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An Examination of the Quality of Supply and Demand Issues of Northeast Ohio's Information and Communications Technology Workforce (Phase II)

Claudette Robey
Cleveland State University, c.robey@csuohio.edu

Daila Shimek
Cleveland State University, dailashimek@gmail.com

Michael McGoun

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Prepared for:
**Cuyahoga County Workforce Investment Board
TeamNEO**

Prepared by:
**The Center for Public Management
Maxine Goodman Levin College of Urban Affairs
Cleveland State University**

June 2007

**An Examination
of the Quality of
Supply and
Demand Issues
of Northeast
Ohio's
Information and
Communications
Technology
Workforce**

(Phase II)



2121 Euclid Avenue Cleveland, Ohio 44115
<http://urban.csuohio.edu>



Supply and Demand Issues of Northeast Ohio's Information and Communications Technology Workforce

ABSTRACT

This report describes results from research conducted by the Center for Public Management (PM) of the Maxine Goodman Levin College of Urban Affairs at Cleveland State University to gain an understanding of the relationship between the supply and demand sides of Northeast Ohio's Information, Communications, and Technology (ICT) market, and how supply and demand communicate to provide the skilled ICT workers needed by ICT-related employers. Further, the intent of the Phase II research was to gain an understanding of how post-secondary education institutions link to the ICT employers as providers of students to meet market demand.

The PM conducted a series of focus groups and interviews as a component of research for the Northeast Ohio Information Technology (IT) Workforce Initiative. The IT Workforce Initiative seeks to assess the supply and demand of Northeast Ohio's information, communications, and technology (ICT) industry through a four-phase approach. Each phase is designed to inform the next and build upon the findings of the prior phase. The PM's role was to conduct Phase II of the process. Partnering with the PM were TeamNEO, the Joint Center for Policy Research of the Public Services Institute at Lorain County Community College, and NorTech.

A series of six focus groups were conducted that included Northeast Ohio ICT graduates, and post-secondary education institution professionals who make decisions regarding ICT curriculum and skill development at their institutions. Five of the focus groups were comprised primarily of Northeast Ohio ICT graduates. There were other institutions represented including the University of Dayton and several from outside of the state. Graduates indicating an interest to participate in the research but unable to attend a focus group were interviewed by telephone. A sixth focus group was comprised of post-secondary education institution deans, professors, and department heads of ICT-related colleges and departments.

The results suggest that a greater degree of collaboration and cooperation is needed between the ICT industry and higher education institutions to ensure that college graduates are better prepared for the modern information technology workplace. In addition, a greater effort to publicize and communicate the full range of career opportunities and available job openings within the information technology field to prospective candidates is also needed. A more focused effort to align the skills, abilities, and experiences of new ICT graduates could greatly benefit both students and businesses within Northeast Ohio's ICT industry.

Keywords: IT, ICT, Information Technology, Information Communications Technology, IT Supply and Demand, ICT Supply and Demand

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- Ashland University
- Baldwin Wallace College
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- Kent State University
- Lake Erie College
- Lorain County Community College
- Malone College
- Stark State College of Technology
- University of Akron
- Ursuline College
- Walsh University
- Youngstown State University
- TeamNEO
- NorTech
- Hyland Software
- KeyCorp
- National City Bank
- Progressive

The project staff of the Center for Public Management contributed to the development of this report. Authors of the report are Claudette Robey, Assistant Director; Daila Shimek, Project Manager; and Michael McGoun, Research Assistant. PM staff that participated in the research and development of this project are Chris Gollan and Elizabeth Pozydaev, Graduate Assistants.

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EXECUTIVE SUMMARY

Many challenges exist for information and communications technology (ICT) employers, graduates, and post-secondary education institutions that educate and train students for Northeast Ohio's ICT workforce. Focus group discussions and interviews with representatives of post-secondary institutions and ICT graduates yielded insight into the issues and obstacles faced by both audiences in meeting market demand.

The intent of this phase of the research, through these discussions, was to gain an understanding of the quality of supply and demand issues relative to the accessibility and skill level of ICT workers in Northeast Ohio. The research sought to identify whether the supply of workers to the Northeast Ohio ICT industry, as well as if the skill set of these workers, is meeting the industry's minimum job and skill requirements. Further, it was anticipated that the research would define whether these workers had obtained through their education the requisite skills to perform jobs within the industry.

The dynamic in the ICT market between supply and demand centers on three aspects – the market, training of labor to meet market demand, and the supply of labor to meet that demand. This dynamic is dependent upon a continuous loop of information between business/industry, the post-secondary institutions, and the students. Post-secondary institutions manage the burden of interpreting the ICT market for their graduates, while at the same time trying to adapt curriculum and training in reaction to a market that is constantly emerging and changing. Market transformations cause changes in job tasks and functions for ICT employees, as well as changes in the skills needed to perform these tasks. To better educate and prepare its graduates, post-secondary institutions need input from companies and students in order to provide the ICT training and skills to meet the needs of the ICT workforce.

Students enrolled in ICT-related post-secondary education programs rely on institutions to cultivate a knowledge base and skill set that will prepare them for today's ICT market. This knowledge and skill base should be such that it supports these graduates in a competitive market. These graduates also look toward post-secondary institutions for guidance in seeking and identifying market opportunities that will best utilize their skill set. Employers have a responsibility to both post-secondary institutions and students to convey its specific needs and skills for the jobs available, and invest time and resources with both audiences to train and develop the workforce it desires.

Key Findings of the Research

The key observations and findings of the discussions with both audiences are outlined here. Obstacles that inhibit training for post-secondary institutions and barriers that restrain opportunities for ICT graduates are also noted.

Post-Secondary Education Institutions

Job Placement and Recruitment

- **Outreach and Access to ICT Jobs has Improved** -- Many post-secondary education institutions offer the traditional job placement mechanisms (career fairs, job boards, placement offices), but have added newer placement mechanisms in an effort to connect ICT graduates with ICT job opportunities.

Curriculum/Skills Development

- **Changes in Curriculum Considered Current as Possible** -- Most of the institutions follow Association of Computing Machinery (ACM) or similar guidelines when reviewing and evaluating curriculum. The institutions indicated that they've initiated various processes to make sure their ICT curriculum is as up-to-date as possible.
- **Difficult to Alter Curriculum to Keep Pace with the Changing ICT Market** -- A limited number of post-secondary institutions indicated that they are able to react quickly with curriculum changes as technologies change and emerge. Despite efforts to reach out to companies and research changes in the ICT market, the institutions say that the needs of the market change faster than they can initiate updates to their curriculum.
- **ICT Market Needs Versus Post-Secondary Instruction** -- There are differing perceptions of the knowledge and skills the post-secondary education institutions believe that an ICT graduate have versus the knowledge and skills that an ICT employer believes a student should have at graduation.
- **Most Graduates Remain in Northeast Ohio** -- Despite the media blitz that ICT graduates are leaving Northeast Ohio, the institutions perceive that many of their graduates remain in the region and that most remain in the state.

Needs/Obstacles for Post-Secondary Education Institutions

- **NEO Job Market** -- Many of the post-secondary education institutions believe that the Northeast Ohio ICT job market is not perceived as a lucrative one by the graduates, leaving them to perceive that there is little demand for ICT workers across Northeast Ohio.
- **Companies Should Target High School Students** -- Due to the dwindling number of students seeking ICT degrees, the post-secondary education institutions believe that companies should target high school students, as well as post-secondary students, for ICT opportunities by working with students on career options, and investing more time in helping them understand the needs of the market.

- **Generate an Interest in the Sciences** -- Companies can assist post-secondary education institutions in generating more of an interest in the sciences among high school and post-secondary students.
- **Resources Needed** -- The post-secondary education institutions are often short-staffed and in need of resources. The institutions are in need of funds to invest in software, hardware, and faculty to keep up with changes in the ICT industry.
- **Invest Time in New ICT Employees** -- Employers need to recognize that they have to invest time to train new employees to meet their specific needs, and be reasonable in their expectations. In some instances, companies have come to campuses seeking candidates with several years of experience unlikely to be found among new graduates.
- **Clearly Articulate Employment Needs** – In the experience of the post-secondary education institutions, employers are sometimes unclear in stating the skills desired of a job candidate and of an employee.
- **Better Communication Between Company ICT Managers and HR Personnel** -- There is a perceived disparity between company ICT managers and company human resources personnel when hiring for ICT positions. The post-secondary education institutions suggested that companies work with their human resources departments to better communicate with ICT managers on the specific needs and skills required for jobs.
- **More Internships Needed** -- The post-secondary education institutions indicated that more internships are needed for ICT students to provide them with practical, on the job experience that will better prepare them for the ICT work environment.

ICT Graduates

Post-Secondary and Education Experience

- **Hands-On Experience Valuable** -- One of the strongest themes with respect to elements of education that prepared graduates for an ICT career was “real world” or “hands on” applications, projects, and opportunities, including internships, cooperative education programs (co-ops), and work-related experience.
- **Room for Improvement in ICT Course Work** – Opinions were mixed among ICT graduates with regard as to how well their academic curriculum prepared graduates for the ICT workplace. Most graduates believed that their post-secondary courses provided a *basic* foundation and fundamental concepts that they have been able to apply in their jobs. However, these graduates indicated that their post-secondary course work did not necessarily prepare them for the ICT workforce.

Job Searches and Current Employment

- **Limited ICT Opportunities in Northeast Ohio** -- Most graduates perceived the ICT job market to be rather poor in Northeast Ohio. Some described it as one where there are plenty of low-level “help desk” types of jobs or senior-level jobs, but not much in between.
- **Experience = Employment** -- Several ICT graduates expressed frustration that many employers want candidates with seven to 10 years experience and are reluctant to hire recent graduates with limited or no job experience. Graduates overwhelmingly agreed that Northeast Ohio employers preferred and hired candidates with experience, yet the level of experience required by companies is not typically that of a new graduate.
- **Get the Word Out!** -- Several of the ICT graduates were surprised to hear that there is an unmet demand for ICT workers in Northeast Ohio. Recent graduates suggested that if good local ICT job openings are plentiful or available, employers should be more transparent about these jobs. If ICT jobs are available locally, the ICT graduates suggested that companies do a better job of getting the word out that these opportunities exist.
- **Good Entry-Level ICT Jobs Somewhat Difficult to Find** -- The job search experiences conveyed by participants suggest that many ICT graduates found the local job market frustrating. Despite this perception, most spent less than six months to find an ICT-related position.
- **Personal Networks Successful as Job Seeking Method** -- Personal networks and referrals, and internships were the most effective methods in locating ICT employment, particularly as many of the graduates are uncertain as to how and where to obtain information on available opportunities.
- **ICT Graduates Will Relocate for Better Opportunities** -- While many graduates indicated that they would prefer to remain in Northeast Ohio, most seemed willing to move to another area for the right opportunity or money. A number of graduates believe that the Northeast Ohio market would not support lucrative opportunities for ICT workers.
- **Family May Keep Them in NEO** -- Many of the graduates who chose to remain in Northeast Ohio did apply outside of the region for ICT employment. And, although currently employed, several graduates have responded to job opportunities outside of Northeast Ohio. For those committed to staying in Northeast Ohio, one of the most frequently cited reasons for taking a job here and staying here was family – graduates are from the area, married someone from the area, or their spouses have established a career in this area.

Professional Growth and Development

- **Job Responsibilities are Increasing** -- For some graduates, the nature and scope of their job has expanded into having managerial or leadership roles and responsibilities. A small number of graduates quickly advanced to management levels, while others have incrementally advanced. As a result of these changes, graduates often require more training and development of soft skills – making presentations, facilitating meetings, technical and business writing, coordination and management of projects and multiple tasks, communicating, providing internal training to fellow employees, and providing client service, training, and support. The training was encouraged by their employers, and in most cases, subsidized by them as well.
- **Graduates Must Keep Up-to-date With Technology** -- Most graduates recognize the importance of maintaining a high level of technical expertise including keeping current with the changing and emerging technology. Graduates said they are continuously learning and developing new technological skills on the job rather than through formal training programs.
- **Training and Degree Needed** – Training, in addition to the knowledge and skills acquired from post-secondary institutions, was deemed necessary in the ICT field. Nearly all graduates received some type of training toward professional certification, yet the graduates said their best training was received on the job or through their own devices (such as reading books and manuals, online research, and manipulating software). In general, graduates with an associate's degree perceived that this level degree was “not enough” in the ICT field, and that it was necessary to obtain a higher-level degree to increase their knowledge base and skills to remain competitive.

Perceived Barriers [by ICT Graduates] to Employment in the ICT Field

- **Experience Needed** -- Fewer [job] opportunities are available to graduates not having hands-on technical experience. Companies prefer experienced job candidates. Good jobs, and in some cases internships, are difficult to obtain if the candidate has little or no experience.
- **Invest in NEO** -- The lack of opportunities within the Northeast Ohio job market will continue to restrain ICT graduate employment unless more ICT related companies invest in Northeast Ohio. The graduates perceive that Northeast Ohio doesn't “grow” ICT companies that provide competitive and challenging opportunities for ICT job candidates.
- **Improve ICT Course Work** -- Although post-secondary courses provided a *basic* foundation and fundamental concepts that graduates have been able to apply in their jobs, their post-secondary course work did not necessarily prepare them for the ICT workforce. Training in soft skills, with a good mix of course work in both

business and user applications is integral to the ICT work environment.

- **Integrate Practical Approaches** -- Graduates want exposure to practical approaches, as well as exposure to technologies used in today's ICT market. The ICT equipment and software utilized in post-secondary education course work should be updated to better enable graduates to be competitive when they enter the job market.

- **Dichotomy Between Job Postings and Job Tasks** -- ICT job description postings were found to be unclear as to the described tasks indicated for the job and the actual tasks to be performed on the job. The graduates perceived miscommunication between the ICT company managers and company human resources personnel as a source of this problem. Further, company human resources personnel conducting interviews interview for different skill sets than those required of ICT company managers.

INTRODUCTION

The PM conducted a series of focus groups and interviews as a component of research for the Northeast Ohio Information Technology (IT) Workforce Initiative. The IT Workforce Initiative seeks to assess the supply and demand of Northeast Ohio's information, communications, and technology (ICT) industry through a four-phase approach. Each phase is designed to inform the next and build upon the findings of the prior phase. The PM's role was to conduct Phase II of the process. Partnering with the PM were TeamNEO, the Joint Center for Policy Research of the Public Services Institute at Lorain County Community College, and NorTech.

The Phase II report summarizes the issues identified and the findings resulting from discussions with focus group participants and telephone interviews. Major themes are discussed, as well as short- and long-term action items suggested by the participants.

The purpose of the Phase II research was to gain an understanding of the quality of supply and demand issues relative to the accessibility and skill level of ICT workers in Northeast Ohio. The research sought to identify whether the supply of workers to the Northeast Ohio ICT industry, as well as if the skill set of these workers, is meeting the industry's minimum job and skill requirements. Further, the intent of the Phase II research was to define whether these workers had obtained through their education the requisite skills to perform jobs within the industry.

A series of six focus groups were conducted that included Northeast Ohio ICT graduates, and post-secondary education institution professionals who make decisions regarding ICT curriculum and skill development at their institutions. Five of the focus groups were comprised primarily of Northeast Ohio ICT graduates. There were other institutions represented including the University of Dayton and several from outside of the state. Graduates indicating an interest to participate in the research but unable to attend a focus group were interviewed by telephone. A sixth focus group was comprised of post-secondary education institution deans, professors, and department heads of ICT-related colleges and departments.

Information for the focus groups was sought in a structured yet informal discussion format. For the higher education focus groups, this information could then lead to generating an understanding of the relationship between market demand for ICT workers and post-secondary education institutions as suppliers of ICT graduates to meet market demand. The graduate focus groups discussions and interviews were conducted to assess education, training, and work experiences.

This report is organized into six sections, which are described as follows:

- 1. Executive Summary** – The Executive Summary consolidates the overall findings of the project and relates these findings in summary format. This section also

relates overall research findings and recommendations.

2. **Introduction** – The Introduction explains the context of the report and outlines its content.
3. **Information Technology Workforce Initiative Overview** – This section of the report offers background information on the Initiative, and presents the project goals and objectives. Further, this section describes the approaches and processes applied toward identifying and developing the focus groups, as well as an explanation of the research design.
4. **Phase II Research Findings** – The overall findings and outcomes of the focus groups and interviews are discussed in this section of the report.
5. **Profile of Focus Group and Interview Participants** – This section relates the results of the demographic questionnaire completed by ICT graduates prior to the focus group sessions and interviews.
6. **Appendices** – The report contains five appendices that detail the development and facilitation of the focus group process, as well as identifies the ICT certification and degree programs available from Northeast Ohio's post-secondary education institutions.

IT WORKFORCE INITIATIVE OVERVIEW

The Northeast Ohio Information Technology (IT) Workforce Initiative is assessing the supply and demand for information and communications technology (ICT) skilled and professional workers throughout Northeast Ohio. Partnering with the IT Workforce Initiative to conduct this research are TeamNEO, NorTech, the Center for Public Management of the Maxine Goodman Levin College of Urban Affairs at Cleveland State University, and the Joint Center for Policy Research of the Public Services Institute at Lorain Community College.

Prior combined research conducted in Northeast Ohio from 2000 through 2002 provided a panoramic perspective of the decline and growth of employment across ICT industry sectors, the availability of ICT graduates to fill ICT positions, and the ICT industry's needs for employing skilled workers. Recent feedback from employers suggests a renewed need for professional and skilled ICT workers to meet the demands of the changing and emerging ICT market. The IT Workforce Initiative is conducting new research to gauge not only the need for ICT workers, but also the capacity of Northeast Ohio's post-secondary education institutions in providing ICT graduates to meet industry demand.

