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Employers' perspectives on new information technology technicians' employability in North Florida

New IT technicians' employability in North Florida

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Abstract

Purpose – In response to recent calls for research relating to employers' perceptions of the workplace readiness of new graduates in a variety of fields, the purpose of this paper is to report North Florida employers' perceptions of information technology (IT) program graduates' workplace readiness. These findings are relevant to stakeholders in growing technology regions.

Design/methodology/approach – Researchers conducted 18 semi-structured interviews with IT employers in North Florida. Data were deductively coded with codes derived from national standards. Interviewee verbatim was also inductively coded by theme.

Findings – While employers valued a blend of technical and general skills and hands-on experience, they also sought new professionals who possessed fundamental understandings of business and computer programming to tailor their problem-solving skills to the specific company environment.

Research limitations/implications – This research represents a limited number of employer viewpoints in one representative community.

Practical implications – Ongoing industry input into curricula and expanded experiential opportunities may ensure that graduates are prepared to address current and future IT developments. Because the region under study was typical of many regions with growing technology sectors, these findings may inform partnerships, curriculum, and program design.

Originality/value – Given the rapid growth and constant advances of the IT sector, institutions with IT degree programs are challenged to ensure that their curricula are current and meeting the needs of employers. This study's findings may offer timely insight into elements of workforce preparedness.

Keywords Employability, Interviews, Competencies, Industry partnerships, Information technology education, IT curriculum

Paper type Research paper

As an occupational group, computer and information technology (IT) occupations are projected to grow faster than all other occupational groups (US Department of Labor, Bureau of Labor Statistics, 2015). To capitalize on the burgeoning need for skilled IT employees, many two- and four-year colleges and universities have begun offering IT degrees. These degrees can be very impactful: in addition to earning a degree with high employability potential (Khan, 2011; Woodward *et al.*, 2013), IT graduates earn up to 40 percent more over a five-year period when compared to students who complete other technical degrees (Compton *et al.*, 2010).



Because IT is rapidly changing and growing both as a standalone industry and as an embedded workplace service, employers are valuable sources of input for academic and technical curriculum content (Hwang and Soe, 2010) as well as for specific desired employability skills (e.g. applied knowledge, interpersonal communication, and analytical and organizational skills) for career readiness (Crews, 2004; Gordon, 2013; Hunt *et al.*, 2011; Woodward *et al.*, 2013). Because ongoing dialogue between employers and IT educators is essential to ensure that IT curricula remain integral and relevant (Downey *et al.*, 2008) and little research has documented employers' perceptions of new graduates' workplace preparedness (Shah *et al.*, 2015), IT employers were interviewed in the growing technology sector of North Florida and the findings from those discussions are reported here.

Florida's IT industry cluster emerged in support of the nation's space program and was further enhanced by IBM's creation of the personal computer at their labs in Boca Raton in 1981. From these early efforts, Florida's IT industry has matured in such areas as digital media, 3D modeling, virtual simulation, on-demand training, photonics/optics, and mobile technologies. The number and diversity of Florida's IT employers and employees are growing steadily and, although employment remains centered in the more populous southern portions of the state, North Florida's strong educational and research infrastructure have made IT a regional economic engine (Florida Department of Economic Opportunity, 2016; *Forbes*, 2016). This growth has placed North Florida in the nationally recognized technology "talent pipeline" and has established innovative workforce programs, regional educational consortia, and industry partnerships to strengthen its technology sector (Enterprise Florida, 2016). The preparedness of graduates from regional IT programs as new IT technicians entering the workforce is not only an educational and economic priority for the region, but also has the potential to inform workforce policy in similar regions (Kotkin and Schill, 2015).

Our participants addressed the extent of their new IT technicians' readiness and shared their perspectives on necessary curriculum content. These regional IT employers also reported their perceptions of local two- and four-year IT programs' strengths and challenges. This exploration was guided by two main research questions:

- RQ1.* What are the differences between the skills IT employers state they need and the skills their new employees have?
- RQ2.* How do employers recommend that IT program curricula be modified to best meet their specific needs of employers?

By identifying these employability skills – both general and technical competencies – the researchers sought to provide recommendations for IT programs and educators to ensure their curricula harmonize with IT industry needs, which, in turn, will help better prepare IT graduates to enter the workforce and provide regional IT employers with the skilled workforce they need.

Literature review

To ground the study, the researchers explored current conceptions of employability as well as research relating to the educational role of technician training and industry certifications.

