39
Question 2: The college provides the latest information on career opportunities available in Information Technology.	Means	6.02	5.37
	SD	1.36	1.35
Question 3: The Information Technology coursework appears to be aligned with business and industry.	Means	6	5.39
	SD	1.34	1.33

Note: Sample Size (N) = 1,319

The results from the three Adult Learning Inventory questions, as represented in Table 2, generated some useful discussions among the MCIT institutions. A representative from the Council for Adult and Experiential Learning that had developed the survey also attended, to help explain the statistical analyses of the overall ALI instrument. Results from the three information technology-related questions were generally encouraging, and relatively consistent with other sources of data from the Working Connections Institute. The institute itself sought to give MCIT faculty the needed background to help improve the information technology skills of their students, facilitate a student's knowledge of career opportunities, and generally align their individual coursework with the needs of area businesses. Students taking the ALI perceived these areas as relatively important, with a moderate level of satisfaction. However, the responses also suggested that students felt that there was still a need to improve in each of these areas.

Evidence from Institutional Student Data

IT student graduation data submitted by the 10 participating institutions is also supportive of the perception that faculty are in general placing an emphasis on IT programs and are increasingly moving students through the program. For example, students graduating with an IT related degree have risen steadily in MCIT from 745 students in 2002 to a total 939 students in 2006, which represents a 26% increase. Data from 2007 was not yet available at the time of this manuscript.

An earlier survey of MCIT information technology students ($N = 410$) conducted in 2005 also provided some interesting background data on MCIT information technology students, as well as some gender contrasts. Students were surveyed from classes recommended by the site facilitator and whose instructors had attended the previous Working Connections Institute. Demographic data from the student respondents

was in itself somewhat interesting. The data indicated relatively high GPAs, with 79.3% of the respondents reporting GPAs of at least 3.0. A total of 90.4% of the respondents had graduated from public high schools. The survey responses indicated that 14.6% of the students were employed in half-time IT positions and 9% of the students had full-time IT positions. When the student respondents were asked, "How well do you believe that your current IT curriculum relates to your eventual or current employment?" a total of 57.0% of the students indicated that their coursework related moderately well or better (AIM, 2007, p. 54). There were some limited differences in the way that females responded to certain items as opposed to the way that males responded. When respondents were asked "Was proximity to your home a factor in choosing your IT program?" a total of 47.5% of the females reported proximity to home was indeed a factor in program selection, contrasted with only 32.1% of males (AIM, 2007, p. 55). Out of the 410 participants responding to the survey, 139 students also took the time to enter some kind of narrative comment in the open response box. A total of 11.9% of these comments gave advice to other students who had not yet selected an IT program. Their responses ranged from giving practical advice like keeping textbooks to comments such as "IT is fun, challenging, and in great demand – why wouldn't everyone want to sign up?" (AIM, 2007, p. 55). Another 9.7% of the comments included general suggestions for the participating colleges such as holding more introductory seminars and having additional information sessions for students. Overall, the survey findings indicated that IT students within the MCIT institutions were generally positive about their programs, quite dedicated in their studies, and relatively thoughtful about how their programs might be improved.

Impact Evidence from Student and Instructor Rubrics

One of the MCIT participating institutions, Northeast Community College (NECC), set up an innovative process for recording student progress within IT coursework that was mapped to the Working Connections Institute. Students and instructors within NECC's Technology Academy of Northeast Nebraska (TANN) complete rubrics related to perceived course achievement. These NECC instructors each attended the Working Connections Institute and participated in various content-related discussions that helped to design and refine these rubrics that are now being operationalized. As of Fall 2007, a total of nine NECC courses have now contributed to this rubric-based information.

Each of the TANN-related courses is using an innovative data collection tool within this rubric comparison process, called the DataWeb, developed by AIM. Students complete a web page delivered pretest and posttest self-assessment, reflecting upon their achievement in various course concepts. The self-assessment rankings use the Likert scaled categories of beginning (1), progressing (2), consistent (3), and advanced (4). The instructors of the courses also then complete a posttest assessment representing their perception of the each student's achievement that corresponds to the student's posttest self-assessment. Recent data from the DataWeb system reported that students taking the courses had a strong growth in their perception of achievement within the courses, and that instructor ratings of student achievement were relatively similar to the students' assessment. As an example, the achievement means and standard deviations for the Fall