I. Goals and Objectives

There are four phases of research to this examination of the supply and demand for Northeast Ohio ICT workers. The research is designed to utilize the findings of one phase to inform the next phase (see Appendix A for research design). The research phases, and the goals and objectives of each phase are described below.

Phase I: Discovery Formulation and Demand Side Qualitative Research

- Identify emerging trends and issues in ICT through a national and local literature review
- Create an occupational framework of ICT specialty positions to be used in the Phase III quantitative assessment of ICT demand
- Sharpen research questions through employer input
- Recruit employers to participate in the Initiative so research findings can be more effectively translated into an action agenda for Northeast Ohio

Phase II: Supply Side Qualitative Research

- Sharpen research questions with input from education/training providers
- Inventory ICT education/training programs available throughout Northeast Ohio post-secondary education/training institutions (colleges, universities, adult education programs of career centers, etc.)
- Assess work experience of Northeast Ohio's ICT graduates to better understand gaps in education/training and workplace applications
- Recruit educators to participate in the initiative so research findings can be more

effectively translated into an action agenda for Northeast Ohio

Phase III: Quantitative Assessment of Supply and Demand

- Determine the number of recent job openings for ICT specialists (plus ICT literacy for workers in other current positions) and the level of difficulty finding qualified applicants/new hires among target industries
- Assess ICT educational requirements, screening/hiring criteria, skill requirements by occupation as well as skill deficiencies in new hires among target industries
- Determine the nature and level of investments in ICT worker training by employers
- Understand ways in which employers are most likely to work with education/training providers to ensure programs meet business needs
- Document the supply of ICT graduates and match figures with employer demand for new hires
- Survey ICT graduates to understand their work history in ICT careers including upward mobility, further education, and additional education/training they recommend for new students

Phase IV: Creating an ICT Roadmap for Northeast Ohio

- Identify priority action areas that are informed and aligned with research findings
- Create regional strategies to address strategic priorities
- Develop regional initiatives and action steps to create a world-class ICT workforce for the region
- Identify champions (either existing initiatives/organizations or new champions) to take action

II. Phase II Research Methods

Overview of Focus Group Design

The PM utilized focus group discussions and telephone interviews as primary research methods for gathering information for Phase II. Five focus group sessions comprised of ICT graduates primarily from Northeast Ohio post-secondary education institutions during and including the years 2000 and 2005 were conducted during a four-week period. There were other institutions represented including the University of Dayton and several from outside of the state. Graduates indicating an interest to participate in the research but unable to attend a focus group were interviewed by telephone. The participants were graduates with associates, bachelors, and/or master's degrees, and/or those with certification in the ICT field. The objective of the focus group sessions was to convene a forum of those graduating in ICT related fields to gather information on their current and former educational experience, job searches and employment, and professional growth and development.

A separate focus group session comprised of deans, professors, and department heads of post-secondary education institutions was also conducted. These participants were professionals who designed and executed ICT curriculum and programs within

their institutions. The objective of this discussion was to gather information on the recruitment and placement of their ICT graduates, their methods for ICT curriculum and skills assessment and development, and the critical needs of these institutions in meeting market demand.

The focus groups were conducted using a nominal group technique to engage participants in a guided discussion. Each discussion was designed for a 90-minute session. A facilitator led each focus group to ensure an equitable level of participation among all participants. The comments of the sessions were recorded on flip charts and by a scribe to serve as documentation of the discussions, and to assemble the data and information that served as the basis for this report. The PM designed discussion guides to serve as the protocol for each of the focus group sessions, as well as the telephone interviews (see Appendix B).

The focus group discussions were qualitative in nature and not intended to be statistically representative of the broader population of Northeast Ohio ICT graduates. Rather, the discussions were open-ended and exploratory to verify anecdotal knowledge and identify new issues. Every attempt was made to be as inclusive and representative as possible, but the Phase III research is not intended to describe statistical parameters of the local ICT graduate population. This phase of the research was used to identify and record concepts and issues as they pertain to the availability of ICT graduates to meet market demand. The Phase III component of this research is designed to examine a statistically representative sample of Northeast Ohio's total ICT graduate population.

Process for Selection of Focus Group Participants

Several methods were used to recruit ICT graduates to participate in the focus group discussions. Alumni departments of 23 post-secondary education institutions in the study area were initially contacted by mail, telephone, and email requesting contact information for ICT graduates. The alumni departments expressed privacy concerns in providing alumni data to an outside institution; therefore, the PM chose an alternate approach to reaching ICT graduates.

The PM then solicited the assistance of ICT departments within post-secondary education institutions in recruiting participants for ICT graduate discussion groups. Letters were mailed to technology department chairs, professors, and deans requesting their assistance, which was two-fold. The PM sought to involve the education institutions to participate in a discussion group of their peers involved in ICT education. The PM also requested these individuals to assist in recruiting ICT graduates to participate in focus groups. Several of the institutions were successful in communicating to their graduates through email and by telephone, by distributing flyers in graduate level classes, by posting flyers on college bulletin boards, and by placing announcements of the focus groups online. Some of the institutions provided names and contact information to the PM, who in turn, contacted the ICT graduates. Research team partners were also asked to assist by contacting businesses and posting

information on websites.

The ICT graduates interested in participating in the focus group sessions were given an opportunity to respond online and indicate their availability to participate in one of five focus groups scheduled on February 22, February 26, March 8, and March 16 (two sessions) (see Appendix C). Those unable to attend the focus group discussions were contacted for personal telephone interviews. The same questions asked of the focus group participants were asked of those interviewed by telephone.

PHASE II RESEARCH FINDINGS

Focus group discussions and telephone interviews were used to collect data and information for this study. The intent of the discussions was to assess the education and employment experience of Northeast Ohio's ICT graduates, and to identify their issues and concerns relative to their experiences. The intent of the focus group with post-secondary education institutions was to obtain information on how these institutions assist their ICT graduates in finding jobs; their measures and methods for curriculum and skills development, assessment, and revision; and what they perceive to be the critical needs of institutions in meeting market demand for ICT workers.

I. Post-Secondary Education Focus Group

A total of 23 post-secondary education institutions were identified as being within the scope of the study. These 23 institutions collectively offer 96 ICT-related training and/or degree programs. Appendix E represents an inventory of the Northeast Ohio ICT education/training programs available from these institutions (at the time this research was conducted).

The post-secondary education focus group was comprised of deans, department heads, and professors representing ICT-related training and/or degree programs from 12 of the 23 institutions, with 14 individuals participating in the February 2nd focus group session. Post-secondary education institutions represented at the focus group were:

- University of Akron
- Baldwin Wallace College
- Case Western Reserve University
- Cleveland State University
- John Carroll University
- Kent State University
- Lake Erie College
- Lorain County Community College
- Malone College
- Stark State College of Technology
- Ursuline College
- Walsh University

Job Placement and Recruitment

Focus group participants were first asked questions focusing on their role in helping ICT graduates locate jobs. The participants were asked to identify mechanisms in place at their institutions to assist their graduates in finding employment. The participants indicated that they used a variety of both formal and informal means to assist graduates in finding ICT-related jobs.

With regard to **formal mechanisms**, the institutions cited on-campus resources such as job placement departments and Career Service Centers, job and career fairs (both campus-wide and specifically for ICT graduates), and employer presentations and

visits. Job and career fairs are also held off campus at various locations. One institution representative stated that graduates have indicated an interest in virtual job fairs as an alternative for those unable to attend site functions. Additionally, most of the institutions participating in this focus group are partners in the College 360 Program, an online portal to education, employment, and social opportunities available to students in Northeast Ohio.

Internships, co-op programs, and partnerships with local companies were also mentioned as other mechanisms used to help students find jobs, primarily through gaining valuable work experience and establishing contacts with local companies. Online mechanisms where resumes and job postings are available through Internet access were also mentioned as resources used to help students find work. Blackboard sites are also utilized, as well as the creation of a database of student skills, which is used to match job candidates with prospective employers.

"Lately, we've had more requests for interns than we can supply, which is a good problem to have."

Some of the focus group institutions mentioned companies hosting mixers and social events as opportunities for ICT students to meet and network with prospective employers. Specifically noted were the digital mixers once sponsored by NEOSA, which were viewed as successful in connecting ICT students with employers. One respondent also stated that ICT students are invited to attend mixers where they can meet and network with company representatives that comprise the university's Center for E-Business Board of Directors.

Informal approaches cited by participants were announcing job opportunities in classes, referrals of opportunities from alumni, employers contacting professors and ICT departments and asking them for job candidate referrals, emailing job notices to students, and networking online with other educational institutions. One participating institution interacts with employers monthly to assess their needs and discuss the institution's curriculum. Another institution also utilizes the assistance of the student chapter of a computer technology organization to help ICT graduates find employment.

When asked, two of the institutions stated that some of their ICT students are currently employed and are taking classes to further skills development or for retraining.

Also with regard to job placement and recruitment, focus group participants were asked how their institutions have altered their job placement and recruitment methods over time, and to identify significant changes from methods utilized in the past. The majority of the institutions indicated improved and streamlined procedures with campus Career Services and Job Placement Offices. Improved communications and sharing of employment information between ICT departments and Career Services offices have helped to keep graduates better informed. The institutions also indicated increased participation from companies in sponsoring internships and co-

"We're seeing more of a push for things like this...things like virtual job fairs."

op programs that offer opportunities for employment, as well as campus presentations and visits to help spark interest among students. One institution calls for an internship as part of its Capstone Course, where external contacts, projects, and community service is required. The participants also indicated an increased use of technology (e.g. blackboards and online postings) to reach out to students. Another institution said that one significant change observed over time is that companies are reaching out directly to students more so than in the past, and that students are receiving multiple job offers from companies *before* they graduate.

Curriculum/Skills Development

The second series of questions focused on how these institutions developed, assessed, and reassessed their curriculum and skills training to meet market demand. The participants were asked to identify the methods or practices utilized by their institutions to regularly assess curriculum, and how they determine whether their coursework/curriculum prepares their graduates for ICT-related careers.

With regard to curriculum assessment, the majority of the institutions indicated that accreditation and program updates were handled by utilizing formal models and guidelines of the Association of Computing Machinery (ACM), National Workforce Center for Emerging Technology (NWCET), Association of Information Technology Professionals (AITP) and/or an institution accreditation board. Two of the institutions additionally utilize curriculum committees and internal department review processes for reviewing course and program content. Nearly all of the institutions said that they rely on the counsel of Advisory Boards or Groups that include business/industry representatives to help shape or update their courses and programs. Direct input is also solicited from employers, ICT students and graduates, and ICT faculty through surveys, focus groups, meetings, and conversations.

When assessing ICT programs and course work, the institutions indicated that efforts are made to keep course work as current as possible but expressed difficulty in keeping pace due to the constantly changing market. One institution stated that in an effort to keep abreast of the changing market, the institution introduces a course as a new topic and if there is a continuous demand for the course, then it becomes part of the curriculum. Another professor said that the institution contracts with ICT companies in a consulting role to conduct research in various ICT areas so as to keep current. Further, another institution said that it utilizes the knowledge of its adjunct professors, who work in the ICT field, to advise on program and course changes.

The issue of re-training ICT graduates was also addressed in this portion of the discussion. One participant cited the difficulties the various changes in technology have posed for education institutions, and how these changes have directly impacted the need for re-training:

“Forty years ago everything (computing) was done on a mainframe, there was only two (programming) languages, and not much else. Today, technology has

become so fragmented, and there is so much more to learn and know.”

Also with regard to curriculum and skills development, focus group participants were asked to discuss the mechanisms they employ to integrate business applications (as needed by the market) into their coursework. Most of the institutions offer internships and co-op programs, where students receive actual experience working in ICT companies.

One issue addressed was the importance of “soft skills” – students being able to write and communicate effectively – and steps taken to ensure ICT students are receiving adequate training in this area. Institutions indicated that they are integrating more soft skills into their course work – skills such as making presentations, project management, report and technical writing, teamwork, and working in teams –the skills that employers indicate are lacking in prospective ICT graduates. During this discussion, one participant indicated that he had received feedback that student writing samples are similar to that of text messages, even in some cases applying the same message lingo such as the letter u for the word you and the letter r for the word are. Another institution introduces soft skills by having students make presentations and participate in ICT competitions against teams from other universities throughout the United States. One institution representative stated what he viewed as a discrepancy of sorts, with regard to the need for soft skills:

“Hard skills are important to get a job, but soft skills are important in keeping that job.”

“IT graduates are in line with what managers say they need. Managers seem to want their employees to be able to think and change with whatever the situation calls for, and we’re more concerned that students are more fundamentally sound and prepared in other ways.”

Some institutions indicated that they are quickly able to react to changes in the market due to internal department assessments of curriculum, by surveying graduates and employers, and by networking with employers at mixers and social events. One institution’s program includes meeting monthly with employers for direct input into curriculum design and content. The feedback has allowed this institution to adjust its curriculum to one that is more project based and includes working in teams.

One participant described the computer science program as “very applied” wanting their students to be “ready to go out of the box,” but added that if a student wanted to concentrate on a more theoretical approach, then the student would have that option.

“Our market is mostly local and regional, but we have two new programs – cyber security and video game design – where these students are more apt to move (to meet market demand).”

Participants were also asked whether their ICT graduates remained in the Northeast Ohio area upon graduation. The majority of the participants indicated that, while a portion of their graduates accepted jobs out of state, most of their

graduates remained in Northeast Ohio or within the state. One participant noted that he is receiving anecdotal information that some students leave the area, work five or ten years elsewhere, and return to the area because they see Northeast Ohio as a good place to raise a family.

While the general consensus among the focus group participants was that more graduates remain in Northeast Ohio as opposed to going elsewhere, there was acknowledgement from some participants that some graduates inevitably leave. One participant said that most graduates remain in the area, but it appears that over time more are seeking jobs outside of Northeast Ohio. One participant said that his institution's graduates leave for employment with east and west coast software companies, while some continue onto graduate school, some find local employment, and some remain and start their own companies. He stated that one company sponsored an entrepreneurial startup plan contest where \$50,000 was awarded to the winner(s) to start their own firm.

"If you ask undergrads, they'll typically tell you 'I have to get out of Ohio.' If you ask faculty, they'll say 'they [students] want to stay here.' But the end result is we have students who do both – some who stay here and some who move out."

Two of the participants indicated that portions of their graduates are international students who are educated in Northeast Ohio and then generally return to their home countries upon graduation. Another participant expressed concern that large companies from India are recruiting on campuses, encouraging graduates to relocate overseas.

Needs of Post-Secondary Education/Training Institutions

The third series of questions focused on identifying the needs and issues facing educational institutions with regard to meeting the demands of the ICT market. The participants were asked to characterize how their institutions determine what ICT training and education curricula are needed to meet market demand. These participants were also asked to cite what they needed from the ICT business community that would better enable them to meet market demand.

With regard to determining the ICT training and education curricula needed to meet market demand, participants referred to earlier comments regarding the counsel of advisory boards or groups comprised of business and education representatives. Focus group participants cited that they seek input from employers and ICT students, graduates, and faculty through surveys, meetings, and discussions as methods to assist in keeping current with today's market. Additionally, participants indicated that the internal curriculum review processes, as well as accreditation guidelines (ACM, NWCET, AITP), require that the institutions demonstrate that curricula is current.

The focus group participants were asked to identify what is needed by their institutions to better meet the ICT education and training demands of the market. Many of the participants stated that companies could invest more time and resources in helping graduates prepare for the ICT work environment. Some suggestions were to

invest in modernizing software and equipment, as well as increase the number of paid internship opportunities, as well as the tenure of these internships (extend them for longer terms). Participants also suggested having companies subsidize the hiring of faculty or instructors to conduct training at the post secondary institution, and to have companies conduct training themselves at the post-secondary institution for the faculty or instructors.

Focus group participants suggested that corporate marketing campaigns not only target post-secondary students, but high school students as well. Participants suggested that companies initiate regional ICT programs or contests for high school students, as well as corporate sponsorships of ICT camps on college campuses. The ICT camps could then be used by post-secondary institutions to recruit future ICT students. One participant also stated that many students have been “lost to the sciences” by the time they enter post-secondary institutions. He felt that companies should work with high schools to foster a stronger emphasis on the sciences by promoting events such as robotics and software development competitions.

“Businesses need to realize they also need to invest some of their own time if they want good job candidates.”

There is also much concern among the institutions that high school students are not being adequately informed of ICT career options. The participants expressed the need for companies to articulate to high school students the types of jobs and opportunities available to those interested in pursuing ICT degrees. At the post-secondary level, participants indicated that companies could aid ICT graduates by outlining career paths associated with a given job and/or degree. For instance, if the student asks, what can I do with a degree in MIS? the employer could work with the institution to conceptualize career paths that align with an MIS degree.

The institutions indicated that companies should more clearly articulate the type of degree and skill set needed for available positions and have reasonable expectations. The participants suggested that employers provide specific information on hard and soft skills desired, or provide a list of specific skills and abilities needed for various jobs. The participants also felt that companies should invest more time with ICT students, graduates, and institutions to develop job candidates that fulfill the demands of the market. Further, the institution representatives suggested that companies couldn't expect graduates to be “trained” or immediately ready to step into a job; some company investment is needed to train graduates on the job. Some participants also indicated that companies come to campuses looking to fill jobs that require seven or more years of experience, and that the higher education institutions are unlikely to have many graduates with this level of experience.