Employability skills

Though recent graduates are sometimes unprepared for the technical side of working in IT, they also often lack many employability skills that the IT industry demands (Downey *et al.*, 2008; Lee and Han, 2008; US Department of Education Office of Career and Technical Education, 2016). Hunt *et al.* (2011) concluded, "emerging information technologies are [...] requiring a new breed of IT professional - a person who understands the needs of the business as well as IT" (p. 5). A subset of employability skills, business and behavioral skills, i.e., "soft skills," are

increasingly in demand on par with technical skills (Downey *et al.*, 2008; Lee and Han, 2008). Robert Half Technology (2016a) reported that employers were seeking employees with “a solid mix of technical and soft skills” (p. 20). In particular, they reported that employers were looking for employees who communicated effectively, solved problems, collaborated with others, worked on teams, and thought creatively (Robert Half Technology, 2016a).

Similar trends have observed outside of the USA. A survey of employers in Scotland identified trustworthiness, reliability, motivation, communication skills, and willingness to learn as important transferable skills (McMurray *et al.*, 2016). In Sri Lanka, a survey of employers in software development industry, identified problem-solving, self-confidence, teamwork, learning, and having a positive attitude toward work as important employability skills (Wickramasinghe and Perera, 2010). Overall, employers expected higher levels of problem-solving ability than recent graduates perceived they had or needed (Wickramasinghe and Perera, 2010). Ultimately, personal attitude, employability skills, relevant degree and work experience were the most important factors when hiring new graduates (McMurray *et al.*, 2016).

New professionals' inexperience with employability skills impacts the front line of many workplaces because many end users require intensive support when using new business technologies (McClure *et al.*, 2011; Yellen, 2005). Hoffman (2003) found that the shortage of soft skills such as troubleshooting, communication, and project management has resulted in a “widening gap between a growing demand for and an insufficient supply of workers” (p. 2). In a field that is highly dynamic and places great emphasis on innovation, IT educators have a responsibility to prepare students to thrive in careers, not simply to function in entry-level jobs (Downey *et al.*, 2008). Confounding these issues, the broad and ubiquitous nature of the IT sector includes many specialized areas which, in turn, requires a wide variety of opportunities for new professionals. Computer and IT occupations that require Bachelor's or Associate's degree at the entry-level include computer network architects, computer programmers, computer support specialists, computer systems analysts, database administrators, information security analysts, network and computer system administrators, software developers, and web developers (US Department of Labor and Bureau of Labor Statistics, 2015).

Technician education

Despite their qualified instructors, community colleges are often seen as secondary technical education options for students and employers (Centers of Excellence: Los Rios Community College District *et al.*, 2016; Valley Vision *et al.*, 2016). However, community colleges play important roles in certification, training, and as gateways to four-year degree programs (Bailey *et al.*, 2005; Compton *et al.*, 2010; Laanan *et al.*, 2006). However, their focus on technical skills can underemphasize the soft skills students require for success in the IT industry. Researchers have reported that students majoring in information systems, a discipline closely related to IT, need more exposure to skills, like interpersonal communication and industry understanding during their education (Lee *et al.*, 2002). In order to better understand what improves the employability of IT graduates, this research seeks to explore both the soft and technical competencies that IT employers are looking for in the skill sets of potential new hires.

Industry certifications

While IT certifications supplement or are an alternative to formal IT education for prospective, Randall and Zirkle (2005) reported that formal institutions have not adequately tracked the data needed to assess the effectiveness of certification programs; this lack of data is important because the type of certification and level of education of the student may impact the usefulness of a particular certification. For example, IT workers with post-secondary levels of education tend to benefit more from certifications because they have a theoretical

foundation from which to base problem-solving and thus are more marketable and have higher chances for long-term career success as compared to high school graduates with IT certifications (Randall and Zirkle, 2005). Similarly, high school graduates with vendor specific certifications may actually be more disadvantaged in the workplace because they may not understand the fundamental concepts that underlie the design, use, and purposes of the technology itself (Randall and Zirkle, 2005).

The balance between technical and soft skills, the delivery of technician education, and the value of certifications are complex and pivotal issues in IT student readiness. Our interviews explored the IT employers' perspectives to shed insight on establishing and improving student career pathways.

Method

Semi-structured interviews with a purposive sample of IT employers and hiring managers who are responsible for recruiting and hiring IT staff in North Florida were conducted. Prior to the interviews, basic demographic information about the interviewees and created basic profiles of their business were collected. Table I provides an overview of participants ($N = 18$).