2006 WebPage course are shown in Table 3, with the means for each of the six assessed areas of performance.

Table 3

Sample Results from the Scoring Rubric for the DataWeb Class

		Student Pre	Student Post	Instructor Post
1. Web design guidelines	Means	2.1	3.2	4
	SD	0.57	0.63	0
2. Proper file structure	Means	2	3.3	3.8
	SD	0.67	0.67	0.42
3. Web page creation using dreamweaver	Means	1.5	3.3	3.6
	SD	0.97	0.67	0.52
4. Web content using Flash	Means	1.1	2.7	3.1
	SD	0.31	1.05	0.32
5. Web content using Fireworks	Means	1.2	3.2	3.1
	SD	0.42	0.63	0.32
6. Web page language	Means	1.9	2.9	3.1
	SD	0.87	0.73	0.32

Note: Sample Size (N) = 10

For the sample webpage class, the students indicated a significant improvement in their self-assessment from the total pretest (Mean = 9.80, SD = 2.39) to the total posttest (Mean = 18.6, SD = 3.89) as examined by a dependent t-test (t = 1.75, p < .0001*). To investigate whether the students' total posttest differed with the instructor's total posttest (Mean = 20.7, SD = 1.06) an independent t-test was conducted and suggested that the student and instructor posttest scores were statistically similar (t = 2.23, p < .130).

Statistical analyses similar to the webpage class were conducted on the data from all of the course rubrics from the nine classes to generally investigate the perceived growth of students across the TANN classes. Results suggested that 88% of the classes achieved a significant student growth level as demonstrated by the dependent t-tests (p < .01). Further comparisons between student and instructor ratings using independent t-tests suggested that instructor rankings were relatively consistent with students across the

coursework. Future analyses will be strengthened by including a control group as represented by other classes within Northeast Community College.

Evidence from Business Leader Surveys and Focus Groups

In an attempt to better connect MCIT and the Working Connections Institute with business leader feedback, the leaders of technology related businesses within the four-state region, as recommended by the participating colleges' advisory boards, were sent a survey asking questions about their information technology needs and practices. The purpose of this survey was to facilitate employer feedback to the MCIT public two-year colleges related to their information technology programs.

A total of 45 businesses responded to the survey ($N=45$). Of the respondents, 37.8% of the businesses identified their primary focus as service, 20% as manufacturing, 4.4% as retail, and 35.6% as other, representing a wide variety of organizations. The size of the businesses as represented by the number of employees, was quite varied and ranged from 19 to 10,000, with a mean of 972.5 ($SD = 403.6$), reflecting a relatively large number of employees for many of the businesses.

The business representatives responding to the survey were quite thorough in responding to the survey, with very few missing items. Several items had the business representatives reflect upon the local MCIT college's preparation of information technology graduates. For example, one item stated: "How would you rate the effectiveness of your local public two-year college in preparing IT graduates?" (AIM, 2007, p. 72). For this item, a total of 57.8% of the business responded that their local college was effective. In general, the business representatives were positive in their perceptions of the effectiveness of the MCIT colleges in preparing IT graduates (with around 50% positive responses for all items). Roughly 30-40% of the businesses gave ratings of being unsure about the local college's effectiveness or responsiveness, and only about 10% rated the local college as either ineffective or unresponsive.

The business representatives were then asked to rate the local two-year college's IT graduates on a variety of important workplace skills. In general, the skills rated as generally strong appeared to represent the more technical skill areas, such as programming, network administration, web development, and computer support. Weaker skill areas appeared to be more representative of the soft skill areas, such as public speaking, writing, and knowledge of business practices.

Many of the skills taught within the Working Connections Institute were reflected within the good and very good categories as identified in Table 4.

Table 4*Specific IT Preparation Topics in the 10 MCIT Institutions*

	Very Good	Good	Not Sure	Fair	Poor
Programming skills	8.9%	40.0%	28.9%	20.0%	2.2%
Network administration skills	11.1%	26.7%	37.8%	20.0%	4.4%
IT security skills	2.2%	23.9%	47.8%	21.7%	4.3%
IT system integration skills	4.4%	28.9%	31.1%	31.1%	4.4%
Web development skills	15.6%	40.0%	31.1%	13.3%	0.0%
Computer support skills	13.3%	40.0%	31.1%	11.1%	4.4%
Public speaking skills	6.5%	21.7%	41.3%	21.7%	8.7%
Writing skills	6.5%	23.9%	34.8%	21.7%	13.0%
Teamwork skills	8.9%	33.3%	35.6%	20.0%	2.2%
Customer service skills	11.1%	26.7%	35.6%	22.2%	4.4%
Customer service skills	8.9%	24.4%	26.7%	28.9%	11.1%