“Business and industry could help us by any formal or informal means of getting concrete information to us...It would help all of us hone our programs if we could understand this gap – and whether it's just a difference in rhetoric or something deeper.”

Additionally, the institutions noted some disparity between corporate executives

who express a need for graduates with skills relating to the transfer of learning and applied thinking, while corporate human resources personnel speak of specific skills, such as programming. It was suggested that companies work with their human resources departments to better communicate with ICT directors on the specific needs and skills required for the job.

Another area of concern cited among the institutions is the perception that the Northeast Ohio market, due to media reports, is not perceived as a lucrative job market for ICT graduates. The participants indicated that media reports of jobs being outsourced to other states and countries disillusion graduates into thinking that the field is “unrewarding” and that there are few available ICT jobs in Northeast Ohio. The participants suggested that companies initiate a marketing campaign to emphasize market need. An additional fact of this dilemma that was expressed by the participants is the competitive global threat for ICT workers in that international companies are luring Northeast Ohio graduates away to fill job openings in other countries.

“The competitive threat we face now is tremendous. If we don't react to it, we have a serious problem.”

Key Findings

Job Placement and Recruitment

- **Outreach and Access to ICT Jobs has Improved**

Many post-secondary education institutions offer the traditional job placement mechanisms (career fairs, job boards, placement offices), but have added newer placement mechanisms in an effort to connect ICT graduates with ICT job opportunities. Technology-oriented placement mechanisms are being used, as well as social events, personal and professional referrals, class announcements, and assistance through ICT student organizations. Co-ops and internships still seem to work in helping students secure jobs. The institutions perceive that more companies are offering internships and co-op opportunities, and many require internships as part of upper-level ICT course work. To bring students together with employers, some institutions are using networking events, bringing potential employers into the classroom, and organizing outreach activities with employers.

Curriculum /Skills Development

- **Changes in Curriculum Considered Current as Possible**

Most of the institutions follow ACM or similar guidelines when reviewing and evaluating curriculum. The institutions indicated that the ICT curriculum is as up-to-date as possible due to (1) accreditation processes requiring that curriculum be updated; (2) input is sought from advisory groups or boards comprised of industry representatives and institution personnel; (3) the institutions involve industry representatives, ICT students and graduates, and faculty through

surveys, focus groups, meetings, social mixers, and networking and conversations with employers; (4) consulting in the ICT field; (5) tapping into the knowledge of adjunct professors who work in the ICT field; and (6) conducting periodic internal department assessments of course work.

- **Difficult to Alter Curriculum to Keep Pace with the Changing ICT Market**

A limited number of post-secondary institutions indicated that they are able to react quickly with curriculum changes as technologies change and emerge. Despite efforts to reach out to companies and research changes in the ICT market, the institutions say that the needs of the market change faster than they can initiate updates to their curriculum.

- **ICT Market Needs Versus Post-Secondary Instruction**

There are differing perceptions of the knowledge and skills the post-secondary education institutions believe that an ICT graduate have versus the knowledge and skills that an ICT employer believes a student should have at graduation. The post-secondary education institutions seek to provide a well-rounded education while employers frequently seek graduates who are trained for their organization or type of industry. The institutions indicated that employers also send out “mixed signals” on the importance of hard versus soft skills as part of ICT training. The institutions noted the discrepancy in human resources departments emphatically communicating to institutions that programming is needed, yet company IT managers desire traits such as applied and critical thinking, and the ability of the candidate to transfer knowledge from one application to another. The institutions are incorporating soft skills into their existing classes, but would like some clarification from companies as specifically what they desire.

- **Most Graduates Remain in Northeast Ohio**

Despite the media blitz that ICT graduates are leaving Northeast Ohio, the institutions perceived that many of their graduates remain in the region and most remain in the state. The institutions believe that there are a small number of students who accept positions outside of the region, and observed that over time more graduates are seeking jobs outside of Northeast Ohio. The few students are placed nationally or internally, are more likely at larger post-secondary education institutions or graduate schools.

Needs/Obstacles for Post-Secondary Education Institutions

- The Northeast Ohio ICT job market is not perceived as a lucrative one by the graduates. Students need to know that there's still a demand for ICT workers across Northeast Ohio. The institutions believe there is a shortage of students seeking ICT degrees and companies should react to this immediately.

- Due to the dwindling number of students seeking ICT degrees, companies should target high school students, as well as post-secondary students, by initiating competitions, fostering interests in science and math, informing of them of career options, and offering internships. The institutions believe that companies should work with students, particularly post-secondary graduates, on career options, and invest more time with these graduates to help them understand the needs of the market.
- Companies can assist post-secondary education institutions in generating more of an interest in the sciences among high school and post-secondary students. Venues such as robotics competition, software development and other entrepreneurial contests will help students gain an applied understanding of concepts, as well as enhance visibility of science, math, physics, and other sciences contributing to the ICT field.
- The post-secondary education institutions are often short-staffed and in need of resources. The institutions are in need of funds to invest in software, hardware, and faculty to keep up with changes in the ICT industry. The institutions believe that companies could invest more time and resources in helping graduates prepare for the ICT work environment by modernizing equipment and software, increasing the number of internships, increasing the duration of the internships, subsidizing the hiring of faculty or instructors, or having company personnel conduct courses/training at the institution.
- Employers need to recognize that they have to invest time to train new employees to meet their specific needs, and be reasonable in their expectations. In some instances, companies have come to campuses seeking candidates with several years of experience not likely to be found among new graduates.
- Employers are not always clear in stating what they want in a job candidate, nor do they necessarily articulate what they desire in an employee. Specific information on hard and soft skills desired, or a list of specific skills and abilities needed for various jobs would be helpful to new graduates as well as the institutions.
- There is a perceived disparity between company ICT managers and company human resources personnel when hiring for ICT positions. The institutions suggested that companies work with their human resources departments to better communicate with ICT managers on the specific needs and skills required for jobs.
- The institutions indicated that more internships are needed for ICT students to provide them with practical, on the job experience that will better prepare them for the ICT work environment.

II. ICT Graduate Focus Groups

Five focus groups comprised primarily of ICT graduates from Northeast Ohio colleges, the University of Dayton, and a few outside of the state, were conducted to assess their education, training, and work experiences. The participants were graduates with associates, bachelors, and/or master's degrees and/or certification in the ICT field. A total of 26 graduates participated in the focus group sessions. Those indicating an interest to participate in the research but unable to attend a focus group were interviewed by telephone or in person. The telephone interviewees were asked the same questions as those attending the focus group sessions. A total of six telephone interviews were conducted. Collectively, 32 graduates in ICT-related fields participated in this phase of the research.

Post-Secondary Education and Experience

The ICT graduates were first asked to discuss how their training and education experiences prepared them for their ICT careers. Graduates were asked to specifically discuss ways in which the curricula contributed to their knowledge and skill set to help them become competitive in the ICT job market.

"A college education helps to give you more of a mind-set – a way of thinking. What we do is more of a creative process. It's not a simple job where there are steps one through five that you do to get it done. Having the right mind-set is important."

The views among respondents were mixed. While some indicated their college level instruction and training was beneficial, others indicated both could be improved or enhanced in some way. A small number of graduates stated that their post secondary curriculum provided the context needed for an ICT career, with a blend of applied and theoretical knowledge. These respondents noted that the curriculum and instructors kept current in the field, with the professors emphasizing the importance of keeping up-to-date on technology uses and equipment. Further, they stated that they were offered flexible scheduling of courses and course options in some areas, such as programming languages. One graduate noted that the hectic pace of the course work was helpful in transitioning from the classroom to the work environment.

The majority of the graduates, however, noted that in many instances their post-secondary course work did not completely prepare them for work in the ICT field. Some of the graduates stated that the curricula taught at their post secondary institution was not relevant or transferable to the business environment and more based in theory rather than technical application.

"Experience is more important than the degree, but you do need a strong GPA to be considered for jobs. Some of the questions in the academic world weren't relevant when I got to the business world. Some technology had changed, but the basic principles stayed the same – even with different technologies. But once I got into my full-time position, a lot of what I learned in college had to be thrown out the door."

In most instances where degree areas centered on management, quality assurance, or business administration, the graduates stated that their post-secondary education generally provided the necessary

concepts and a sound knowledge base, yet the course work “had little to do with the job” and that most of what they learned came from outside the scope of the classroom. Further, the respondents stated that they had to independently learn the more in-depth aspects of the course work on their own.

In instances where degree areas centered on programming, software development, networking, and multimedia, the graduates stated that while their post secondary education provided them with the basic concepts, their education was not sufficient in preparing them for an ICT career. The graduates indicated that there was a gap between the curriculum thought to be current and the technology in use today. The respondents stated that curriculum changes are not made quickly and that updates are not made timely to keep pace with the changing ICT field. They additionally noted that they found the equipment and software applications outdated, and expressed concern that professorial knowledge seemed limited and professors were not up-to-date on current aspects of the ICT field. One graduate perceived that there are also gaps in the ICT curriculum across colleges and departments. In particular, the graduate stated that curriculum for degree programs should interface because the ICT field is “not just about computers.”

“The degree doesn’t mean you have the ability to do the work; you need experience, soft skills, and the ability to conduct yourself in a business environment.”

Consistent throughout the interviews and group discussions was the perception that hands-on experience was a more valuable asset than formal classroom education. Consensus among graduates seemed unanimous that getting as much hands-on practical experience as possible was essential in preparing them for an ICT career and helping them find a suitable position within their field. In particular, those aspects of college-level curriculum that involved labs and projects where students would work in tandem to address a practical need for employers were frequently cited as beneficial. Graduates emphasized that internships, co-op programs, and project-oriented classes where student “teams” meet with employers to solve problems or make site visits to businesses to observe operations were valuable components of a college-level ICT program. The team building exercises, noted the graduates, offered opportunities to experience the dynamics of interacting with others to bring a project to completion – differing personalities, working together to meet deadlines, motivating other team members, decision-making, delegating responsibility, and time management. Additionally, graduates stated that “cyber challenges” – collegiate competitions with other states – were helpful in sharpening technological knowledge and seeking creative solutions to problem simulations.

“[School] did not talk about how people work on projects together and that you cannot manage all of the components of most projects in the real world on your own.”

“Having a degree helped, but people with experience will still get preference. And, I think it’s also a situation where people with experience will often leave Ohio, and employers are not willing to take a chance on someone without experience.”

In addition to preparing them for the ICT workforce, having hands-on practical experience was also cited by a majority of the graduates as key to securing employment.

The graduates perceive that employers have a strong preference for job candidates with some form of ICT work experience. The graduates indicated that, in some instances, employers preferred a higher level of experience than a new college graduate is likely to have, thus leaving many graduates seeking jobs for the first time at a disadvantage.

While consensus among graduates consistently echoed the view that experience is more important than the degree, it was also mentioned that job offers could be contingent upon a candidate completing a degree. Further, the graduates also pointed out that a strong grade point average is necessary to be considered for some jobs.

Job Searches and Current Employment

This segment of discussions focused on the graduates' perceptions and experiences in seeking and locating employment following graduation. The graduates were asked to characterize the Northeast Ohio ICT job market and the opportunities available to them upon graduation, as well as to discuss the methods they utilized to locate employment. Graduate discussions and interviews also inquired as to whether they considered leaving or did leave Northeast Ohio to seek employment, and whether it is their long-term intention to remain within the region.

Northeast Ohio Job Market

With few exceptions, the graduates agreed that the Northeast Ohio ICT job market did not offer many opportunities for them upon graduation, nor does it offer lucrative opportunities today. The graduates cited that there are few large ICT firms or companies with large ICT departments here (such as those that might be found in the Carolinas and along the East Coast), where greater numbers and varieties of jobs are available, salaries are competitive, and companies offer advancement opportunities. The perception, one graduate observed, is that the ICT field is "big companies," and that information on the available job opportunities in smaller ICT firms is not reaching ICT graduates. The graduates also perceived that salaries were non-competitive and much lower in Northeast Ohio than in other cities. A small number of graduates found that (when they were seeking jobs) information they had received from school advisors and counselors on salary expectations to be misleading and contrary to the salaries actually being offered to recent college graduates by ICT companies.

"I always find it surprising to hear a lot of companies are looking for IT people. It didn't feel that way at all when I was looking for a job. And my peers felt the same way, too. If they're out there, they're not doing a good job of letting us know."

In contrast, two of the graduates observed that the Northeast Ohio job market is improving for ICT workers. Both stated that their employers need large numbers of ICT workers and are unable to fill these positions. One graduate stated that, in addition to being unable to locate ICT workers, that there are other problems facing Northeast Ohio ICT employers. The other graduate stated that his employer has transferred a large portion of its ICT staff to Colorado because there is no land available for expansion. Another perception of some graduates is that at least to some extent, the Northeast

Ohio market is “tapped out” of available ICT talent.

The views regarding the degree of difficulty in securing an ICT job upon graduation were mixed. Nearly half of the graduates found it difficult to find employment, while the remainder had no difficulty in securing a job in the ICT field. Despite some graduates' perception of having difficulty in finding a job, the majority spent less than six months finding an ICT-related position. A number of graduates perceived the job market as “saturated” with new graduates seeking ICT jobs, thus making it difficult at that time to find employment in the field. One graduate stated being “laid off several times” from various ICT jobs before securing a more stable position with his current employer. Further, many of the graduates indicated that they did not get a sense that a large number of ICT jobs were available. The graduates stated that they did not feel that available ICT jobs were and are well advertised by companies, and if jobs are available, that this information is not reaching them. A small number of graduates noted that opportunities may exist but they are uncertain as to how to obtain information on these opportunities. In contrast, several of the graduates stated that they had no difficulty in finding a job upon graduation because they were either employed while attending school or participating in an internship that evolved to full-time employment. The graduates also stated that there are an abundance of “help desk” types of jobs available, but few other types of ICT jobs.

“But if you don't have experience, how do you get your first job? ...you have companies at these college career fairs and they want people with three to five years experience. Why do they [companies] even go there?”

The overwhelming consensus among graduates is that Northeast Ohio ICT employers are seeking graduates with a level of experience not typically found among new graduates. The graduates found that ICT jobs were available requiring anywhere from three to seven years experience, yet new graduates have minimum experience in the field (even with internship experience). Further, two of the graduates said that it was much easier to find employment after they received their master's degree, rather than upon graduation with a bachelor's degree. One graduate observed that entry-level candidates appeal to some employers because they are thought to have an “untainted mindset,” but did agree that Northeast Ohio companies preferred experienced candidates.

Job-Seeking Methods

Of the methods utilized by the graduates to seek employment in the ICT field, there were two that were most prominently mentioned as being effective in yielding interviews and securing jobs. A large number of graduates found employment when personally referred for an available position by a friend already working within the company, or by a friend knowing someone within the company. Another highly effective method to locating employment was through personal networks – where a friend, relative, or colleague sent information of the opportunity to the graduate.

“I knew people here, and most of my friends also seemed to get jobs where they knew someone. Getting to know someone inside the company – it helps.”

Another effective method noted by the graduates to securing employment was through internships. Those graduates who worked as interns while working toward their degrees said that these internships generally led to an offer for full-time employment. However, some of the graduates did note that these internships were difficult to obtain. One respondent stated that he was unable to secure an internship in Cleveland over a four-year period. Others indicated that they had friends who also found it difficult to get internships in the ICT area.

While the majority of the graduates utilized online methods to seek employment, it was the consensus among graduates that this method was the least effective. The graduates accessed website portals such as Monster.com and CareerBuilder.com to post resumes and access available positions, but said that these yielded few results. Only one graduate noted success through an online mechanism.

Additionally, the graduates said they searched for ICT positions by scanning newspaper and business classified advertisements, accessing online company and university postings, attending school and community career fairs, contacting headhunters, and working with school career centers, advisors, and professors. Yet, only one graduate cited a career fair as beneficial in locating an ICT job.

The graduates indicated that it would be helpful to potential graduates to have the ability to obtain information on potential employers and interact more with their representatives. One graduate suggested that businesses have industry representatives at the schools on a regular basis to serve as recruiters who would supply information on the company and the jobs available there.

Did you stay in NEO?

While a number of participants indicated that they wanted to remain in Northeast Ohio, most also agreed that they would not rule out leaving the region if the right opportunity became available elsewhere. The graduates cited Northeast Ohio's "lukewarm" ICT job market as a reason for seeking better opportunities. A number of graduates indicated that they did not feel the market would support profitable opportunities for ICT workers. For these graduates, better opportunities translated to a greater number of jobs being available in a variety of ICT areas with room for advancement and additional responsibility, as well as competitive salaries and benefits. Additional reasons cited by graduates for relocating were warmer climate, being transferred to another company location, or furthering their education elsewhere. If they were to relocate, the graduates stated that they would most likely seek employment in the Carolinas and along the East Coast.

"With the IT field, there's a lot of talent here, but people are leaving because the money and opportunities aren't here. And that's not overstated; they definitely leave – the companies aren't here."

Many of the graduates, while choosing to remain in Northeast Ohio, did apply outside of the region for ICT employment. In most cases, several chose to remain in

Northeast Ohio primarily because of family ties or because their spouse had a career here. Other considerations cited by graduates for remaining in Northeast Ohio included a lower cost of living here than elsewhere, good learning experiences here based upon their current employment, and the inability to relocate due to financial constraints.

Further, several of the graduates, although employed, have responded to job opportunities outside of Northeast Ohio. These graduates said that they chose not to relocate primarily due to the fact that they are happy with their current employers and are challenged in their work.