As Table I suggests, most participants ($n = 8$) were from the IT sector and because the state capital's location is North Florida, four participants represented state government. The remaining participants ($n = 6$) were evenly distributed across the engineering and manufacturing, financial and healthcare sectors. Verbatim excerpts from interviews with 12 of the 18 participants were included.

Data collection and analysis

The interview questions featured in Appendix 1 were pre-tested and revised. All interviews were conducted by phone, recorded, and transcribed.

Two members of the research team manually coded the interview transcripts using a codebook derived from the Competencies Model for IT Program Management (US Office of Personnel Management, 2011), and the Florida Career and Technical Education (CTE) IT Frameworks (Florida Department of Education, 2013). The US OPM model represents expected industry competencies; the CTE standards are the basis for two and four-year college curriculum in Florida. The resulting combined codebook, included in Table AI, captures educational and industry competencies and their component knowledge, skills, abilities, and other factors (Dirkx *et al.*, 2004; Miller and Dettori, 2008). As Table AI shows, the combined codebook included 13 general competencies, such as communication and self-management, and 14 technical competencies, including knowledge of operating systems, coding, and other related technical skills. As data analysis proceeded, the research team identified emerging themes and created codes for them, as noted in Table AI.

To ensure reliability and validity of the coding results, the two coders continually compared their coding, discussed discrepancies, and made adjustments until consensus.

Industry sector	Participants (n)	Quoted participant pseudonym
IT consulting and services	8	James, Ellis, Kendall, Lester, Vern
Government	4	Paul, Andrew, Casper
Engineering and manufacturing	2	
Financial	2	Gerry, Robert
Healthcare	2	Landon, Carl

Note: $n = 18$

Table I.
Description of
participants

Limitations

The study's limitations stem from its qualitative nature and use of interview data. Despite the researchers' attempts to ensure transparency and replicability by providing codebooks and interview questions in this research report, interview research quality is heavily dependent on the individual skills of the researchers and can be more easily influenced by the researchers' personal biases and idiosyncrasies (Lewis-Beck *et al.*, 2004). As mentioned above, continual coding comparisons were used to ensure reliability and validity of the analysis and findings. Given the project's relatively small sample size drawn from North Florida, study findings may not be generalizable; however, IT employers in other areas may share similar experiences and opinions. In particular, areas with growing IT sectors and regional institutions that offer two- and four-year IT degree programs may identify similar emerging trends.

Findings

This section reports findings from coded interviews complemented with substantiating participant verbatim.

Skills and competencies

During their interviews, employers mentioned specific skills and competencies 296 times. Table II summarizes employers' desired skills, with mentions of interpersonal skills ($n = 57$), self-management ($n = 55$), and professional learning (49) most frequent. The least frequently mentioned skills included flexibility ($n = 4$) and compliance ($n = 2$). No participants mentioned teaching others as a desired skill.

When asked to expand on their desired skills, employers strongly emphasized that they sought well-rounded individuals who understood the interpersonal "soft" side of an IT job as well as the technical side. Professionalism, self-management, and patience were cited as important parts of customer service, as Landon stated, "People skills are a must. They have to be able to present themselves in a clean, respectable manner and be patient." Another employer, Ellis echoed this requirement, "They have to have good human skills, you know?"

Landon expanded on his above thoughts and remarked on the difficulty employers' face when cultivating soft skills. Landon continued, "[G]iven enough time you can teach anybody anything, but people skills, I think that starts from early on and that's what we kind of look for in our recruiting and our hiring process." Interpersonal skills are not only valuable for providing customer service, but also peers in the industry, as James mentioned, "[O]ur employees need to

General competency	Mentions (N)
Interpersonal skills	57
Self-management	55
Professional learning	49
Oral communication	29
Problem solving	22
Customer service	21
Writing	18
Reading comprehension	16
Accountability	12
Teamwork collaboration	11
Flexibility	4
Compliance	2
Teaching others	0
Total	296

Table II.
Employers' desired
general competencies

...speak well to their customers and also of the industry as a whole. We're one of the leaders in the industry, so people look towards our company for speaking events and that type of thing." Interpersonal skills are complemented with oral and written skills, as Gerry stated, "Communication skills, writing skills, those are all very much important."

Technical competencies

Technical competencies were mentioned 233 times across the 18 interviews. Of the technical competencies detailed in Table AI, infrastructure design (49), IT architecture (46), operations support (38), configuration management (33) and data management (26) were the most frequently mentioned skill sets. Notably, the remaining technical competencies were less emphasized, accounting for less than 7 percent or less of the codes.

