IT's Academic

From emerging IT degree programs to new approaches to technical education, IT has found its place in academia

TEGAN JONES, DANIEL MARGOLIS, BEN WARDEN & KELLYE WHITNEY

Sixteen years ago, the Rochester Institute of Technology (RIT) became the first school in North America to offer a four-year degree program in something called information technology. This ground-breaking program moved away from the theoretical base of traditional computer science curricula, focusing instead on the applied aspects of computing. Although RIT's program was a great success, it was almost a decade before other schools began to follow suit.

These early programs at schools such as Brigham Young University (BYU), Georgia Southern University (GSU) and Purdue University all emerged with the same purpose in mind: prepare graduates to fill a quickly growing hole in the computing job market.

As companies began relying on the Internet and corporate networks to meet more of their organizational needs, employing computer specialists who could manage and integrate network systems became a business requirement, said Dr. Han Reichgelt, associate dean of the GSU College of Information Technology.

"Most of the students who came out of the computer science programs were very good when it came to taking on programming positions but did not necessarily know how to keep a network up and running — same thing for students out of information systems programs," he said. "So, in that particular area, there was a need to be filled."

Despite the downturn in the IT market during the early part of the decade, students have responded to this need by overwhelmingly choosing IT programs over their computer science counterparts.

IN FOCUS: TECHNOLOGY, INNOVATION AT THE UNIVERSITY OF ILLINOIS-URBANA CHAMPAIGN

IT often falls into two categories. First, there are the technology-based business solutions companies build to make work easier, faster and more accessible. These solutions must be fixed when they break, maintained when they do well and routinely upgraded to keep up with the rapidly and continually changing requirements of the business world.

Second, there's the fun side of IT. This includes the technical games that can be used for learning, entertainment or both, as well as those innovative, often revolutionary and well-timed creations that change the IT landscape.

Consider the University of Illinois-Urbana Champaign (U of I). Arguably the start-up or breeding ground for some of the most well-known IT projects and brands in the world, U of I was the postsecondary academic home to notable IT innovators, including 2004 alumnus and co-founder of YouTube Jawed Karim, as well as fellow co-founder Steven Chen.

The world of academia always has been a breeding ground for innovation. Marc Andreessen, co-founder of Internet browser Netscape, graduated from U of I in 1993. Andreessen is the chairman and co-founder of Opsware Inc., an IT data and process automation software company. On the lighter — but no less creative — side, Ed Boon graduated from U of I in 1986 with a bachelor's in math and computer science, and he went on to create the popular video game "Mortal Kombat."

U of I has sheltered and helped produce many other IT students who went on to contribute significantly to the tech industry. Lawrence Ellison, founder of Oracle Corp., dropped out of the school, but Oracle co-founder Bob Miner completed a bachelor's degree in mathematics in 1963. Tom Siebel, founder of Siebel Systems, which Oracle later bought for several billion dollars,

earned a bachelor's degree in history in 1975, an MBA in 1983 and a master's degree in computer science in 1985.

Ray Ozzie, creator of Lotus Notes, earned a bachelor's degree in computer science in 1979, and Max Levchin, co-founder of PayPal, earned a bachelor's in computer science in 1997. Michael Stern Hart, founder of Project Gutenberg, which converts books in the public domain into electronic text files that can be displayed on almost any computer, earned a bachelor's degree of science in a U of I independent-study program in 1973.

The list goes on and on.

Hot on the heels of YouTube, U of I alumni Jeremy Stoppelman and Russel Simmons founded Yelp.com, which is marketed as the first online service to combine social networking with personal reviews, critiques and a five-star rating scale for shopping, hotels, night life, restaurants and more. Yelp users also can create profiles, add photo albums, send and receive messages and make friends with common interests.

U of I's record for innovation isn't solely the providence of the student body, however. Former professors Donald Bitzer and Gene Slottow received the 2003 Emmy Award in Technical Achievement for inventing the plasma display in 1964, the precursor to today's high-definition plasma TVs.

There are many who debate the value of academic training for those interested in pursuing an IT career.

Some say it's hands-on experience that counts in the real world. Others say the combination of theory and application available in academic IT settings is equally, if not more, valuable.

The real answer to that issue is an individual one, but academia can't be all bad — just look at this short list of people who went to college and later went on to literally change the world.

– Kellye Whitney, kwhitney@certmag.com

IN FOCUS: COMBINING CERTIFICATIONS, DEGREES ONLINE AT WESTERN GOVERNORS UNIVERSITY

RUKI JAYARAMAN

The demand for talented, competent information technology professionals is tremendous. Whether someone is a seasoned IT pro or a newcomer interested in breaking into the field, today's employers expect employees to possess superior IT skills and industry certifications, as well as a degree.