A small number of graduates left Northeast Ohio upon graduation, but returned to the area because they experienced a similarly difficult ICT job market elsewhere, or because of family reasons. Two non-native Ohioans relocated to the region from warmer climates – Alabama and California. The former Alabama resident located to the region after being hired by a Northeast Ohio software development firm. The former California resident came to Northeast Ohio to attend college but remained due to the region's lower cost of living.

"I would stay [in Northeast Ohio]...If Cleveland wants to reinvent itself, it has to market itself better, promote its best aspects. I never felt I wanted to be anywhere else. It's kind of neat that Cleveland is like 'the smallest big city.'"

Professional Growth and Development

The constantly changing ICT environment poses challenges for graduates, as well as for post-secondary education institutions and employers. Higher education institutions are faced with the challenge of adapting curriculum and training to the emerging and changing needs of the market. Employers assess and reassess job functions and skills needed as the market changes over time. This series of questions focuses on how the function or scope of the job has changed over time, how the graduates perceive their current employment situation, and discussion on any barriers or issues faced by graduates while working in the ICT field.

Changes in Job Function or Scope

When asked how the scope or function of their jobs in the ICT field has changed over time, the majority of the graduates said they have experienced increased responsibilities leading to leadership and management opportunities. A small number of the graduates quickly advanced to management levels, while others have incrementally advanced. Companies that promote team environments offered advancement opportunities through project management leadership, team leadership, and oversight of multiple teams. Graduates indicated that additional responsibilities such as oversight of Macintosh computers (in addition to those Windows-based), an increase in oversight of the number of computer users (from one department to multiple departments), devising and creating new product ideas, resolving product development issues, and management of projects have altered the

"In IT, you must be dedicated to being a student the rest of your life."

scope of their work environment.

With the increased responsibilities came the need for training and development of soft skills, such as making presentations, facilitating meetings, technical and business writing, coordination and management of projects and multiple tasks, and providing internal training to fellow employees. The graduates found training in these areas valuable to the performance of their jobs. The training in these areas was not only encouraged by their employers, but in most cases, subsidized by them as well.

Further, the graduates indicated that the constantly changing ICT environment demands that they keep up-to-date on the latest technology. The graduates noted that they are continuously learning and developing new technological skills, the majority of which are learned while on the job rather than through formal training programs. Additionally, the graduates found it satisfying that the constantly changing ICT industry presents situations where they are challenged on the job to formulate their own solutions and work through production problems.

"When technology changes, it also changes how you think about problems...complications, how you deal with it and manage it."

A small number of the graduates emphasized that higher-level degrees were essential in the ICT field. Graduates with an Associate's degree stated that it was "not enough," and that it was necessary to obtain a higher-level degree to gain deeper knowledge and skills and to be competitive. Additionally, two graduates said that the job they now perform (as compared to their first job) has evolved into one that reflects their area of expertise. Only one graduate indicated that very little change had occurred over time in his ICT employment.

Additional Training

The graduates indicated that training, in addition to the knowledge and skills acquired from their post secondary institution, was essential to their employers during their tenure in the ICT field. In all cases, the employers provided both internal (taught onsite by employer personnel) and informal (workshops, seminars) training, and more formal training through certification and degree programs. The majority of the employers subsidized most of the training programs.

"If your school doesn't teach you to learn other technologies, you'll have a hard time in this industry."

Nearly all graduates have received some type of training toward professional certification, such as those of the Computing Technology Industry Association (CompTIA A+, CompTIA Certified Document Imaging Architech, and others) and the Association for Automatic Identification and Mobility. Many of the graduates cited their best training as being received on the job and through their own devices, such as through reading books and manuals, online research, and manipulating software.

Current Employment Situation

The graduates were asked to characterize their current employment situation, and provide insight as to whether they aspire to obtain a different type of job in the ICT field or another job in a different field altogether. With few exceptions, the graduates indicated that they are happy in the ICT field and intend to continue in some type of ICT-related job. Graduates said that they are interested in other ICT areas such as project planning, network administration and design, forensics, and hardware and software engineering and research. Two of the graduates stated that their current job is not the type of job they originally envisioned, but the type of job that is a “good fit” for them and their skill set. Only one graduate stated an intention to seek employment outside the ICT field.

“It would be nice if people who get higher-level degrees would get some kind of tangible reward for doing so, but the local market just won't pay out for that. For someone who can already do programming, there's no incentive to advance their education.”

Consistent among the discussion and interview participants was that their current job was seen as an initial step to advance to something more – either toward increased or diversified opportunities within the company or with another employer. Many of the graduates indicated that there were opportunities available for advancement that they would pursue with their current employers. A small number of the graduates intended to remain within the ICT field, but seek opportunities with another employer. Two of the graduates stated that they are attending graduate school to enhance their knowledge base and skill level to better prepare themselves for advancement opportunities.

Barriers/Issues to Working in the ICT Field

When asked to identify any barriers or issues experienced since working in the ICT field, the overwhelming response was that few opportunities were available to graduates not having hands-on, technical experience. The respondents indicated that companies prefer experienced candidates, those with years of experience rather than entry level knowledge (as that of a college graduate). The graduates emphasized that the degree and professional certifications are not as attractive to employers as practical experience – experience in networking, applications, programming, databases, product development, and most aspects of the ICT field. The graduates found that internships were also difficult to acquire if the candidate had little or no experience.

“The opportunities aren't there if you're short on experience.”

The majority of the graduates cited the lack of opportunities in the Northeast Ohio job market as another barrier for ICT employment. It is the perception of the graduates that opportunities will continue to be limited for ICT job candidates unless more ICT related companies invest in the Northeast Ohio region. The graduates indicated that Northeast Ohio does not “grow” ICT companies that provide competitive and challenging opportunities for those in the ICT field. Without ICT related companies (those with ICT functions or departments) basing their operations in Northeast Ohio, the graduates perceive that competition will increase for the limited number of opportunities

available, causing candidates to seek employment outside of the region. Further, the graduates stated that as students, they were not aware of the ICT opportunities that existed. Additionally, the graduates said that areas for advancement within the ICT field are unknown to them and that they are uncertain as to where to seek ICT opportunities within the region.

The graduates contend that, in some instances, their post secondary institutions did not fully prepare them for employment in the ICT field. A large number of the respondents indicated an increasing demand for soft skills in the work place. These types of skills, according to the graduates, were not necessarily demonstrated in their course work. The graduates emphasized a need for skills such as project management, managing multiple tasks, leading teams, presentation skills, technical writing and communications, and facilitating meetings that should be included as part of an ICT curriculum. Some of the graduates pointed out that higher education institutions should also offer course work or professional development training on how to be more flexible in the work place – the problem solving, management, and prioritization of multiple tasks.

“Companies don’t want to invest time and money into entry level [employees] because they [inexperienced workers] do not want to stay and then they leave with more experience.”

Many of the graduates stressed that post secondary degree programs should be designed to allow for a mix of course work in business and user applications. For example, the graduates noted that a degree in software development should include course work in other technologies such as Internet security, database design, programming, networking, and operating systems. Also stated was the need for students to have more exposure to practical (as opposed to theoretical) technologies and exposure to technologies used in today’s ICT market. The graduates emphasized that the ICT equipment and software need to constantly be updated to better enable them to be competitive when they enter the job market.

Additionally, a small number of graduate respondents noted discrepancies with job description postings as impediments to locating ICT employment. The respondents found that employers are either too general or too specific in the descriptions posted for ICT jobs. Some of the graduates said that this led to confusion between the tasks described and the tasks to be performed on the job. Some graduates also indicated that some job postings might require more experience than is necessary for the position. Further, the graduates perceived that when developing descriptions for jobs, companies do not consider the transferability of skills or experience. For example, if the job calls for experience with a specific programming language but the candidate has experience with several more complex languages but not the one required, companies often do not consider that the candidate could learn the new language based on his/her prior knowledge other languages.

“The market conditions in Northeast Ohio are the biggest barriers. Northeast Ohio was mostly an industrial region and not many technical related jobs have emerged here. The job market is very thin for technical related jobs, and the competition is pretty strong for those jobs that do exist here.”

Another barrier noted by graduates working in the ICT field is the miscommunication between human resources personnel and ICT managers. The graduates stated that human resources personnel conducting interviews seek different skill sets than those required by the ICT managers. Also, the graduates indicated that human resources personnel are not familiar with as to how the ICT manager wants a particular set of skills applied on the job, and thus, are not able to convey this to the candidate. Further, the graduates contend that the methods in applying for ICT jobs through human resources personnel as opposed to an ICT manager differ, and could present obstacles to obtaining and filling the job. As an example, one graduate applied for a programming job and was asked to program with a paper and pencil rather than with a computer, limiting his ability to exhibit his programming knowledge.

The graduate stated that some employers are reluctant to train entry-level candidates; therefore, the candidates are not able to gain the needed experience required for the job. As a result, a small number of graduates indicated that they have experienced bias by some employers with regard to being young in age. The graduates said they were told that not only did they not have the necessary experience, but also the employees they'd supervise would not work with them or respect them because they were younger in age. Further, the graduates said they have experienced situations where an older employee was not receptive to them due to being a younger employee.

“Another barrier would be the city of Cleveland. It's like telling them [ICT job candidates] it's great to learn how to do this, but you can't do it here [in Cleveland]. You can't get hired for the position you want, or make the money you want here.”

An interesting issue discussed by the graduates was that some ICT jobs are considered as assets to a company, while others are considered liabilities. In software development companies, ICT workers are considered assets because these employees are the production and brain thrust of the company, and as such, generate revenue. As such, these workers are much more comfortable and secure in their jobs. In other types of organizations, such as financial institutions, ICT workers are considered liabilities because they generate expenses to a company. Thus, as an expense, these ICT employees are under pressure to do things “better, faster, and cheaper.” As a result, these graduates are uncertain as to job security.

One annoyance expressed by the graduates is the misperception of fellow employees as to the ICT employee's role within the work environment. The graduates stated that they are called upon by fellow employees to repair pagers, cell phones, PDAs, televisions, VCRs, and electrical items. While amusing at times, the graduates feel they are undervalued and that their talents are not being fully utilized.

Key Findings

Post-Secondary and Education Experience

- **Hands-On Experience Valuable**

One of the strongest themes with respect to elements of education which prepared graduates for an ICT career was “real world” or “hands on” applications, projects, and opportunities, including internships, cooperative education programs (co-ops), and work-related experience. Graduates also cited examples of team projects, team-building exercises, and problem-solving assignments required in labs and classes as some of the most helpful in preparing them for their career. Not only did the experience gained from the types of opportunities seem to better prepare graduates for the workplace, but it also gave them an advantage in finding a job or position in the ICT field. If there is a shortage of internships and cooperative education program opportunities, as suggested by some graduates, this might limit the ability of graduates to more easily transition into the workforce upon graduation.

- **Room for Improvement in ICT Course Work**

With regard to how well their academic curriculum prepared graduates for the ICT workplace, there was a mix of opinions. A small number believed that their post-secondary courses provided the context needed for an ICT career, with a good blend of applied and theoretical knowledge. Further, most graduates believed that their post-secondary courses provided a *basic* foundation and fundamental concepts that they have been able to apply in their jobs. However, these graduates indicated that their post-secondary course work did not necessarily prepare them for the ICT workforce. One participant indicated, “[college] taught me how to learn, but not necessarily how to do my job.” This speaks to the responsibility of employers in providing at least some on the job training for new employees, particularly recent graduates.

Job Searches and Current Employment

- **Limited ICT Opportunities in Northeast Ohio**

Most graduates perceived the ICT job market to be rather poor in Northeast Ohio. Some described it as one where there are plenty of low-level “help desk” types of jobs or senior-level jobs, but not much in between. A clear consensus among these graduates is that the local ICT job market is limited at best, and that it stacks up poorly against other cities and regions of the country. The graduates cited that there are few large ICT companies or companies with large ICT departments here where greater numbers and varieties of jobs are available, salaries are competitive, and opportunities for advancement exist.

- **Experience = Employment**

Several graduates expressed frustration that many employers want candidates with seven to 10 years experience and are reluctant to hire recent graduates with limited or no job experience. Graduates overwhelmingly agreed that Northeast Ohio employers preferred and hired candidates with experience, yet the level of experience required by companies is not typically that of a new graduate.

- **Get the Word Out!**

Several participants were surprised to hear that there is an unmet demand for ICT workers in Northeast Ohio. Recent graduates suggested that if good local ICT job openings are plentiful or available, employers should be more transparent about these jobs. If ICT jobs are available locally, respondents suggested that companies do a better job of getting the word out that these opportunities exist.

- **Good Entry-Level ICT Jobs Somewhat Difficult to Find**

The job search experiences conveyed by participants suggest that many ICT graduates found the local job market frustrating. Despite this perception, most spent less than six months to find an ICT-related position. The disparity between recent graduates' perception and reality was due in part to their expectation of a higher salary, and higher-level position, and perhaps what is a reasonable length of time to find a job. Some graduates had multiple job offers prior to graduation or indicated that they found a job with relative ease.

- **Personal Networks Successful as Job Seeking Method**

Personal networks and referrals, and internships were the most effective methods in locating ICT employment, particularly as many of the graduates are uncertain as to how and where to obtain information on available opportunities. Online mechanisms most frequently used for the job search included websites such as Monster.com, Careerbuilder.com, CareerNet.com, and others, as well as college and university job search sites. Generally, these online mechanisms were deemed somewhat effective in terms of finding a position. Despite being in the digital age, some graduates still look through the newspaper classified section for potential job openings, and attend career fairs at local colleges and universities.

- **ICT Graduates Will Relocate for Better Opportunities**

While many graduates indicated that they would prefer to remain in Northeast Ohio, most seemed willing to move to another area for the right opportunity or money. A number of graduates believe that the Northeast Ohio market would not support lucrative opportunities for ICT workers. Given perceived limited opportunities available locally, as well as other issues, some respondents

envisioned their next career step as a position that would likely be located in another city. Even among those who described their current position as satisfying, eventual relocation to further their career was often described as a possibility. This issue again points to the ICT industry being more transparent with job opportunities. The next phase of the research should assess the factors affecting ICT workers' decisions to leave and determine whether these workers would still leave if the Northeast Ohio ICT job market, or the perception of the market, were to improve.

- **Family May Keep Them in NEO**

Many of the graduates who chose to remain in Northeast Ohio did apply outside of the region for ICT employment. And, although currently employed, several graduates have responded to job opportunities outside of Northeast Ohio. For those committed to staying in Northeast Ohio, one of the most frequently cited reasons for taking a job here and staying here was family – graduates are from the area, married someone from the area, or spouses have established a career in this area. Another reason for staying was related to the content of the job or type of work in the positions here. Although graduates expressed that their initial search or job offers did not yield the salaries they expected, this was not mentioned when asked what factors would influence their decision accept that position. While salary may not be the predominant factor in the selection of their first job, it may be a factor as ICT workers gain experience and look to further develop their career. As stated above, to more fully understand the complex issue of the factors affecting ICT workers' decisions to seek or accept jobs outside of the area, it will be critical to fully explore this in the next phase.

Professional Growth and Development

- **Job Responsibilities are Increasing**

For some graduates, the nature and scope of their job has expanded into having managerial or leadership roles and responsibilities. A small number of graduates quickly advanced to management levels, while others have incrementally advanced. As a result of these changes, graduates often require more training and development of soft skills – making presentations, facilitating meetings, technical and business writing, coordination and management of projects and multiple tasks, communicating, providing internal training to fellow employees, and providing client service, training, and support. The training was encouraged by their employers, and in most cases, subsidized by them as well.

While most graduates with less technical jobs (even some programmers) acknowledged the importance of learning “soft skills” as part of their college experience, specific technical coursework, such as programming languages, seemed more valued by those with jobs involving programming and software development. In the next phase of this project, it will be important to look at the

responses of the participants by degree and current position to assess the extent to which these factors influence the responses in this area.

- **Graduates Must Keep Up-to-date With Technology**

Most graduates recognized the importance of maintaining a high level of technical expertise including keeping current with the changing and emerging technology. Graduates said they are continuously learning and developing new technological skills on the job rather than through formal training programs. This poses challenges within the work environment (which they found to be rewarding) to work through problems and formulate solutions. Graduates suggested that there would always be an inherent necessity to learn on their own, initially beyond the academic curriculum, and eventually outside the work environment. Numerous respondents echoed the theme that given that technology continues to evolve, the need for training and learning on the job will continue. This issue has a variety of implications, particularly how both employers and providers of education and training satisfy this need and determine how to meet these demands as they change over time.

- **Training and Degree Needed**

Training, in addition to the knowledge and skills acquired from post-secondary institutions, was deemed necessary in the ICT field. Nearly all graduates received some type of training toward professional certification, yet the graduates said their best training was received on the job or through their own devices (such as reading books and manuals, online research, and manipulating software). In general, the graduates with an associate's degree perceived that it was not enough in the ICT field, and that it was necessary to obtain a higher-level degree to increase their knowledge base and skills to remain competitive.

Perceived Barriers to Employment in the ICT Field

- Fewer [job] opportunities are available to graduates not having hands-on technical experience. Companies prefer experienced job candidates, and good jobs, and in some cases internships, are difficult to obtain if the candidate has little or no experience.
- The lack of opportunities within the Northeast Ohio job market will continue to restrain ICT graduate employment unless more ICT related companies invest in Northeast Ohio. The graduates perceive that Northeast Ohio doesn't "grow" ICT companies that provide competitive and challenging opportunities for ICT job candidates.
- Although post-secondary courses provided a *basic* foundation and fundamental concepts that graduates have been able to apply in their jobs, their post-secondary course work did not necessarily prepare them for the ICT workforce.