While all 18 of the employers interviewed mentioned technical competencies, as Table III suggests, certain technical skills sets were mentioned more than others. In describing the types of technical competencies and their importance, multiple technical competencies and related skills sets were often mentioned together, demonstrating the breadth and depth of knowledge expected of IT professionals by their employers. For example, in describing the sorts of skills needed for infrastructure design and IT architecture, employers described skills ranging from very basic to highly advanced levels of knowledge. Gerry, an employer in the financial industry based in a metropolitan area, stated, "As far as network skills, just basics [...] what we require them to do is just be able to open a port, close a port, on our network switch." Other employers required more in-depth knowledge from potential recruits:

- Ellis: "We do have a networking group that does require those skills because we do sell not only the mainframes and the peripherals, but we also sell solutions that would involve- they could involve- redoing the WiFi capability of a business or setting up a high speed internet connection to be redundant or a disaster recovery site."
- Paul: "[T]he role is primarily in setting up networks, software applications, servers, assisting faculty, and with new equipment, connecting new equipment to networks, providing technical support, when something goes wrong on a network or on an individual PC, whether it be a notebook, or a smartphone."
- Andrew: "[I]t's very important very important for a graduate to have some idea of what an ISDM is. An ISDM is an information system development methodology. The ISDM is different with every organization but it still relates back to the same—it's how you build something in IT."

Technical competencies	Mentions (N)
Infrastructure design	49
Information technology architecture	46
Operations support	38
Configuration management	33
Data management	26
Technology awareness	17
Information systems network security	16
Project management	10
Compliance	7
Information management	5
Information technology performance assessment	2
Product evaluation	2
Employers' desired technical competencies	2
Systems testing and evaluation	2
Total	233

Table III. Employers' desired technical competencies

These comments suggest that designing and managing networks and providing technical support for a variety of technologies and devices are all interconnected parts of the overall services and knowledge expected of IT professionals.

Certifications

Participants mentioned that they required or preferred industry certifications 62 times. Microsoft ($n=13$) and A+ certifications ($n=10$) were the most frequently cited certifications while 18 other certifications were infrequently mentioned six or fewer times.

In the interviews, several of the employers ($n=10$) mentioned that certifications were seen as a plus, but not necessarily a requirement for IT jobs in their companies. Carl's comment captured the nine other employers' opinions:

Credentials are always a bonus, experience though also to me tells me you've been there, done that. And it depends on how much experience you have. See you have to weigh experience versus credentials. You know somebody can come out of college with 50 certifications but give me some real life when you've acquired that, that knowledge.

Two employers stated that certifications were a mandatory requirement for their IT employees. However, only one of these employers believed that IT programs should focus more on helping students earn such certifications. In reflecting on this issue, Robert mentioned that for inexperienced workers, certifications can "open a lot of doors of opportunity." Other participants agreed that aside from documenting technical knowledge, certifications demonstrated an IT professional's commitment.

Emerging themes

In addition to the themes included in the codebook, the participants frequently mentioned several other topics ($N=220$), with experiential learning ($n=129$) and industry partnerships ($n=48$) being most frequently mentioned. Employers also mentioned the importance of computer coding and programming knowledge ($n=22$) as well as a grasp of business fundamentals ($n=21$).

Experiential learning. Comments relating to experiential learning described the importance of on the job training, internships, work experience, service experience, and other hands-on opportunities. Employers viewed real-world and hands-on experience as an important factor when looking at potential IT employee:

- Kendall: "I think that to have a internship program, or [...] where [...] students could work with their related field and, and get some hands-on knowledge would be beneficial for them down the road."
- Lester: "So it'd be nice if they had [...] a little more hands on, like with technology that's actually being used."
- Robert: "It goes beyond academics. It's got to be real world application."

Four employers mentioned that experience was interchangeable or equivalent in value with a degree if an applicant did not have a degree. The employers explained how internships are valuable for recent graduates on the job market:

- James: "Internships are key. If you want a technology job right out of college, you already have the education leg of the stool, in school you can get a certification leg of the stool, so really the third leg that you're missing is experience and I think that that there's nothing more valuable than a good internship or any internship after you graduate or even during school in order to land a job."
- Robert: "I strongly recommend-and don't wait until your last term in school to do this- an internship."

James also placed a high level of importance for internships, and continued on to say, “It just ought to be mandatory to get some type of internship.” and “[...] if they could push harder on internships to get more experience for jobs.”