At Western Governors University (WGU), an online, competency-based university, bachelor's degrees incorporate up to nine industry certifications into a student's degree program. These can include Certified Internet Web (CIW) Associates, CIW Professional, Microsoft Certified Systems Engineer (MCSE), CompTIA A+, CompTIA Security+, CompTIA Project+, CompTIA Networks+, Sun Microsystems Certified Associates, Sun Microsystems Certified Programmer and Oracle Certified Associates.

If students pass the certification exams used to measure competency, they get a dual benefit — they demonstrate their competency toward their degree, and they often walk away with an industry IT certification.

WGU also offers many certification exams that don't necessarily lead to a certification. Rather, students might need additional exams to complete a full certification.

WGU offers six bachelor's degrees in IT: information technology, networks administration emphasis, networks design and management emphasis, databases emphasis, security emphasis and software emphasis. It also offers an MBA in IT management.

WGU's degrees are based on demonstrated competency, measuring learning rather than time or class credits. The programs are created based on the recommendations of WGU's IT Council, as well as educational standards suggested by the Association for Computing Machinery/Institute of Electrical & Electronics Engineers (ACM/IEEE) and the accrediting bodies.

From these three arenas, WGU develops its degrees so students will demonstrate competencies deemed appropriate for the respective degree programs. Course competency units are determined by the rigor of the competencies students are expected to demonstrate.

WGU's degree programs are designed to fit the schedules of adult learners. If a potential student already holds a major IT certification or possesses considerable IT knowledge, that person can obtain a degree even faster.

WGU mentors help develop a customized academic action plan for all students, which allows them to accelerate through what they already know and progress at the best possible learning speed.

For more information about WGU and its competency-based online degree programs, visit http://www.wgu.edu/online_it_degrees/programs.asp.

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At GSU, for example, about 400 students have declared a major in IT, whereas only about 180 students have enrolled as computer science majors. Reichgelt said this popularity could correspond to the major's stress on application, as well as its lack of theoretical requirements.

"It seems to provide a focus on technology, which many of these students are really interested in, without forcing them to go into the various theoretical foundations of the technology," he said. "In general, IT programs require far less mathematics than computer science programs, and many students, whether we like it or not, simply don't like doing a bunch of math courses."

Instead, the courses generally focus on hands-on skills students can use on the job. Initially, students were offered a limited range of courses in network administration, Web technologies and systems integration, but in more recent years, many schools have expanded their IT curriculum to include an emphasis on security, storage and information assurance.

Reichgelt expects to see future programs focus on IT infrastructure, with courses that teach students how to integrate applications, platforms and machines, as well as technology acquisition.

Joseph Ekstrom, an associate professor at BYU, said the future also will bring more specialization, as students begin to learn IT skills earlier, and the needs of companies get more complex. He said he expects to see an increase in research focused on network deployment and new techniques to deliver systems to the end-user.

"Things have specialized to the point where the field is just too large for one four-year degree, so there's more and more of them," Ekstrom said. "IT is specializing."

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International Students in IT

How important are international students to IT in the United States? So much so that no less a figure in IT development than Bill Gates went before Congress in March to advocate reforming the nation's schools and immigration laws to keep IT jobs from going overseas.

"The U.S. cannot maintain its economic leadership unless our workforce consists of people who have the knowledge and skills needed to drive innovation," Gates told the U.S. Senate Committee on Health, Education, Labor and Pensions.

A central issue here is H-1B, a nonimmigrant visa category that allows American universities and companies to temporarily employ foreign workers who have the equivalent of a U.S. bachelor's degree. This allows immigrants to be employed in the United States in a "specialty occupation" for three to six years.

Computer programming qualifies as such a specialty. Therefore, the H-1B provides technical universities and companies with a pool of highly skilled students and professionals from which to draw.

IN FOCUS: CAPELLA UNIVERSITY'S APPROACH TO THE TRAINING VS. DEGREE DEBATE

KURT R. LINBURG, PH.D.

Since 2001, Capella University has bridged the gap between industry certifications and educational degree programs. When Capella faculty members develop IT degree programs, they incorporate competencies associated with leading IT certifications into the overall curriculum as a subset of the total program outcomes.

For students just learning about IT, they can prepare to take one or more certification exams before graduating with their bachelor's degree.

In addition, students with strong IT skills, a bachelor's degree and gold-standard certifications potentially can obtain graduate-level credit for the competencies they have obtained with their certification and associated work experience.

Capella's bachelor's degree in IT program strives to have outcome-based learning. In each course, learners prepare projects that apply their skills, knowledge and comprehension.

For a master's degree in IT, an outcome-based learning experience is incorporated, but courses also are designed to include opportunities for learners to analyze and synthesize their new skills and knowledge to develop individualized end-of-course projects.