Training in soft skills, with a good mix of course work in both business and user applications, is integral to the ICT work environment.

- Graduates want exposure to practical approaches, as well as exposure to technologies used in today's ICT market. The ICT equipment and software utilized in post-secondary education course work should be updated to better enable graduates to be competitive when they enter the job market.
- ICT job description postings were found to be unclear as to the described tasks indicated for the job and the actual tasks to be performed on the job. The graduates perceived miscommunication between the IT company managers and company human resources personnel as a source of this problem. Further, company human resources personnel conducting interviews interview for different skill sets than those required of IT company managers.

PROFILE OF FOCUS GROUP AND INTERVIEW PARTICIPANTS

The ICT graduate focus group and interview participants were asked to complete an informational questionnaire prior to their sessions (see Appendix D). The rationale for this instrument was to characterize the education and employment background of each participant. The data were compiled from the questionnaires to establish a profile of the focus group participants. The terms *focus group/interview participants* and *ICT graduates* are used synonymously here to state the responses to the questionnaire. As previously mentioned, the focus group discussions were qualitative in nature and not intended to be statistically representative of the broader population of Northeast Ohio ICT graduates. The Phase III component of the research will examine a statistically representative sample of Northeast Ohio's total ICT graduate population.

Pre-Focus Group Questionnaire

Type of Industry

The focus group/interview participants were asked to indicate the type of industry in which they are currently employed. The industry listing is consistent with those developed in Phase I of the project. The majority of the respondents indicated that they are currently employed in the Information Technology industry (Figure #1). Banking / Finance, Software Development, and Insurance were also types of industries in which focus group/interview participants are largely employed. Additional industry types noted are Advanced Manufacturing, Communications, Government, Non-profit, and Multi-media Production. Note that respondents may have selected multiple industries.

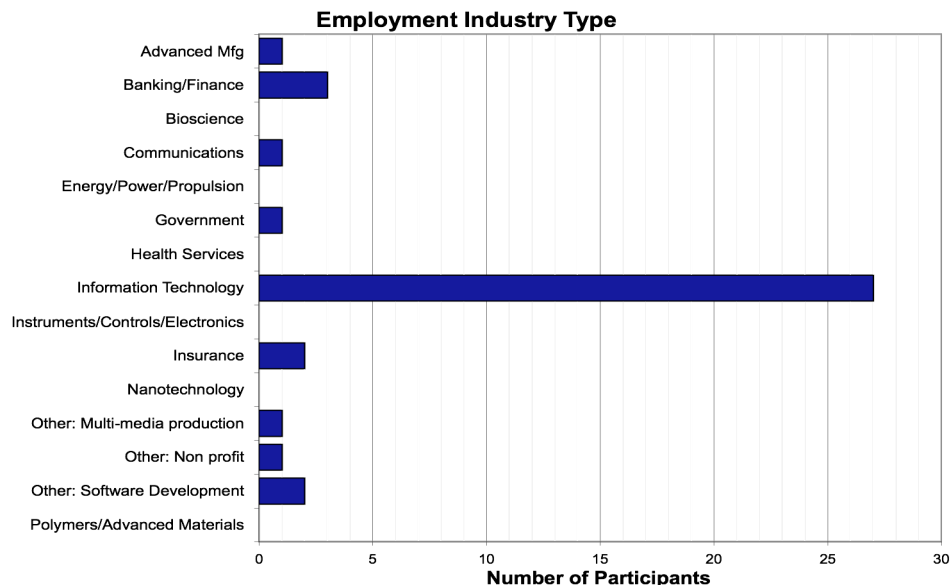


Figure 1

Number of Employees

The ICT graduates were asked to provide the number of full-time employees employed at their current work location. Respondents were asked to indicate whether their company employs 1-50, 51-100, 101-150, 151-200, or 200 or more workers. The majority of focus group/interview participants are employed by companies with 200 or more employees (Figure #2).

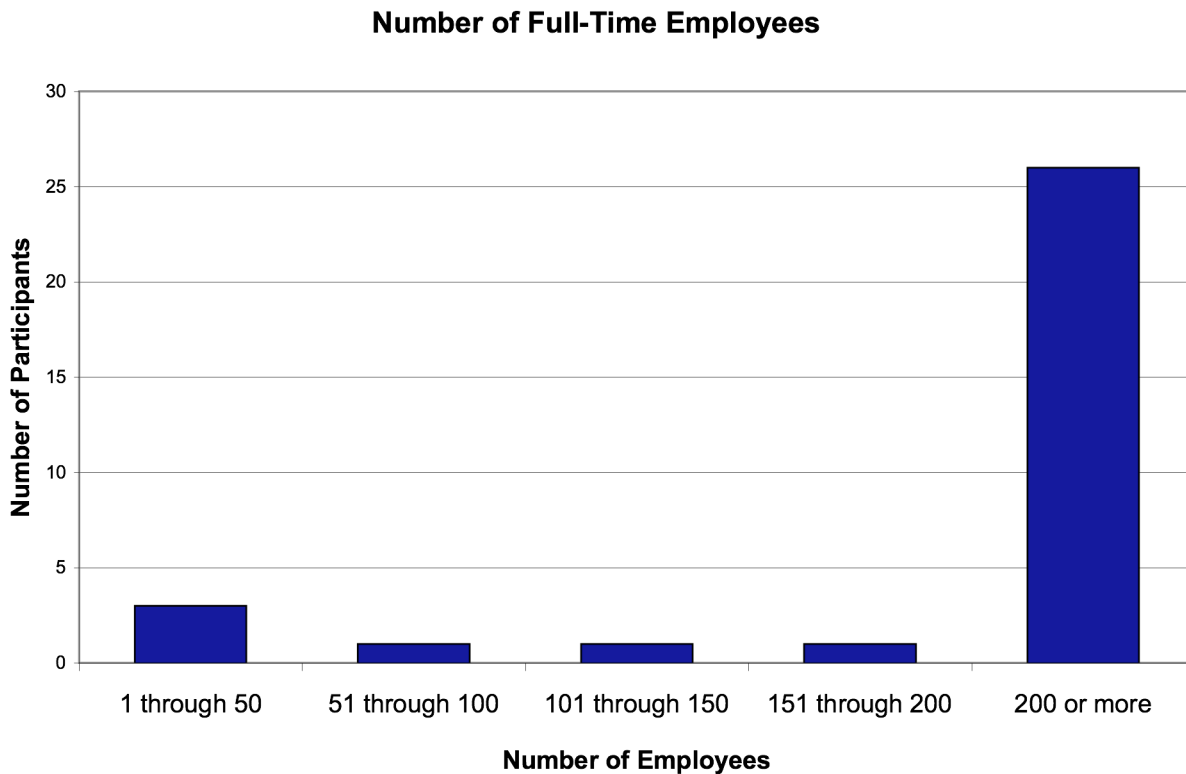


Figure 2

Length of Employment

When asked to provide the length of time worked for their current employer, a substantial number of ICT graduates indicated that they have been employed with their company for at least one year, but less than two years. A large number of respondents also noted that they have been with their company for three or more years (Figure #3). Note that the data reflect responses from all but two ICT graduates; also, one respondent has two jobs.

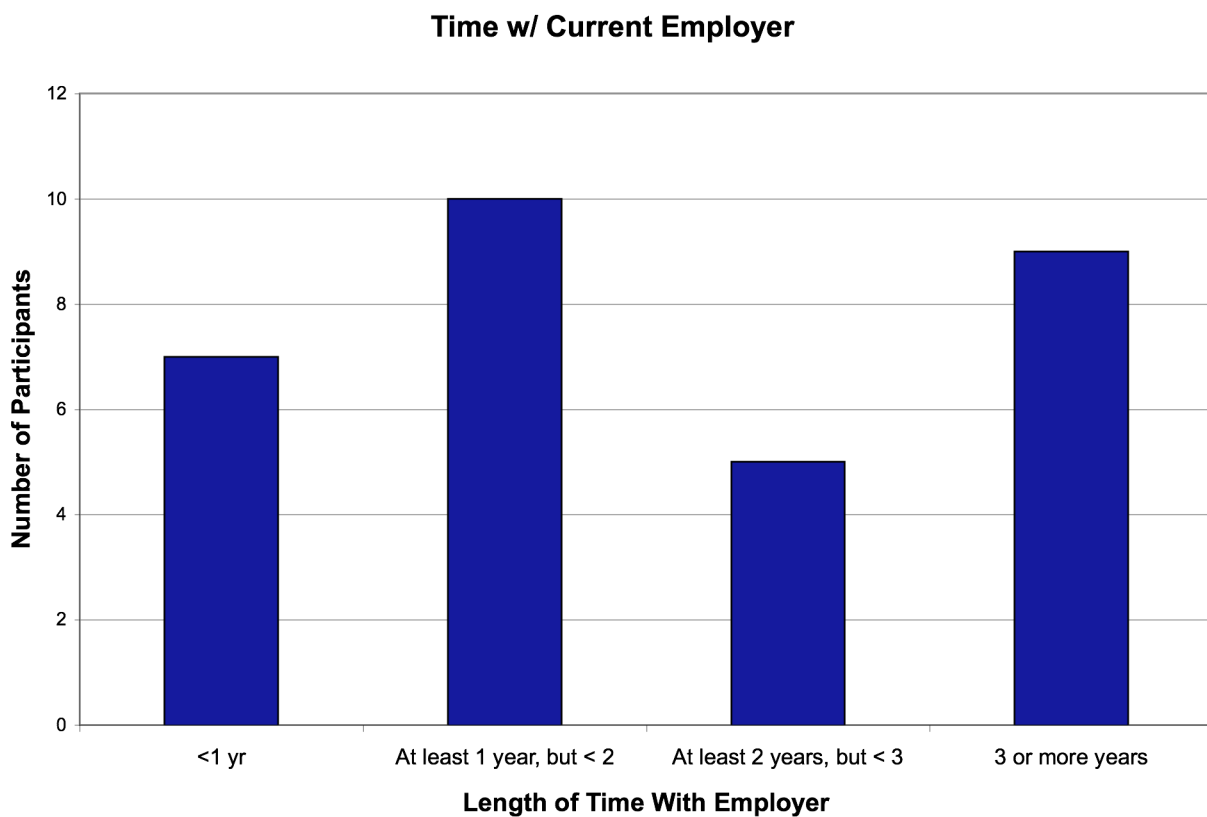


Figure 3

Type of Job

Those participating in the ICT graduate focus groups and interviews were asked to indicate the type of job in which they are currently employed. The selection of job categories and positions were identified during Phase One of this research during key informant interviews conducted with employers. The majority of the respondents indicated that they are employed in Programming and Software Engineering, while a substantial number noted Enterprise Systems Analysis and Integration as their area of employment (Figure #4). Note that the data reflect responses from all but one respondent, and that respondents may have selected multiple job functions.

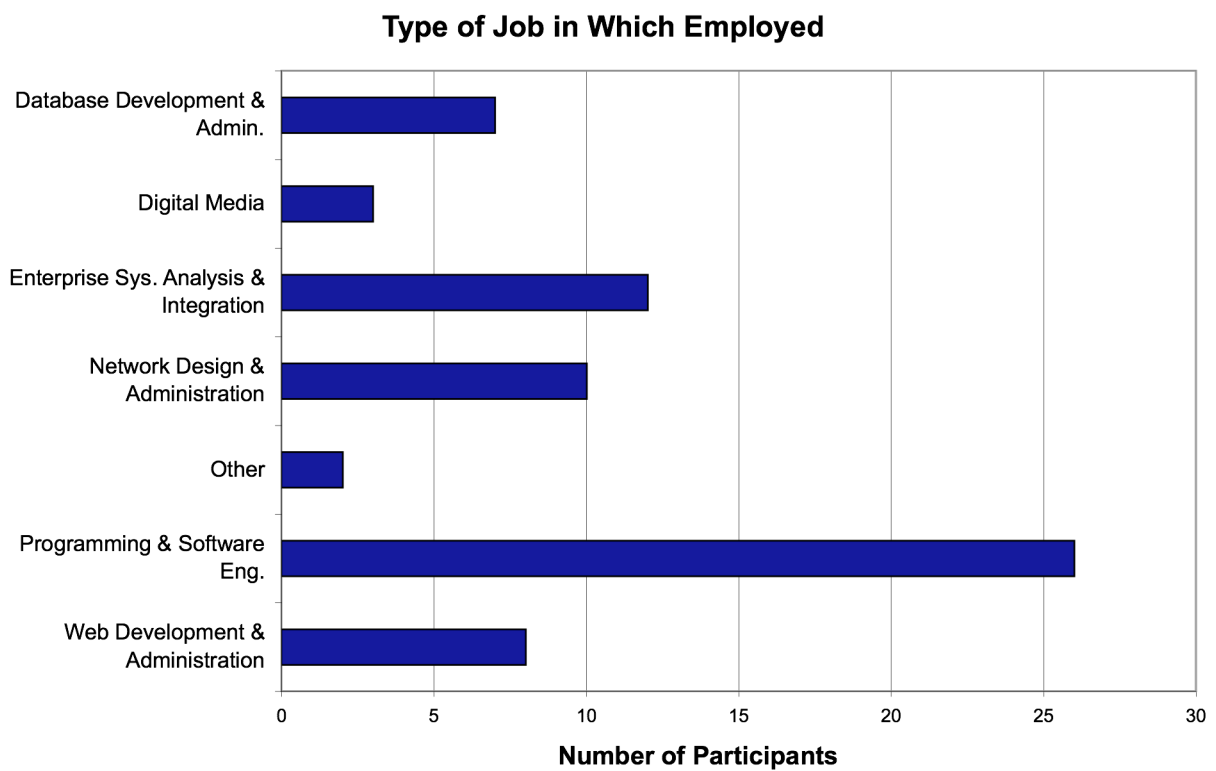


Figure 4

Geographic Location of Employment

Respondents were asked to indicate the city and state or the zip code and state in which they currently work. The results are depicted in Figure #5.

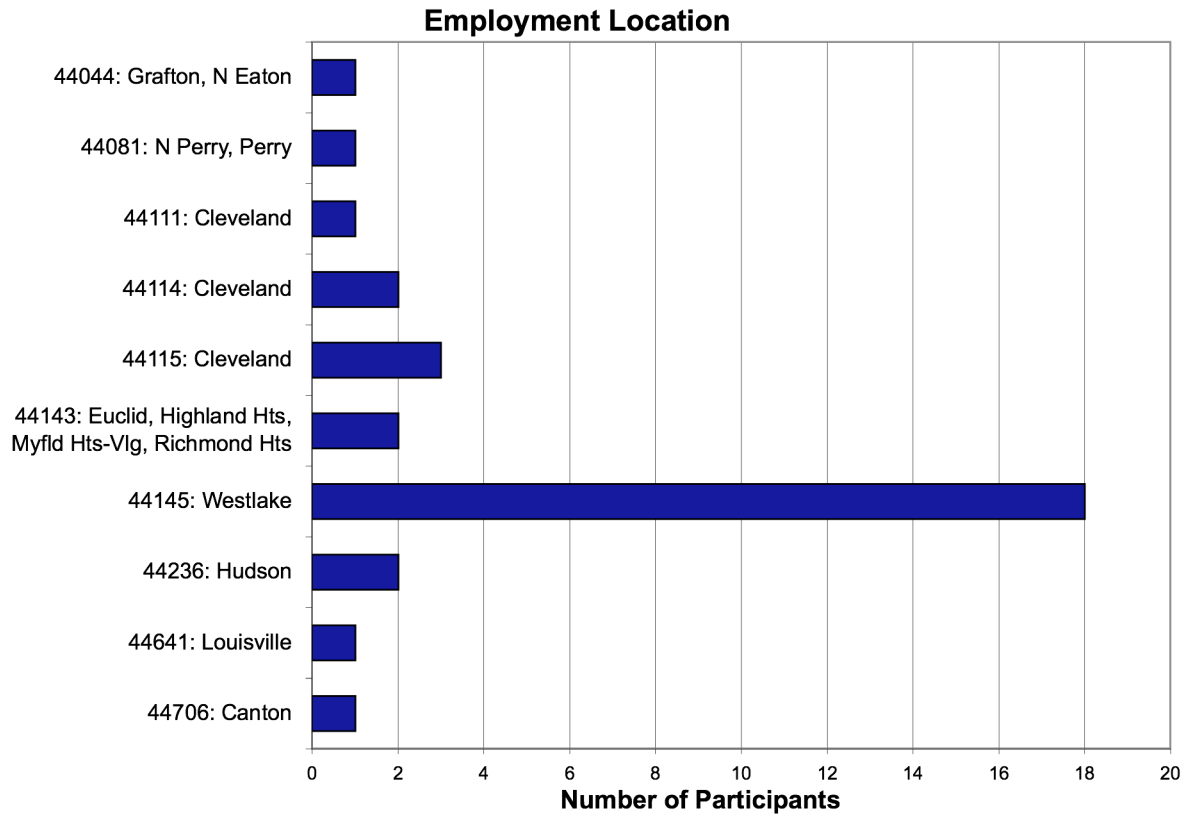


Figure 5

Geographic Location of Residency

The ICT graduate focus group participants were asked to list the city and state or the zip code and state in which they currently reside. Most of the respondents reside in North Olmsted, Lakewood, and Westlake. A large number also reside in the Cleveland area (Figure #6). Note that the data reflect responses from all but one respondent.