Industry partnerships. Several employers believed that community college IT programs lacked the practical skills students needed for jobs in the industry. Employers specifically mentioned seeing a disparity between what schools are teaching and what they, as employers, were looking for in terms of content. They believed that the curriculum was “outdated” and out of touch with the industry. As Robert summarized, “So, essentially, what you teach in college is right, but sometimes, I wish colleges were more on the leading edge instead of industry – you kind of lag [behind] what we do.”

However, Vern acknowledged that it was difficult for curricula and educators to remain current with technological trends. When asked if he expected new graduates to be proficient in all of the latest technologies, as Vern simply stated: “No they can’t be. No I don’t think they could be. I think the technologies move faster than the curriculum can change.”

In a related way, Robert and Ellis mentioned graduates often had more generalized skill sets rather than more specialized knowledge and experience:

- Robert: “We haven’t hired anybody new [who] didn’t have a lot of years of experience because we’re looking for specialized skill sets that you don’t typically get in college. I hate to say it like that, but that’s what we’ve seen.”
- Ellis: “Far as IT goes, we get generalists. We get people that have, you know, maybe they came from Computer Science, and they’ll have more of a programming background and less about how to create webpages, let’s just say for example. But from the employer standpoint, they’re still a generalist. They’ve got, you know, book learning about real-world stuff I’m not saying every class ignores the outside. That’s not true; we know that. But what we need is we need a specialist- we don’t need a generalist; we need a specialist in a particular product. So that’s kind of the rub there, right? I mean, in academia, you really don’t want, at least in my mind, I wouldn’t want to just teach to a certain product because I’m pretty much a shill for the company creating the product, right? I’m just part of the corporation. In my opinion, the educator should be surveying the most popular products, and- software products and applications that people use when they get- when they graduate and making sure that that’s part of the curriculum.”

While some employers would prefer to see new professionals and graduates with more specialized skill sets, many of the participants ($n = 11$) mentioned a desire to establish and improve industry partnerships with universities and community colleges so that they could offer internships or supply guest “expert” speakers to visit classes:

- Robert: “I think that more of these community councils, advisory councils should [...] be at every university, every college.”
- Vern: “If there [were] a way for us to work more with the universities so that they understand what activities the candidate is going to be engaged in, then that would produce a better person for us.”
- Casper: “We need more guest speakers at the community colleges and universities where experienced people both young and old come in and uh talk to the students.”

Discussion

Our findings provided preliminary answers to the research questions:

- RQ1.* What are the differences between the skills IT employers state they need and the skills their new employees have?

Many researchers (e.g. Crews, 2004; Gordon, 2013; Hunt *et al.*, 2011; Woodward *et al.*, 2013) have suggested that IT employers seek employees who have employability skills equal to or beyond their technical expertise. Many of our participants mentioned that recent graduates were lacking needed both technical and general skills, but tended to have a better grasp of soft skills and general competencies than the technical skills. Our participants expected new hires to have interpersonal skills to work with their peers as well as with clients and self-management skills to complete work on time and without supervision. Some of the employers also emphasized the importance of ongoing professional learning, in relation to all job skills; our participants expected new hires to invest time learning the responsibilities and skills needed for their position and to fit into the workplace.

While employers emphasized soft skills more often than technical skills, some employers wanted to hire specialized IT professionals. Other researchers have reported similar findings. For example, in the Sacramento Capitol Region, an area not unlike North Florida, employers were looking for individuals in specialized areas like cybersecurity and data science (Valley Vision *et al.*, 2016) and noted that this specialized knowledge could be gained through internships or on the job training, but suggested it would be beneficial if recent graduates specialized their skill sets during their education. This theme has been expressed by employers in other industries and regions as well. For example, employers in the retail and hospitality industries also expressed a need for more industry-specific skills and knowledge in vocational education and training programs in Australia (Smith and Brennan Kemmis, 2010). This finding is consistent with related studies of employers' perceptions of internship value (e.g. Gault *et al.*, 2010). Researchers (McMurray *et al.*, 2016; Wickramasinghe and Perera, 2010) have reported that employers throughout the world valued a blend of broad and focused technical skills; similarly, employers in North Florida sought specific technical skill sets, such as infrastructure design and information architecture, in addition to more general technical competencies such as operations support and configuration management.