Within Capella's doctorate in IT program, learners are challenged to conduct independent research that expands the body of knowledge associated with information technology.

Training vs. Degrees

There are times when training is a better option than formal education, and there are times when formal education is a better option than training. There are also times when it is appropriate to concurrently pursue formal education and training. The following section presents some scenarios to help clarify the potential opportunities for training and education.

- ***Sam Needs a Job in a Hurry***
  Sam has never liked school. He will be graduating from high school in the Minneapolis/St. Paul area, but he has no desire to go to college. He has always enjoyed computers and already has set up a LAN in his parents' basement. Sam is interested in working as a network administrator for a midsize company in the area. Sam enjoys working with technical things and solving problems.

  Recommendation: Although Sam might be stuck in an entry-level job without a degree, at 18, he is interested only in making good money. Sam could pursue one or more industry certifications such as the Cisco Certified Network Associate certification and be a welcome addition to many organizations in the Minneapolis/St. Paul area.

- ***Susan Needs a Better Career***
  Susan obtained an associate degree in applied science at 25. For the last 10 years, she has been testing software applications. Most of her training has been gained on the job, but she has taken and passed two Microsoft certifications. Unfortunately, she has hit the top of the technician pay scale at her job. For the last five years, she has seen other people get promoted to higher-paying jobs. She could see that these people were less qualified than her. The only difference between her qualifications and theirs was a bachelor's degree.

  Recommendation: Susan could pursue a bachelor's degree in IT and work with her faculty to assess her prior learning to determine whether she could get credit for one or more courses.

- ***Stan Needs a Better Job***
  Stan graduated 10 years ago with a bachelor's degree in music. Since then, he has been a high school music instructor. Stan and his wife are having trouble paying their bills on his salary. Part of the problem is that Stan works in a high-tech area of San Jose, Calif. He is frustrated at the high cost of living in the area and is contemplating leaving teaching. He is very knowledgeable about computers and has incorporated advanced musical instrument digital interface (MIDI) and digitally enhanced technologies in his classroom. He loves technology and music.

  Recommendation: Stan could pursue a master's degree in IT and move into a higher-paying job as a software developer. He could also use his master's degree to teach part-time or be involved in corporate training.

- ***Linda Needs to Retool Her IT Skills***
  Linda is a 45-year-old common business-oriented language (COBOL) programmer in the insurance industry. She has a bachelor's degree in computer science. She is considered an expert in her department and always has been well-paid during her 20 years with her employer. She has heard rumors her company might merge with a much larger corporation. Linda knows her expertise is outdated, and she could be laid off if the merger happens. She knows, however, that if the merger happens, she will be needed to help transition the systems. This process would take about 12 months, so she has about one year to prepare for her next job.

  Recommendation: Linda could pursue a master's degree in IT with a curriculum that emphasizes Web application development and associated Web-enabling technologies. Her existing domain knowledge of the insurance industry, in concert with her new IT skills, will make her very valuable to the new merged corporation.

Individuals, organizations and society need more IT professionals. The Bureau of Labor Statistics lists IT-related jobs as some of the most-in-demand professions, including three of the top 10 fastest-growing occupations in the next decade. To fill this gap, we need training, and we need education. As you can see, the choice depends on the individual's situation, natural talents, existing skills and personal desires.

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Yet, Congress capped the number of H-1B visas granted each year at 65,000, with an additional 20,000 given to applicants with U.S. graduate degrees.

"Even though it may not be realistic, I don't think there should be any limit," Gates said, adding that Microsoft hasn't been able to fill 3,000 technical jobs in the United States because of a shortage of skilled workers.

Sen. Edward Kennedy, D-Mass., said the issue would be addressed when Congress discusses immigration reform legislation this session, and President Bush

IN FOCUS: HOW INFORMATICS BROADENS TRADITIONAL IT EDUCATION AT IUPUI

The Indiana University (IU) School of Informatics has nearly 1,500 graduate and undergraduate students spread over two main campuses: IU Bloomington and IU-Purdue University in Indianapolis (IUPUI).

Informatics — as IU defines it — is the study, application and social consequences of technology. This definition has guided the school's integral personnel through its developmental process for the past several years.

Since its conception during the technology boom of the late '90s, the School of Informatics has been closely tied to local IT businesses to try to produce well-rounded yet technical talent.

Local IT business owners such as Mark Hill of Collina Ventures were asked to contribute both intellectually and financially to the school and become members of its advisory council.

"[Then-IU President] Myles Brand said he wanted to build a school for informatics, a school focused on not just technology and computer science but also how to apply that technology and make it successful," Hill said. "They wanted to create a link right away between the school and technology businesses around the state. At the time, I was chairman of the Indiana IT Association, so I was asked and became involved right then."