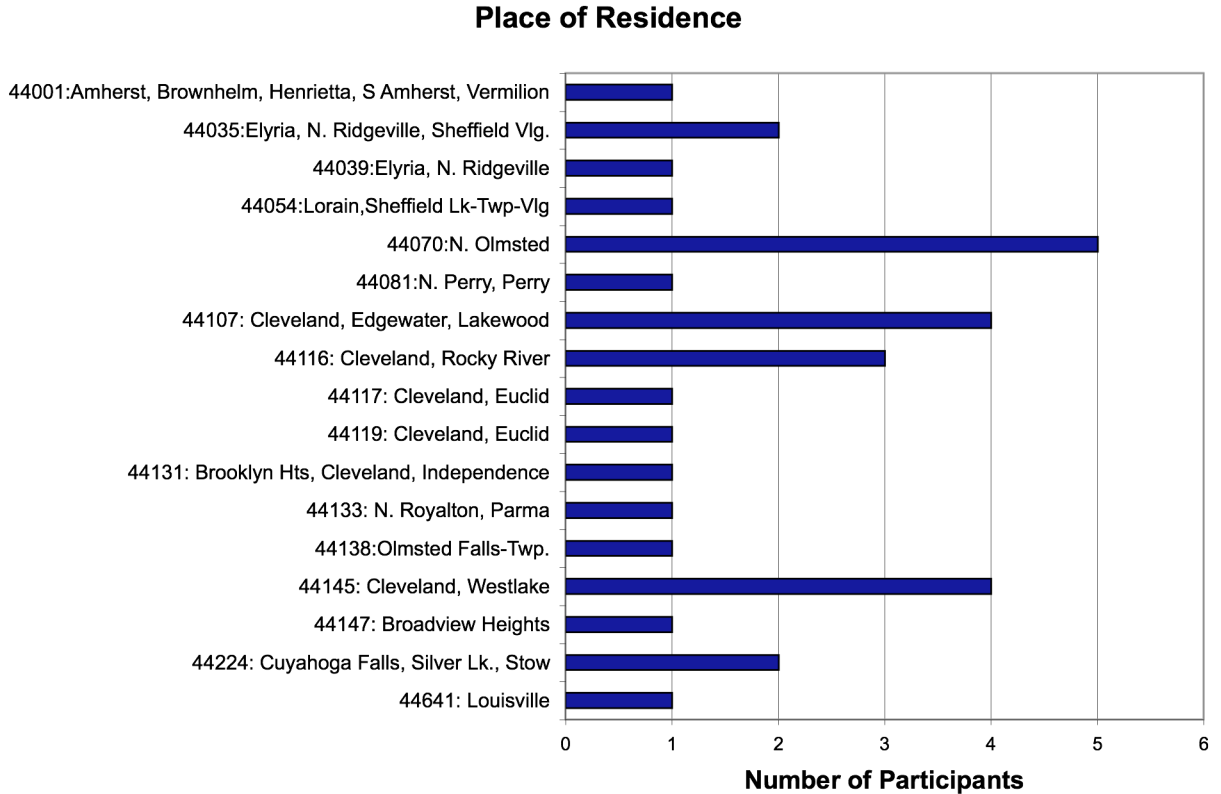


Figure 6

Post-Secondary Education Institution

The participants in the ICT graduate focus groups were asked to identify the post-secondary educational institution from which they received their ICT degree and/or certification. In some cases, the participants graduated from more than one institution. The Northeast Ohio institutions from which a large number of respondents received their degree(s)/certification are Case Western Reserve University, Cleveland State University, the University of Akron, and Lorain County Community College (Figure #7). Note that one respondent graduated from more than one institution.

Some of the individuals that participated in the focus groups attended and received ICT degrees from post-secondary institutions located beyond the Northeast Ohio region. These institutions are Ohio University, Bowling Green State University, and University of Dayton (Ohio); Auburn University (Alabama), Grantham University (Missouri), and Purdue University (Indiana). Although the participants graduating from these institutions are not Northeast Ohio graduates per se, their experiences are relative to them being a native, resident, and/or seeking employment in Northeast Ohio.

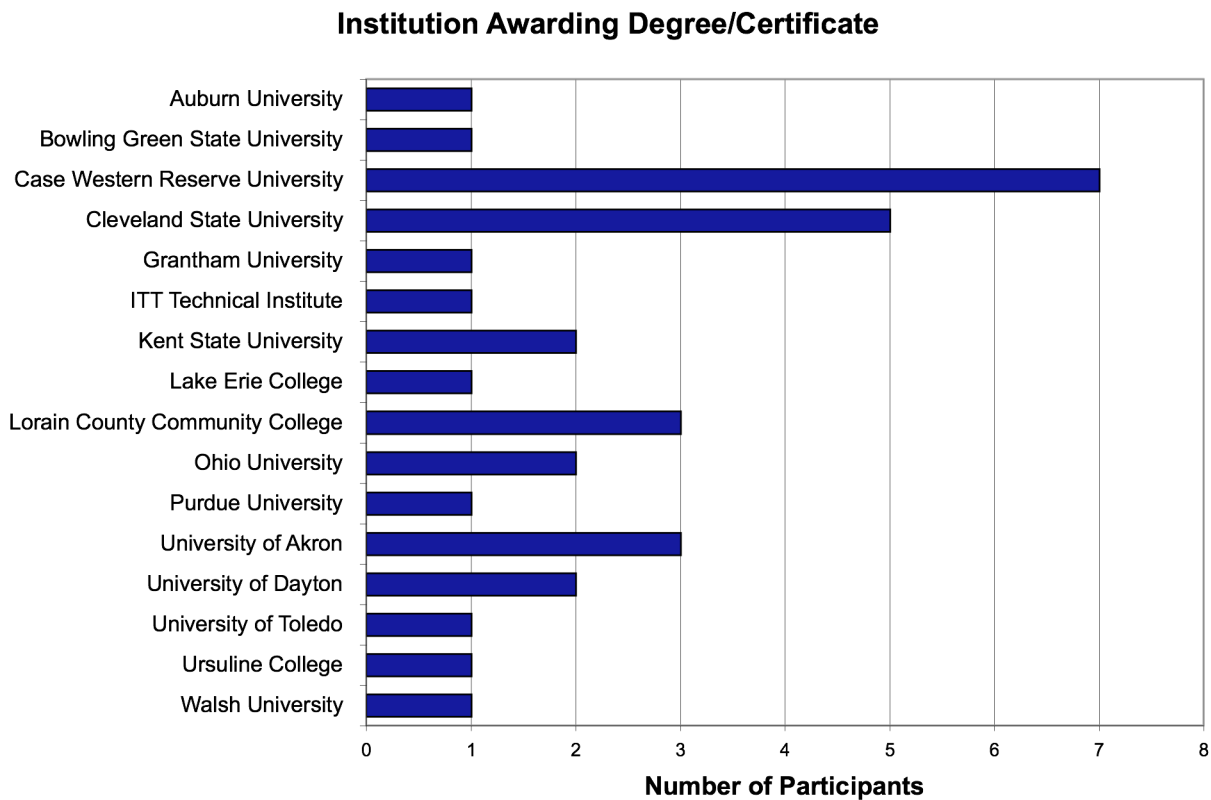


Figure 7

ICT Degree or Certification

The ICT graduates were asked to indicate the types of ICT degree and/or certification completed from their post-secondary educational institutions (Figure #8). In some cases, the participants received more than one degree. The majority of the respondents have Bachelor's degrees, with 10 of the respondents additionally being certified in an ICT application.

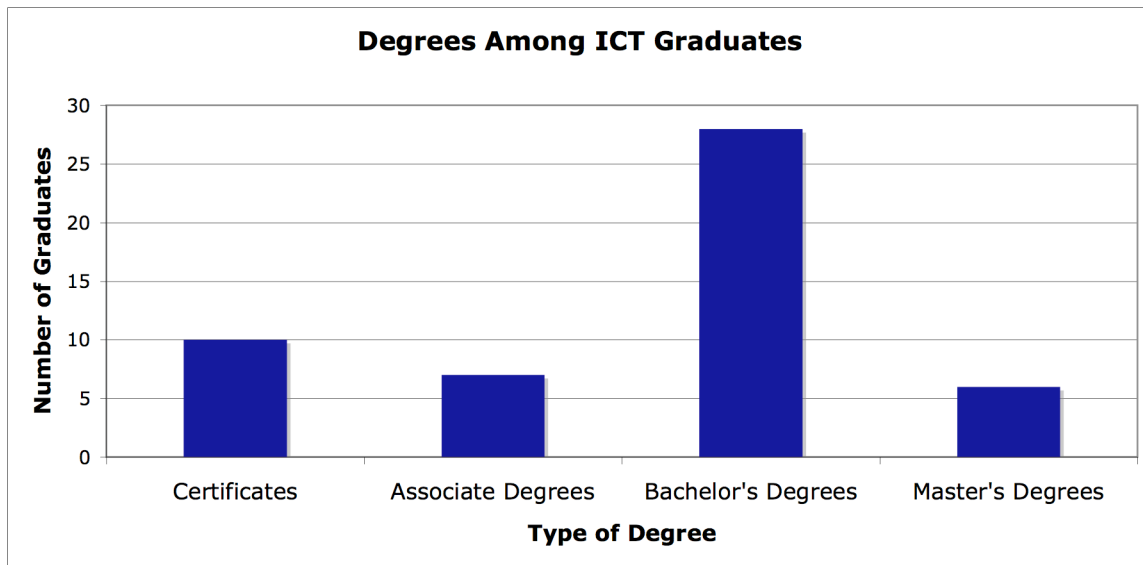


Figure 8

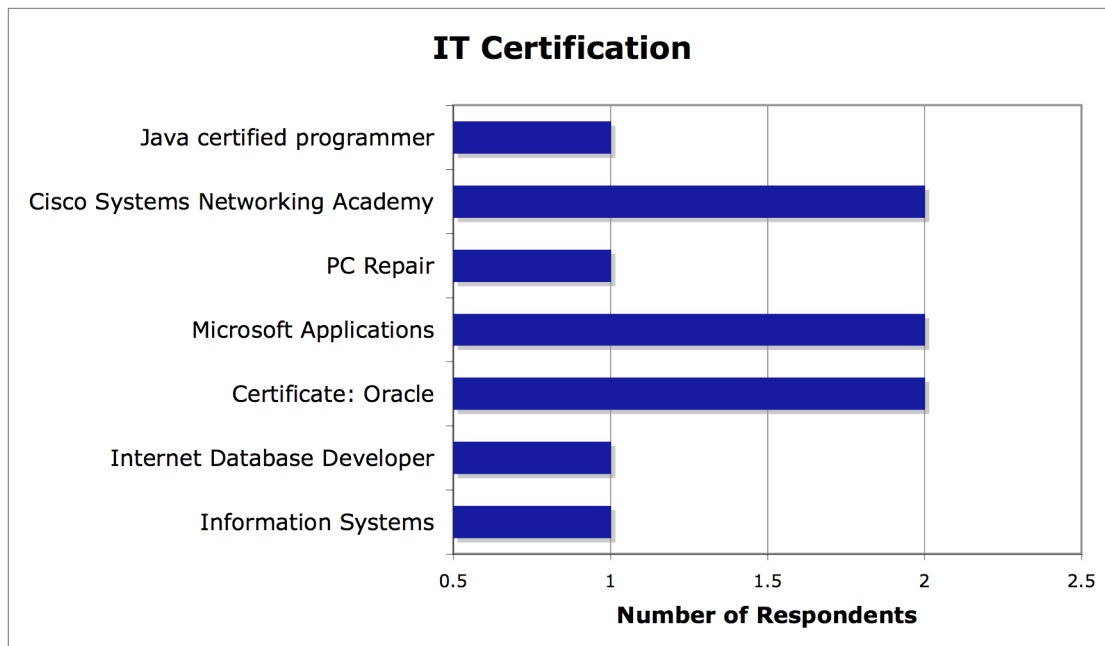


Figure 9

The focus group/interview respondents indicated the specific degree/certification programs from which they graduated. The breakdown of ICT certification, and Associate's, Bachelor's and Master's degree programs are shown in Figures 9, 10, 11 and 12.

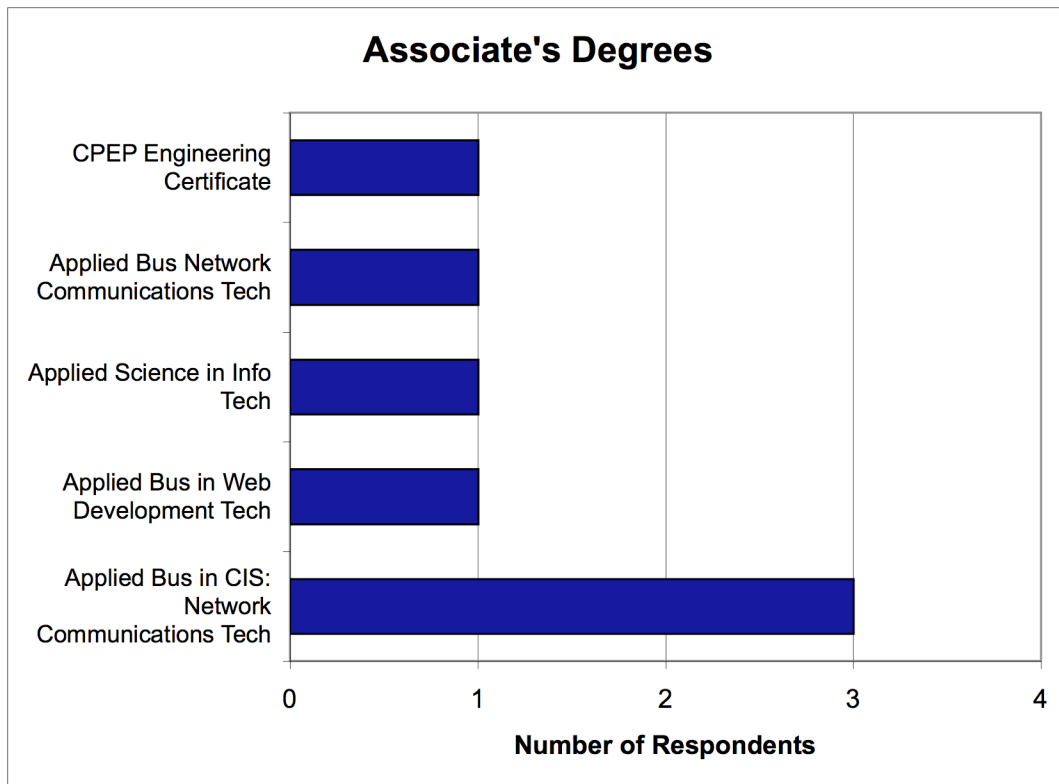


Figure 10

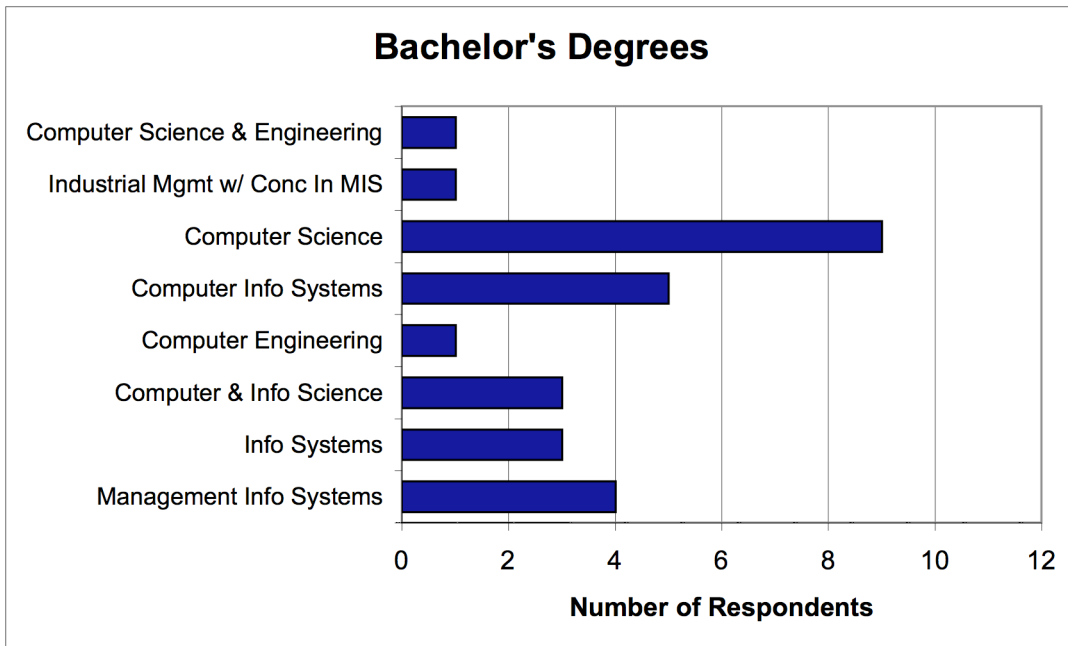


Figure 11

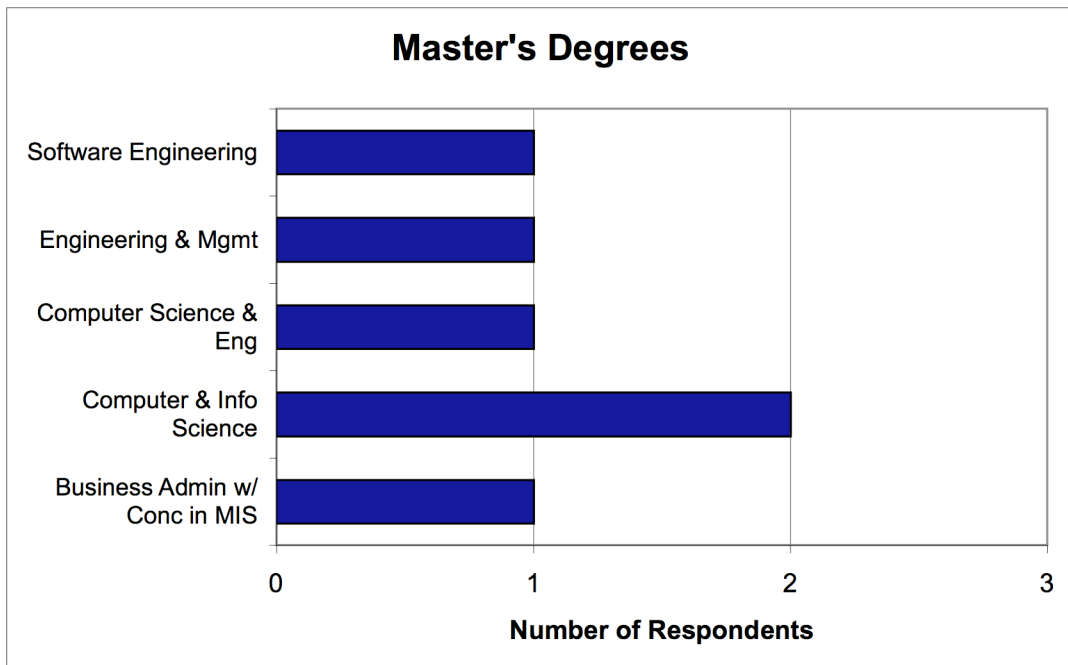


Figure 12

Experience in the ICT Field

Respondents were asked to indicate whether they have worked in a job performing ICT-oriented tasks since graduating with their ICT degree and/or certification. If so, they were asked to indicate the length of time they've been employed in the ICT field. All of the focus group participants have worked in an ICT-related job since receiving their degree or certification.