Note: Sample Size (N) = 45

Correlations were also computed to identify possible patterns within the preparation perceptions. These correlations suggested that the respondents who represented larger and smaller businesses were relatively similar in how they rated questions dealing with the skills of IT graduates. Writing skills were an exception, with larger businesses rating IT graduates significantly lower on writing skills ($r = -.308$, $p < .05^*$). When examining relationships related to the local college's effectiveness in preparing IT graduates, correlations confirmed that MCIT colleges were seen as providing more effective training in technical skill areas than in soft skill areas. For example, the technical skill area of web development showed a stronger correlation to college responsiveness ($r = .692$, $p < .01^*$) than did the soft skill area of public speaking ($r = .168$, $p < .08$).

Summarizing the Impact Threads

As described in the preceding review of data sources, the research question related to the Working Connections Institute was a helpful mechanism for the MCIT leadership and participating institutions to try to examine the potential impact of this important and collaborative workforce development effort. As logical linkages were drawn between the various sources of evidence, various threads of potential impact did indeed emerge related to faculty professional development, which in turn appeared to positively impact IT curriculums and programs. These data sources documented a strong endorsement by faculty who attend the institute, but more importantly, also documented curriculum innovations (such as the TANN rubric efforts at Northeast Community College) that could be traced to the Working Connections Institute and institutional MCIT collaborations. These same data sources also suggested additional improvement areas for Working Connections and MCIT, such as an increased presence at the institute by business and industry representatives. However, in general it appeared that the Working Connections Institute was making a solid contribution to providing quality IT programs for area students within the four state area represented by MCIT.

Although the Midwest Center for Information Technology has been quite successful during its initial funding, the evaluation process has routinely contributed to documenting the various areas the Center might improve. For example, the evaluation process has recently helped to encourage new efforts to increase the participation of women in the MCIT colleges' IT programs of study. From a dissemination and collaboration perspective, the MCIT institutions are also appearing to be more interested in sharing their best practices, developing collaborative programming, and better connecting to businesses and industries across the region. Each of these areas of potential improvement were identified within the ongoing MCIT evaluation process.

Given the strong history of local control in the Midwest and the mission of the public two-year colleges to address the needs of the local communities they serve, it is particularly important for large-scale collaborative projects like MCIT to have a shared vision in the evaluation process. The research question based approach that we are now using has helped to facilitate such a shared vision within our project. It is our experience that a systematic evaluation process that includes questions of investigative interest can help workforce education projects to interpret their evaluation data in a more systematic and coherent way. This approach can not only help better focus the formative evaluation feedback, but also better contribute to the professional literature base, by being more immediately compatible with possible publications and presentations from this data.

Looking to the Future

Based on the evaluation work completed thus far by the Midwest Center for Information Technology and its participating colleges, a strong evaluation process is now in place to continue to examine new MCIT initiatives and workforce development efforts. A broad cadre of IT faculty across the region is also becoming more experienced with this more dynamic evaluation process. A number of promising practices in IT education are being documented, including student recruitment and retention, articulation, and workforce development initiatives, providing an ever more interesting context for this investigation. Essentially, a durable and regional evaluation foundation has been established for MCIT.

The evaluation process is also documenting that the MCIT itself appears to be relatively on track for demonstrating a possible regional collaboration model for 2-year colleges, that includes partnering with secondary schools, four-year colleges/universities, and perhaps most importantly, the businesses and industries who hire their IT graduates. In keeping the overall goals of NSF's Advanced Technologies in Education program, the MCIT will continue to strive for a better-prepared and more diverse IT workforce in its four-state region and to carefully document those efforts in a way that can enhance the broader impacts of this important initiative. Already, the MCIT evaluation process has led to several individual discussions with other ATE evaluators and principal investigators that are seeking to refine their own evaluation activities, based upon MCIT's evolving evaluation model.

Finally, it is the intention of the MCIT, and its 10 partner colleges, to continue the collaborative evolution of this regional center into becoming an ever more systematic regional effort, and to contribute directly to the IT workforce education needs facing our nation. By better understanding MCIT's regional impact through a careful evaluation process, our Center hopes to be increasingly needs responsive to business and industry,

and most importantly, to better prepare our students for today's and tomorrow's information technology workplace.

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