While certifications may seem like a specialization route, our findings indicated that certifications were not a requirement for many positions. This finding is in line with existing research (Anderson *et al.*, 2005; Benham, 2006; Rob and Roy, 2013) that documents that certifications were infrequently mentioned in job postings, and that employers preferred a blend of formal education and experience. Cegliecki and Hall (2009) as well as Hunsinger and Smith (2009) found that human resources professionals valued IT certifications more than IT professionals did in the hiring process; IT professionals do not necessarily see a direct relationship between an IT certification and specific job skills. That said, IT employers did identify a number of certifications, such as Microsoft, A+, and Security+ as being a preferred, but not necessary, requirement for hiring. However, in a much larger metropolitan area (Sacramento), Robert Half Technology (2016a) found that employers often required relevant certifications for positions, such as Cisco (CCNA and CCNP), Microsoft (MCP and MCITP), project management (PMP), security (CISSP), and virtualization (VCP) certifications (Robert Half Technology, 2016a). This comparison suggests that employers in larger markets may be able to tailor their hiring more precisely to their needs.

Emerging themes related to this research question included employers' desire for hires with coding and programming skills as well as business fundamentals knowledge. These emerging themes are significant because they suggest that employers are interested in hiring IT professionals with skills to create and implement solutions tailored to a dynamic, collaborative business and workplace culture:

RQ2. How do employers recommend that IT program curricula be modified to best meet their specific needs of employers?

Experiential learning opportunities, such as internships, were often identified as effective ways for students to gain much needed hands-on experience. Vairis *et al.* (2013)

also found that internships allowed students to increase their employability by gaining hands-on experience with the technical skills; our participants also valued internships because they provided direct experience and exposure to current industry technologies (Galloway *et al.*, 2014); our participants also reported that they perceived internships as sources of exposure to the newest technologies beyond those IT program coursework could facilitate.

Other researchers (e.g. Shoenfelt *et al.*, 2013; Vairis *et al.*, 2013) found that in addition to enhancing technical skills, internships provided students with opportunities to develop career goals and to determine fit for particular jobs. Researchers (e.g. Galloway *et al.*, 2014; Ralevich and Martinovic, 2010; Venables and Tan, 2009) reported that internships gave students the chance to develop soft skills in a workplace environment and that student interns often offered fresh perspectives and were likely to be familiar with the latest technologies (Galloway *et al.*, 2014). Our participants did not express the value of internships in this way: while several employers stressed the importance of soft skills at various points in their interviews, these skills were not explicitly linked with internship or experiential learning experiences.

The findings suggest that internships and other experiential learning opportunities are important parts of IT career student pathways, but that there is no consensus on why they are valuable. As IT employers seek increasingly specialized new IT professionals and prefer applicants with both soft skills and internship experience when making hiring decisions, IT curricula should be adjusted to incorporate more experiential learning opportunities, such as internships and apprenticeships, into the requirements of their respective programs. Ralevich and Martinovic (2010) also found that academic institutions that offered internship opportunities are well positioned to offer a curriculum that meets the needs of the IT industry. Recent graduates with internship experience may require less training after they are hired to acclimated to the specialized systems and technologies, especially if graduates are hired by their internship site. Gault *et al.* (2010) reported that even interns with average performance levels were more likely to obtain offers for full-time employment than those without internship experience. However, the potential for experiential learning opportunities to develop and promote soft skills should be further explored.

Denning (2001) suggested that the instruction in IT programs that focuses on professional practices should follow an apprentice-master relationship between learners and educators, where faculty should be “competent both as presenters and coaches” and called for increased collaborations between universities and businesses (p. 22). Kenyon (2005) found that apprenticeships also provide numerous benefits to the host companies, such as increased workforce diversity, retention of staff, productivity, profits, work quality, and lower costs across nine case studies of small companies in the UK. Kenyon’s (2005) findings may help to explain why employers value experiential learning.

Gault *et al.* (2010) also found that employers were more receptive to internship programs when the interns performed at higher levels. Fuller *et al.* (2005) suggested that apprenticeship programs offered more possible opportunities for new workers to explore non-traditional occupations based on their gender; institutions offering IT degree programs should strengthen existing partnerships with employers and continue to build new relationships with other employers in order to provide experiential learning opportunities, such as internships, service learning, volunteering, and apprenticeships that, in turn, may produce a more diverse and prepared workforce.