With regard to ICT employment, the majority of the participants have been employed in the ICT field for more than two years overall, with the greatest number of participants working in the ICT field for more than three years (Figure #13). Note that the data reflect responses from all but three respondents.

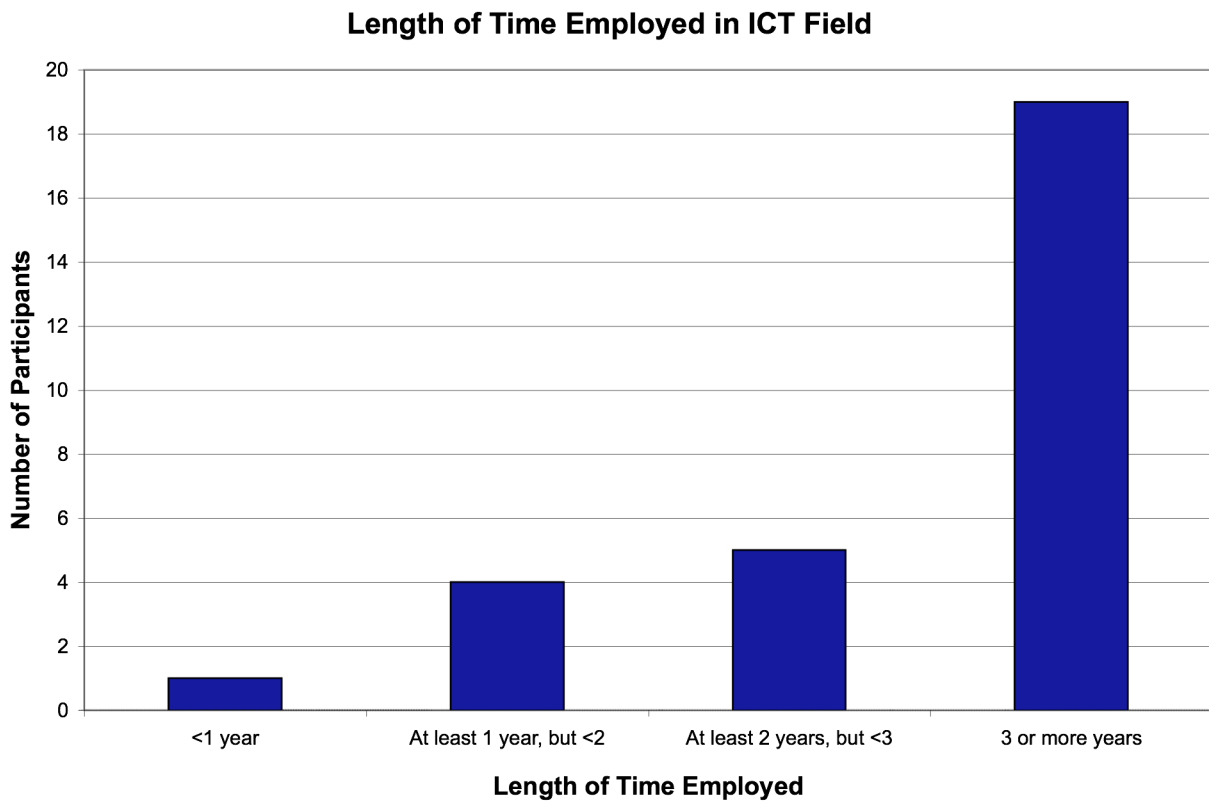


Figure 13

Length of Time to Secure ICT Employment

When asked to indicate the length of time it took to find ICT-related employment upon completion of their ICT degree and/or certification, the majority of the focus group/interview participants were hired within or less than six months (Figure #14). None of the ICT graduates were unable to find an ICT-related job, although one participant did search for more than one year before being hired in the ICT field. Note that the data reflect responses from all but one respondent.

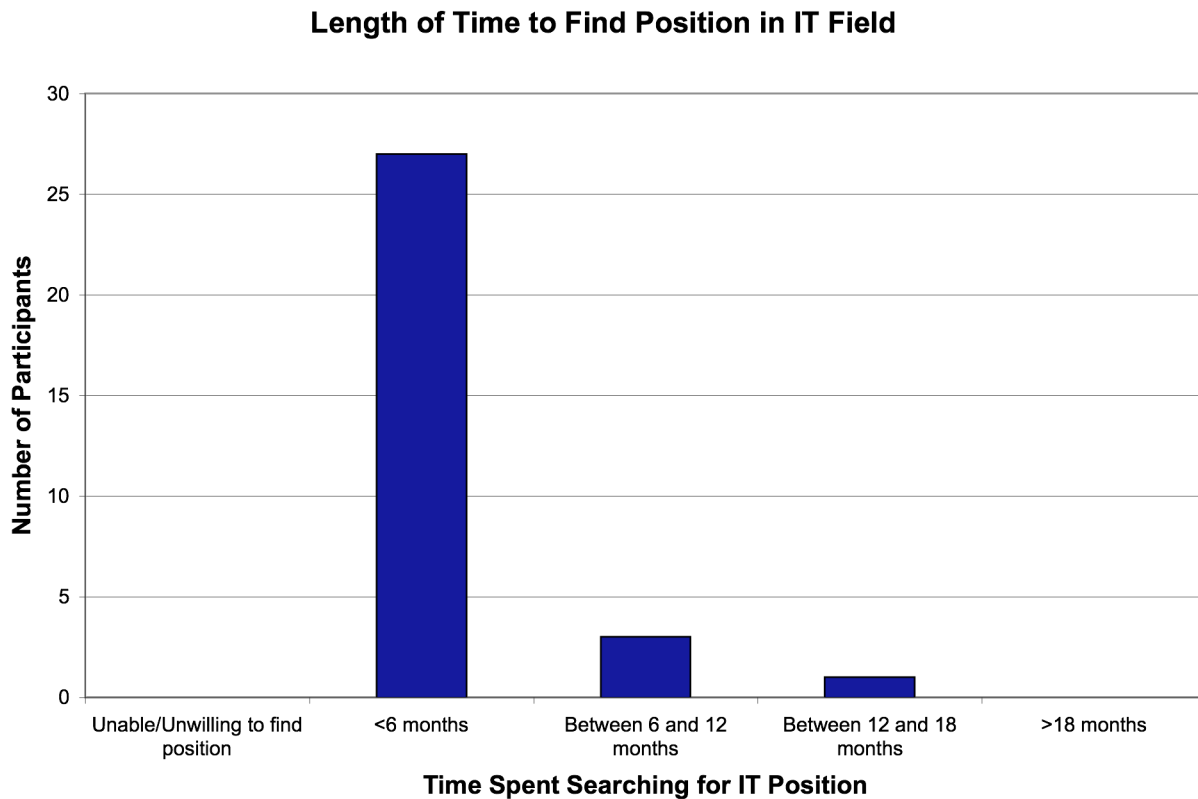


Figure 14

Number of Employers

The ICT focus group/interview participants were asked to provide the number of employers they have worked for since graduating or completing their ICT degree and/or certificate. The majority of the ICT graduates have worked for only one employer since receiving their ICT degree and/or certification. Six of the respondents indicated that their current job is their second job since graduating or completing their degree, while four of the respondents have had three jobs since graduating.

ICT-Related Jobs

Focus group/interview participants who indicated they worked in more than one job since graduating or completing their ICT degree or certificate were asked to identify the number of these jobs that were ICT-related. Of the multiple jobs held since graduating, the majority of these respondents indicated that these jobs were in the ICT field.

APPENDICES

Appendix A: Research Design

Appendix B: Focus Group Protocol

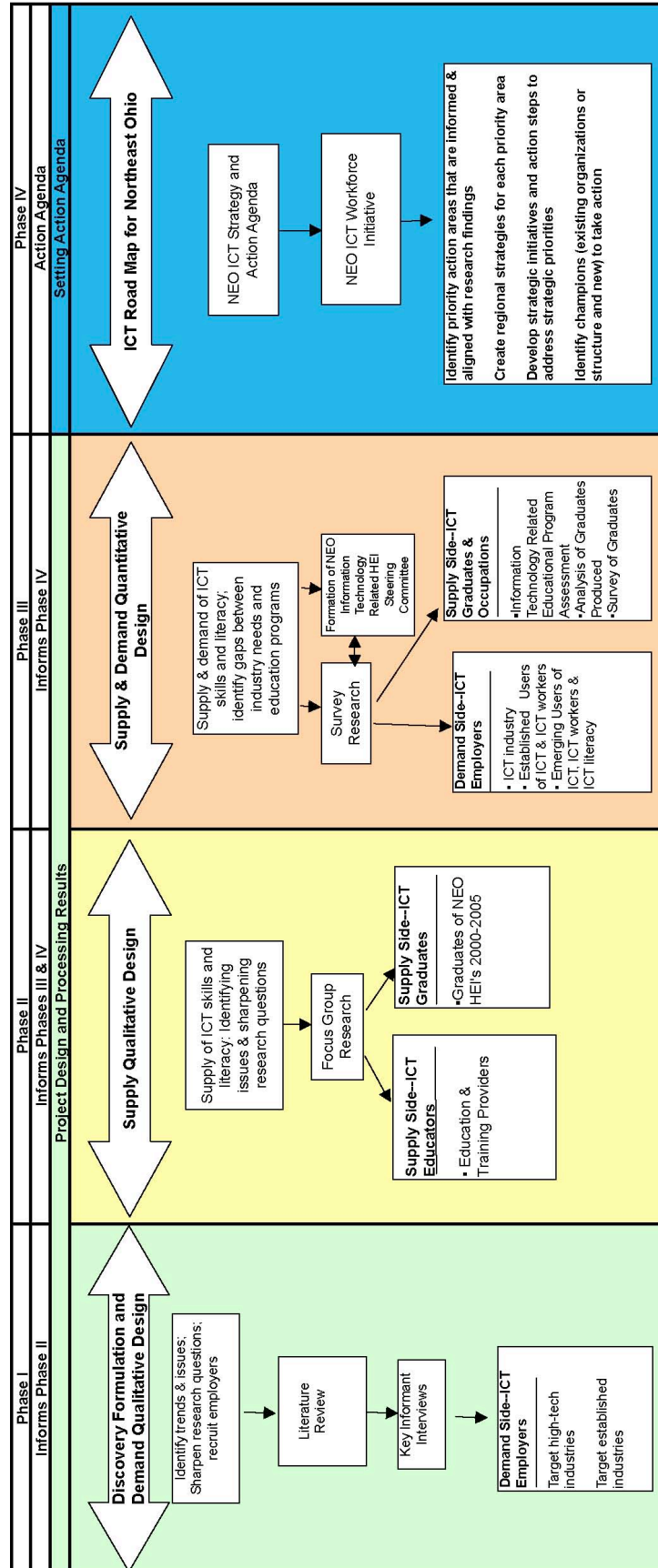
Appendix C: Online Web Announcement

Appendix D: Pre-Focus Group Questionnaire

Appendix E: Post-Secondary Education ICT Certificate/Degree Programs

APPENDIX A: RESEARCH DESIGN

Supply and Demand Issues of Northeast Ohio's Information and Communications Technology Workforce



APPENDIX B: FOCUS GROUP PROTOCOL

**Focus Group Protocol
Northeast Ohio Post-Secondary Education/Training Institutions
Friday, February 2, 2007**

Cleveland State University – East Campus

- I. Introductions
- II. Housekeeping (restrooms, lunch, length of time of focus group, etc.)
- III. Purpose of the focus group and background on the project

Questions

1. Job Placement and Recruitment

Our interviews with ICT employers in the first phase of this project informs us that they are in dire need of ICT workers, and that these employers are concerned in sustaining a constant stream of ICT graduates to fill job openings. The lines of communication and opportunities that link ICT candidates to the market and its needs are critical. This places higher education institutions in the position of managing the burden of understanding the market for their graduates.

This series of questions focuses on how your institutions help ICT graduates find jobs to meet market demand.

- A. Does your institution or IT department/college have mechanisms in place to assist your graduates in locating jobs? If so, what are these mechanisms? (Is there an informal network within your IT program that helps graduates find jobs? For example, are there professors or instructors within your IT programs that employers call to help graduates fill job vacancies? Do students go to professors or instructors for help in finding jobs?)
- B. Also, have your institutions changed their methods of job placement over time? In other words, what does your institution do today that it has not done in the past?

2. Curriculum/Skills Development

One of the challenges for educational institutions has been adapting to the changing and emerging needs of the market. The job functions and skills needs of business and industry change over time. This poses challenges to our educational institutions to frame curriculum and programs to meet the needs of the market.

This series of questions focuses on how your institutions develop and assess curriculum and skills training to meet market demand.

- A. What methods or practices are in place at your institution to assess curriculum on a regular basis? How and how often are these implemented? (What does your institution do to determine whether its coursework/curriculum prepares its graduates for careers in ICT?)
- B. Are mechanisms in place to integrate business applications as needed by the market into your coursework? If so, what are these mechanisms? (For instance, do you offer a co-op or internship program that provides technical or practical experience in ICT to the student?)

3. Needs of Post-secondary Education/Training Institutions

We feel that the dynamic in the market centers on three aspects – the market, the graduates, and training/education. This dynamic is dependent upon the continuous loop of information between business/industry, students, and our post secondary education/training institutions. To maintain this dynamic, we must consider the needs of our education/training institutions in meeting the demands of the market.

- A. Does your institution or department/college have an idea as to the ICT needs of the industry? How does your institution determine what ICT training and education curricula is needed to meet market demand? (Are you in touch with the industries in your area, solicit feedback, network, conduct forums and meetings?)
- B. What are the needs of your institution in meeting the ICT education and training demands of the market? (What do you need from business and industry that will enable you to help meet their needs?)

Focus Group Protocol Northeast Ohio ICT Graduates 2000-2005
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- I. Introductions
- II. Housekeeping (restrooms, meal, length of time of focus group, etc.)
- III. Purpose of the focus group and background on the project
- IV. Discussion

A. Post-Secondary Education and Experience

You've been recruited to participate in this focus group because you are a recent graduate in the ICT field from a Northeast Ohio post-secondary higher education and/or training institution. This research is intended to understand the current availability of ICT graduates to meet the workforce needs of employers.

Through this first series of questions, we'd like to get a sense from you of the training, education, and experience you received while working toward your ICT degree or certification.

- 1) How has the education/training you received in college or through your certification program prepared you for your career in ICT? (In what ways did your classes contribute to your knowledge and skill set to make you competitive in the ICT market? How did your ICT curriculum prepare you for a job in your field?)

B. Job Searches and Current Employment

Our interviews with ICT employers in the first phase of this project informs us that they are in dire need of ICT workers, and that these employers are concerned in sustaining a constant stream of ICT graduates to fill job openings. Is there anyone within the group who is not currently employed?

Through this series of questions, we would like to get your perception of the Northeast Ohio job market when you were seeking employment and your experience in locating employment following graduation.

- 1) How would you characterize the Northeast Ohio ICT job market and opportunities available to you upon graduation? (How difficult was it for you to find a job in the ICT field? How long did it take for you to find a job?)

- 2) What methods did you use to find your job? (How did you find your job – through your college/program, headhunter, newspaper, online, etc.?)
- 3) In searching for your job, did you consider leaving Northeast Ohio and why? Did you leave Northeast Ohio upon graduation and move back; if so, why? Why did you choose the place where you currently work and live (salary, family, career opportunity, commute time, lifestyle, etc.)?
- 4) Do your long-term goals include staying in or leaving Northeast Ohio? If it involves leaving, why?

C. Professional Growth and Development

The ICT environment seems to constantly be changing. Our higher education institutions are faced with the challenge of adapting curriculum and training to the emerging and changing needs of the market. Employers assess and reassess job functions and skills needed as the market changes over time.

This series of questions focuses on the skills that are required of you for your job, the changes you've faced, and any barriers you've experienced or foresee with your job.

- 1) How has the function or scope of your job changed since you've been employed? (Has your job required additional training to advance or further your skills? If so, was this training received on the job or through another provider? Was an additional degree or certification required?)
- 2) How would you characterize your current employment situation? Is your current job the type of job that you've wanted or aspired to, or do you consider your current job a stepping stone (to another job or career)? Are you happy in the ICT field – why/why not?
- 3) What, if any, have been the barriers or issues that you've faced since working in the ICT field? What, if any, are the barriers to advancing in your career in Northeast Ohio or elsewhere?

APPENDIX C: ONLINE WEB ANNOUNCEMENT



Northeast Ohio Colleges and Universities Need Your Help!

Graduates of Technology-Related Programs are Needed to Participate in Regional Discussion Groups

The Information and Communication Technology (IT) Workforce Initiative is conducting research to assess the current supply and demand for computer and information technology professionals in Northeast Ohio.

As part of this research project, Cleveland State University is working in cooperation with Northeast Ohio colleges and universities to recruit participants for regional discussion (focus) groups. Discussion will center on participants' experience in post-high school education, job search, professional growth and development, and current employment in technology-related fields. For more information on the first phase of the project or a detailed description of this phase of the project, click on the reports below.

[Phase1_report.pdf](#)
[Phase2_description.pdf](#)

Participants should be recent graduates (2000-2005) from technology-related degree or certificate programs. Focus group participants will receive either a \$25 gift card or honorarium. A light meal and beverages will be provided.

If you would like to participate in a focus group for this study, please respond to each of the screening questions below.

1. Did you complete an information technology (IT) certificate or degree between 2000-2005?

- Yes
- No

2. Before you are asked to respond to additional screening questions, please indicate whether you would be able to participate in the scheduled focus group listed below.
Focus group date and location

- Thursday, March 8, 2007, 6:00-8:00 p.m. at Cleveland State University's West Center in Westlake, Ohio.

- I am interested and available to participate in the above focus group.
- I am unable to participate in the focus group.

APPENDIX D: PRE-FOCUS GROUP QUESTIONNAIRE

**Supply and Demand Issues of Northeast Ohio's
Information and Communications Technology Workforce**

Focus Group Location:
(To be completed by project staff)

1. Please indicate the type of industry in which you are currently employed.

- | | |
|--|---|
| <input type="checkbox"/> Advanced manufacturing | <input type="checkbox"/> Information Technology |
| <input type="checkbox"/> Banking/Finance | <input type="checkbox"/> Instruments/Controls/Electronics |
| <input type="checkbox"/> Bioscience | <input type="checkbox"/> Insurance |
| <input type="checkbox"/> Communications | <input type="checkbox"/> Nanotechnology |
| <input type="checkbox"/> Energy/Power/Propulsion | <input type="checkbox"/> Polymers/Advanced Materials |
| <input type="checkbox"/> Government | <input type="checkbox"/> Other |
| <input type="checkbox"/> Health Services | |

2. How many full-time employees are at your current work location?

- | | |
|----------------------------------|--------------------------------------|
| <input type="checkbox"/> 1-50 | <input type="checkbox"/> 151-200 |
| <input type="checkbox"/> 51-100 | <input type="checkbox"/> 200 or more |
| <input type="checkbox"/> 101-150 | <input type="checkbox"/> Not sure |

3. How long have you worked for this employer?

- | | |
|---|--|
| <input type="checkbox"/> Less than 1 year | <input type="checkbox"/> At least 2 years, but less than 3 |
| <input type="checkbox"/> At least 1 year, but less than 2 | <input type="checkbox"/> 3 or more years |

4. Please indicate the type of job in which you are currently employed (check all that apply).

Database Development & Administration

- Database administrator
- Database architect
- Database generalist
- Other

Digital Media

- Programming for gaming
- Electronic imaging
- Digital media generalist
- Other

Enterprise Systems Analysis & Integration

- Interface engineer developer
- System administrator
- System engineer
- Desktop support
- Integration analyst/engineer
- Systems generalist
- Cost engineer
- Other

Programming & Software Engineering

- Server administrator (hardware and software)
- Technical support specialist
- Programming/software generalist
- Other

Network Design & Administration

- Project management
- Network engineer
- Network architect
- Technical writing & communication
- Network & systemic administration
- Security specialist
- Network generalist
- Cost engineer
- Separate network administrator (communications) from systems administrator (servers)
- Other

Web Development & Administration

- Content producer, writer
- Web development
- Web design
- HTML programmer
- Web generalist
- Other

- Any other not listed

5. Please indicate the city and state or zip code and state in which you currently work.

**Supply and Demand Issues of Northeast Ohio's
Information and Communications Technology Workforce**

6. Please indicate the city and state or zip code and state in which you live.

7. From what college or university did you graduate in the IT field? (Check more than one if appropriate).

- | | |
|--|---|
| <input type="checkbox"/> Ashland University | <input type="checkbox"/> Mount Union College |
| <input type="checkbox"/> Baldwin Wallace College | <input type="checkbox"/> Northeastern Ohio Universities
College of Medicine and College of
Pharmacy (NEOUCOM) |
| <input type="checkbox"/> Case Western Reserve University | <input type="checkbox"/> North Central State College |
| <input type="checkbox"/> Cleveland State University | <input type="checkbox"/> Notre Dame College of Ohio |
| <input type="checkbox"/> College of Wooster | <input type="checkbox"/> Oberlin College |
| <input type="checkbox"/> Cuyahoga Community College | <input type="checkbox"/> Stark State College of Technology |
| <input type="checkbox"/> Hiram College | <input type="checkbox"/> University of Akron |
| <input type="checkbox"/> John Carroll University | <input type="checkbox"/> Ursuline College |
| <input type="checkbox"/> Kent State University | <input type="checkbox"/> Walsh University |
| <input type="checkbox"/> Lake Erie College | <input type="checkbox"/> Youngstown State University |
| <input type="checkbox"/> Lakeland Community College | <input type="checkbox"/> Other (Please indicate): |
| <input type="checkbox"/> Lorain County Community College | |
| <input type="checkbox"/> Malone College | |

8. Which of the following information technology (IT) certificate(s) or degree(s) have you completed? (Check more than one if appropriate). Note: responses continue on the next page.

- | | |
|---|--|
| <input type="checkbox"/> Certificate: Information Systems | <input type="checkbox"/> Certificate in Networking - Microsoft |
| <input type="checkbox"/> Certificate: Internet Database Developer | <input type="checkbox"/> Certificate in Networking - Novell |
| <input type="checkbox"/> Certificate: Oracle | <input type="checkbox"/> Certificate in PC Repair |
| <input type="checkbox"/> Certificate: Robots and Autonomous
Machines | <input type="checkbox"/> Cisco Systems Networking Academy |
| <input type="checkbox"/> Certificate in Microsoft Applications | <input type="checkbox"/> Other Certificate: |
-
- Associate of Applied Business in Computer Information Systems
 - Associate of Applied Business in Information Systems
 - Associate of Applied Business in Information Technology
 - Associate of Applied Business in Web Development Technology
 - Associate of Applied Science in Computer Integrated Manufacturing Technology
 - Associate of Applied Science in Electronic Engineering Technology in Computer Maintenance and Networking
 - Associate of Applied Science in Information Technology
 - Associate's in Administrative Information Technology
 - Associate's in Business Computer Programming
 - Associate's in Business Data Communications
 - Associate's in Digital Arts
 - Associate's in Digital Media Web/Tech Communications
 - Associate's in Electronic Engineering Technology
 - Associate's in Industrial Technology
 - Associate's in Information Support Services
 - Associate's in Mechanical Engineering Technology
 - Associate's in Networking
 - Associate's in Technical Studies
 - Other Associate's degree (please specify)
-
- Bachelor of Arts in Business Administration with a major in Management Information Systems
 - Bachelor of Arts in Computer Science
 - Bachelor of Arts in Computer Systems Management
 - Bachelor of Arts/Science in Management Information Systems
 - Bachelor of Business Administration in Information Systems
 - Bachelor of Business Administration with a major in Accounting and a concentration in Information System Auditing
 - Bachelor of Science in Business Administration with a concentration in Computer Information Systems
 - Bachelor of Science in Computer and Information Science

**Supply and Demand Issues of Northeast Ohio's
Information and Communications Technology Workforce**

- Bachelor of Science in Computer Engineering
- Bachelor of Science in Computer Information Systems
- Bachelor of Science in Computer Science
- Bachelor of Science in Information Systems
- Other Bachelor's degree (please specify):

- Master's in Biomedical Engineering
- Master's in Biomedical Science
- Master of Business Administration with a concentration in management information systems
- Master's in Computer and Information Science
- Other Master's degree (please specify):

- Doctorate in Biomedical Engineering
- Doctorate in Biomedical Science
- Doctorate in Business Administration with Information Science Technology Major
- Other Doctorate's degree (please specify):
- Other (Please specify):

9. Since completing your IT certificate, program, or degree, have you worked in a job performing information technology-oriented tasks?

- Yes
 - a. Including current and previous employment, how long have you worked in the IT field?**
 - Less than 1 year
 - At least 1 year, but less than 2
 - At least 2 years, but less than 3
 - 3 or more years
- No
- Other (Please explain)

10. About how long did it take you to find a position that was related to your field of study in college?

- I have not worked in a position related to my field of study
- Less than 6 months
- At least 6 months but less than 12 months
- At least 12 months but less than 18 months
- At least 18 months but less than 24 months
- Two years or more

11. How many different employers have you worked for since graduating from college with your IT degree or certificate?

12. If you have worked in more than one job since completing your IT degree or certificate, how many of these jobs have been information-technology related?

**APPENDIX E: POST-SECONDARY EDUCATION
ICT CERTIFICATE/DEGREE PROGRAMS**

**Northeast Ohio Information Technology
Workforce Initiative: Phase II Summary**

POST SECONDARY EDUCATION ITC DEGREE PROGRAMS	
Education Institution	IT Degrees and Certificates
ASHLAND UNIVERSITY	<ul style="list-style-type: none"> • Bachelor of Arts in Computer Science • Bachelor of Science in Computer Science • Bachelor of Arts/Science in Management Information Systems
BALDWIN WALLACE COLLEGE	<ul style="list-style-type: none"> • Bachelor of Science in Computer Science with concentrations in Computer Science or Web Application Engineer • Bachelor of Science in Computer Information Systems with concentration as Information Systems Analyst or Network Analyst
CASE WESTERN RESERVE UNIVERSITY	<ul style="list-style-type: none"> • Bachelor of Science in Computer Engineering • Bachelor of Science in Computer Science
CLEVELAND STATE UNIVERSITY	<ul style="list-style-type: none"> • Doctorate in Business Administration, with IST Major • Masters in Computer and Information Science • Bachelor of Business Administration in Information Systems • Bachelor of Science in Computer and Information Science • Bachelor of Business Administration with a major in Accounting and a concentration in Information System Auditing
COLLEGE OF WOOSTER	<ul style="list-style-type: none"> • Bachelor of Arts in Computer Science
CUYAHOGA COMMUNITY COLLEGE	<ul style="list-style-type: none"> • Associate of Applied Business in Information Technology with a concentration as an Information Application Specialist
HIRAM COLLEGE	<ul style="list-style-type: none"> • Bachelor of Arts in Computer Science; Bachelor of Arts in Computer Systems Management
JOHN CARROLL UNIVERSITY	<ul style="list-style-type: none"> • Bachelor of Science in Computer Science; Bachelor of Science in Computer Information Systems
KENT STATE UNIVERSITY	<ul style="list-style-type: none"> • Bachelor of Science in Computer Science • Bachelor of Science in Computer Information Systems • Master of Business Administration with a concentration in management information systems
LAKE ERIE COLLEGE	<ul style="list-style-type: none"> • Bachelor of Science in Business Administration with a concentration in Computer Information Systems
LAKELAND COMMUNITY COLLEGE	<ul style="list-style-type: none"> • Associate of Applied Science in Computer Integrated Manufacturing Technology • Associate of Applied Business in Information Systems • Oracle Certificate • Internet Database Developer Certificate • Robots and Autonomous Machines Certificate

**Northeast Ohio Information Technology
Workforce Initiative: Phase II Summary**

POST SECONDARY EDUCATION ITC DEGREE PROGRAMS	
Education Institution	IT Degrees and Certificates
LORAIN COUNTY COMMUNITY COLLEGE	<ul style="list-style-type: none"> • A+ Certification, Certificate of Completion - Information Systems Support • Certificate of Completion in Computer Aided Design • Certificate of Completion in Computer Aided Machining/Manufacturing Processes • Certificate of Completion in Computer Maintenance and Networking • Certificate of Proficiency in Computer Aided Design Operator • Certificate of Proficiency in Computer Aided Machining Operator • Certificate of Proficiency in Computer Maintenance and Networking • Certificate of Proficiency in Electronic Engineering Technology • Associate of Applied Business in Computer Information Systems (e-Business Technology) • Associate of Applied Business in Computer Information Systems (Network Communications Technology) • Associate of Applied Business in Computer Information Systems (Software Development) • Associate of Applied Business in Network Communications Technology • Associate of Applied Business in Software Development • Associate of Applied Business in Web Development • Associate of Applied Science in Automation Engineering Technology • Associate of Applied Science in Computer Aided Machining • Associate of Applied Science in Electronic Engineering Technology • Associate of Applied Science in Engineering Technology • Associate of Applied Science in Welding Technology • Associate of Science in Electronic Engineering Technology • Bachelor of Science in Automated Manufacturing Engineering Technology • Bachelor of Science in Computer Information Systems, Networking Option • Partnership degrees with University of Toledo: Bachelor of Science in Computer Science and Engineering; Bachelor of Science in Computer Science and Engineering Technology
MALONE COLLEGE	<ul style="list-style-type: none"> • Bachelor of Arts in Computer Science
MOUNT UNION COLLEGE	<ul style="list-style-type: none"> • Bachelor of Science in Computer Science • Bachelor of Science in Information Systems
NEOUCOM	<ul style="list-style-type: none"> • Master's degree in biomedical science • Master's degree in biomedical engineering • Doctoral degree in biomedical science • Doctoral degree in biomedical engineering

**Northeast Ohio Information Technology
Workforce Initiative: Phase II Summary**

POST SECONDARY EDUCATION ITC DEGREE PROGRAMS	
Education Institution	IT Degrees and Certificates
NORTH CENTRAL STATE COLLEGE	<ul style="list-style-type: none"> • Associate degree in Administrative Information Technology • Associate degree in Business Computer Programming • Associate degree in Business Data Communications • Associate degree in Information Support Services • Associate degree in Mechanical Engineering Technology • Associate degree in Digital Media Web/Tech Communications
NOTRE DAME COLLEGE OF OHIO	<ul style="list-style-type: none"> • Bachelor of Arts in Business Administration, with a major in Management Information Systems • Information Systems Certificate
OBERLIN COLLEGE	<ul style="list-style-type: none"> • Bachelor of Arts in Computer Science
STARK STATE COLLEGE OF TECHNOLOGY	<ul style="list-style-type: none"> • Associate of Applied Science in Information Technology degree with a concentration in Computer Networking and Telecommunications Engineering Technology • Associate of Applied Science in Information Technology degree with a concentration in Computer Network Administration and Security Technology • Associate of Applied Science in Information Technology degree with a concentration in Computer Programming and Database Technology • Associate of Applied Science in Information Technology degree with a concentration in Computer Science and Engineering Technology (CSET) • Associate of Applied Science in Information Technology degree with a concentration in Cyber Security and Computer Forensics Technology • Associate of Applied Business degree with a concentration in Computer Technology • Associate of Applied Business degree with a concentration in E-Commerce Technology • Associate of Applied Business degree with a concentration in Internet/Web Development • Administrative Information Technology Certificate Program • Associate of Applied Science in Biotechnology

**Northeast Ohio Information Technology
Workforce Initiative: Phase II Summary**

POST SECONDARY EDUCATION ITC DEGREE PROGRAMS	
Education Institution	IT Degrees and Certificates
UNIVERSITY OF AKRON	<ul style="list-style-type: none"> • Bachelor of Science in Computer Engineering • Bachelor of Science in Computer Science • Bachelor of Science in Industrial Management - Information Systems Management track • Bachelor of Science in Management with a concentration in Information Systems Management • Bachelor of Science in Management with a concentration in E-Business Technologies • Master of Business Administration in E-Business • Master of Business Administration in Management of Technology and Innovation • Master of Science in Computer Science-Cooperative Education Program in Computer Science • Master of Science in Electrical and Computer Engineering • Master of Science in Management- Information Systems Management Option • Master of Science in Statistics-Statistical Computer Science Option • Graduate Certificate in E-Business • Graduate Certificate in Management of Technology and Innovation
URSULINE COLLEGE	<ul style="list-style-type: none"> • Bachelor of Arts in Management Information Systems
WALSH UNIVERSITY	<ul style="list-style-type: none"> • Associate in Computer Science • Bachelor of Science in Computer Science • Bachelor of Arts in Management Information Systems
YOUNGSTOWN STATE UNIVERSITY	<ul style="list-style-type: none"> • Bachelor of Science in Computer Science • Associate in Applied Science in Computer Information Systems • Bachelor of Science in Applied Science in Computer Information Systems • Associate in Applied Science in IT • Bachelor of Science in Applied Science in IT