Areas of future research

In addition to providing insight on the research questions, further research should investigate a larger number of employers in a range of regions, industries, and locales. The findings

presented in this study have identified a number of additional areas and topics for future research including:

- (1) What are the best practices for building partnerships between two and four-year IT programs and industries to provide up-to-date curriculum and experiential learning opportunities? How should these practices be tailored to region or locale (urban, rural)?
- (2) How can IT programs in two- and four-year institutions maximize certifications or other specialization opportunities to attract and retain students beyond a general IT degree or major?
- (3) How can soft skills be effectively integrated into the IT curriculum?
- (4) How can experiential learning experiences be leveraged to develop and promote soft skills?
- (5) What applications do employers foresee for a workforce with coding and programming skills? To what extent is this emerging desired skill interrelated with soft skills and experiential learning?

Finally, as technology skills can be a pervasive general job skill, the question remains as to the basic level of technical literacy required in increasingly technology-driven jobs.

Conclusion

North Florida is a region with a growing IT industry and a great need for a skilled workforce; this region is typical of many across the country, outside of major urban hubs, that are building economic momentum through technology and innovation. Like these similar regions, North Florida is continually challenged to grow and maintain a skilled IT workforce. In this study, researchers interviewed employers in the growing North Florida technology sector in an attempt to understand IT employers' perceptions of the skills they seek in recent graduates from two-year community college IT programs. Overall, employers had mixed opinions on the readiness of recent graduates, but often mentioned the importance of soft skills and the helpfulness of experiential learning opportunities, such as internships, to help students and graduates to more fully develop their knowledge and skills before entering the job market. Employers are looking for candidates with soft skills, more specialized technical skills, and, preferably, hands-on experience in the workplace. IT employers suggest that partnerships with industry will help institutions offering IT degree programs to better prepare their students for the workforce.

Ultimately, IT employers, not human resource professionals, determine IT graduates' employability. Therefore, IT employers' perceptions of their needs and of prospective hires' qualifications are an important part of assessing current and future directions for IT degree programs.

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Appendix 1. Interview questions and probes

- (1) Tell me a little about yourself
 - Your job position
 - Time with your current employer?
 - Work experience and educational background
 - Membership in professional associations related to information technology (IT) and/or human resources (HR)?
- (2) Can you tell me a little about your organization?
 - Products and services your organization offers?
 - Organization size (no. of employees, revenue range, no. of locations)
 - Public/private status (public, private, non-profit, government)
 - Position types within the organization (industry-specific)

- How external and internal IT is obtained. If external, please describe.
 - Broadband availability
 - IT/broadband positions have been posted and filled over the past year
- (3) Can you tell me about the role of IT in your organization?
- Role of IT in the organization
 - Roles of entry-level IT computer support and network technicians
 - Need for technicians to have broadband network skills
 - Role of IT education and training in the employee promotion process
 - Typical career path for an IT employee in your organization
 - Professional development is required by the IT employee (e.g. on the job training and development, certifications)
 - How do you think IT technicians learn skills outside of formal education?
 - How does widespread broadband deployment affect needed IT technician skills?
- (4) Describe the recruiting, selection and hiring process of your organization.
- Methods and sources to recruit entry-level IT technicians? Which are most successful?
 - Process for preparing recruitment materials, position description announcements
 - Qualifications or competencies sought for entry-level IT. Verify proficiency?
 - Minimum level of education preferred or required
 - Industry certifications used in hiring and promotions
 - Employment policy and rules that influence the hiring process?
- (5) Can you tell me a little bit about the schools in your area?
- Perception of community colleges
 - Knowledge of local community colleges' IT programs?
 - Experiences with local community colleges (e.g. recruiting, internships, volunteering, personal experience)
 - Describe organization's interaction with local college and community.
- (6) Describe your view of the available pool of job applicants.
- How well local schools preparing students for organization's IT technician positions?
 - Valuable of the community college IT credentials
 - Suggestions to improve the education and training at local colleges

Technical competency	Definition
Coding/programming ^a	Fundamental data structures Fundamental programming constructs Object-oriented programming Algorithms and problem-solving Event-driven programming Intersystems communications Data mapping and exchange Integrative coding Scripting technologies Software security practices Miscellaneous issues Overview of programming languages
Compliance	Knowledge of procedures for assessing, evaluating, and monitoring programs or projects for compliance with laws, regulations, and guidance
Configuration management	Knowledge of the principles and methods for planning or managing the implementation, update, or integration of information systems components
Data management	Knowledge of the principles, procedures, and tools of data management, such as modeling techniques, data backup, data recovery, data dictionaries, data warehousing, data mining, data disposal, and data standardization processes
Information management	Identifies a need for and knows where or how to gather information; organizes and maintains information or information management systems
Information systems and network security	Knowledge of methods, tools, and procedures, including development of information security plans, to prevent information systems vulnerabilities, and provide or restore security of information systems and network services
Information technology architecture	Knowledge of architectural methodologies used in the design and development of information systems, including the physical structure of a system's internal operations and interactions with other systems
Information technology performance assessment	Knowledge of the principles, methods, and tools (e.g. surveys, system performance measures) to assess the effectiveness and practicality of information technology systems
Infrastructure design	Knowledge of the architecture and typology of software, hardware, networks, and telecommunications systems, components and protocols, and standards, and how they operate and integrate with one another and with associated controlling software
Operations support	Knowledge of procedures to ensure production or delivery of products and services, including tools and mechanisms for distributing new or enhanced software
Product evaluation	Knowledge of methods for researching and analyzing external products to determine their potential for meeting organizational standards and business needs
Project management	Knowledge of the principles, methods, or tools for developing, scheduling, coordinating, and managing projects and resources, including monitoring and inspecting costs, work, and contractor performance
Systems testing and evaluation	Knowledge of principles, methods, and tools for analyzing and developing systems testing and evaluation procedures and technical characteristics of IT systems, including identifying critical operational issues
Technology awareness	Knowledge of developments and new applications of information technology, emerging technologies, and their applications to business processes, and applications and implementation of information systems to meet organizational requirements
General competencies	Conceptual definition
Accountability	Holds self and others answerable for measurable high-quality, timely, and cost-effective results. Determines objectives, sets priorities, and delegates work. Accepts responsibility for mistakes; professional ethical issues and responsibility

Table A1.
Technical and general
competencies
codebook

(continued)

Business fundamentals ^a	Social context of computing Organizational context History of computing
Compliance	Knowledge of procedures for assessing, evaluating, and monitoring programs or projects for compliance, regulations, and guidance
Customer service	Works with clients and customers to assess their needs, provide information or assistance, resolve their problems, or satisfy their expectations; knows about available products and services; is committed to providing quality products and services
Flexibility	Is open to change and new information; adapts behavior or work methods in response to new information, changing conditions, or unexpected obstacles; effectively deals with ambiguity
Experiential Learning ^a	Characteristics of experiential learning include active learning, student-based perspectives, subjective experiences, personal growth, participative learning that includes evaluation and reflection (Kolb, 1983). "Programs [...] designed to expand the setting of learning experiences beyond the traditional school environment to occupational and community settings and these programs use planned experiences [...] to promote cooperation between traditional educational institutions and business, industry, labor, government, and community groups to support learning (Miller, 1982, p. 3).
Industry partnerships ^a	Collaborative effort between industry representatives and program developers to make curriculum better, produce more internships, etc.
Interpersonal skills	Shows understanding, friendliness, courtesy, tact, empathy, concern, and politeness to others; may include effectively dealing with individuals who are difficult, hostile, or distressed; relates well to people from varied backgrounds and different situations; is sensitive to cultural diversity, race, gender, disabilities, and other individual differences
Learning (professional)	Ability to research, acquire, update, and apply new and relevant knowledge and skills quickly; uses training, feedback, or other opportunities for self-learning and development
Oral communication	Expresses information to individuals or groups effectively, taking into account the audience and nature of the information; makes clear and convincing oral presentations; listens to others, attends to nonverbal cues, and responds appropriately
Problem solving	Identifies problems; assess accuracy and relevance of information; uses sound judgment to generate and evaluate alternatives, and to make recommendations
Reading comprehension	Understands and interprets written material, including technical material, rules, regulations, instructions, reports, charts, graphs, or tables; applies what is learned from written material to specific situations
Self-management	Sets well-defined and realistic personal goals for themselves; displays a high level of initiative, effort, and commitment toward completing assignments in a timely manner; works with minimal supervision; is motivated to achieve; demonstrates responsible behavior; multi-tasking; time-management; stress management; remain positive, proactive; professionalism
Teaching others	Helps others learn through formal or informal methods; identifies training needs; provides constructive feedback; coaches others on how to perform tasks
Teamwork and collaboration	Encourages and facilitates cooperation, pride, trust, and group identity; fosters commitment and team spirit; works with others to achieve goals
Writing	Recognizes and uses correct grammar, punctuation, and spelling; communicates information in a succinct and organized manner; produces written information appropriate for the intended audience; ability to document procedures, policies, and infrastructure in a detailed manner

Note: ^aEmergent

Table AI.

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