In the beginning, the council had a conceptual role — writing to a legislator, extensively defining what modern employers are looking for in students and fund raising in both the public and private sectors.

As the school began to get off the ground, however, the council's role increasingly has moved toward students' issues.

"Over time, it has evolved into four specific roles the council has: helping to get high school/early college students interested in informatics, making sure local companies hire the students coming out of informatics, commercialization or turning concepts and ideas into viable commercial enterprises and, finally, fund raising, which obviously hasn't changed from the beginning because if you want to be world-class at something, it takes money to do that," Hill said.

In going from council member to business owner, Hill's 25-year experience in the local IT community has given him a good idea of the kind of IT education he'd like to see.

He said a single-discipline approach to IT education won't work anymore, as people with specific IT skills are being asked to assume a larger role in project management.

"I'm very big on collaboration," Hill said. "Most of the problems that need solving are so complex, it's hard for people to just do it on their own. We're looking for people who are really taught about collaborating and working with others and not just burying their nose in a book and grinding it out on their own.

"Also, I want someone who has some sense of something else besides just computer engineering — the best software engineers understand business processes, user interfaces and data-based design."

The balancing act between traditional IT majors such as computer science or software engineering and the inter-disciplinary approach of informatics is still a tricky one.

Only a handful of universities and colleges have an informatics school, but Hill said he sees student interest in technical subjects declining, even though demand is higher than ever.

"I hear young people say, 'Oh, those jobs are being outsourced to India.' Well, the reality is there are jobs being outsourced to India, but the demand for those jobs are growing faster than they're being outsourced," he said.

The IU School of Informatics' approach to IT education boils down to its original mission: producing students with a broad base of understanding in terms of how to apply a technology, not just how to code it.

Informatics isn't confined just to business IT perspectives — technologies that apply to subjects as diverse as biology and music are studied at the school. Hill points out these subjects sometimes can produce the most world-changing students and ideas.

"Take a look at Apple's success with the iPod," he said. "There were already systems around that could do all that stuff. Their genius was in the application of the technology."

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has expressed support for raising the visa cap.

In April, the U.S. Senate introduced the High Tech Worker Relief Act of 2007, which would temporarily increase the cap to 115,000 for fiscal year 2007 and 195,000 for fiscal year 2008. This certainly would be welcome news for American technical colleges, including the Illinois Institute of Technology (IIT). Lori Friedman, director for the IIT International Center, said her office has been flooded with questions about H-1B.

"Aside from some students who want to go home, there's a large number who want to at least get the H-1B and get sponsored so they don't have to worry," Friedman said. "Then, there's the cap, and that's really the problem. That's a huge issue for all of our students."

Friedman also said the H-1B cap should be increased or lifted entirely.

"Apparently, there is a need for the number of international students that are in this country, so what the cap allows is just not enough," Friedman said. "It could probably be met next week, when it opens on Monday."

Friedman's estimation was right on target — the 65,000 cap was reached in the first day. This evidence and research from the National Center for Education Statistics (NCES) support a need for increasing the amount of international IT talent in U.S. schools. According to the NCES, in 2003 to 2004, of 59,488 students graduating from American universities with degrees in computer and information sciences, 5,059 (about 9 percent) were nonresident aliens.

That ratio fell the following year. Of 54,111 students graduating from American universities with degrees in computer and information sciences and support services in 2004 to 2005, 7 percent were nonresident aliens.

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Getting more international students into U.S. schools and companies will help Americans — who are often culturally isolated — better understand the people and cultures they work with abroad, said Robert Fenstermacher, executive director of CDS International, a nonprofit that administers trainee exchanges, internships and work-study programs for college students.

Canadian students in cooperative education programs are some of the most common ones in CDS' programs, followed by German, Indian and Chinese students, he said.

In 2003 to 2004, of 59,488 students graduating from American universities with degrees in computer and information sciences, 5,059 (about 9 percent) were nonresident aliens.

Employees from other countries might understand certain aspects of international business relationships better than their domestic partners, which could provide an organization with a competitive edge, Fenstermacher said.

Although many companies temporarily employ international students after they graduate as part of the six-month optional practical training (OPT) experience allowed with their student visas, these workers are required to return home once that period expires.

At that point, they can reapply for the J-1 exchange visitor visa, which will allow them return for another period that ranges from six weeks to 19 months, or they can seek the H-1B through an employer that successfully applied for one.

The increased outsourcing of IT projects to India and East Asia has made it beneficial for people in these nations to get experience with U.S. business practices and return home to work for companies with international partnerships, and enrollment statistics from IIT support this trend.

Of the school's total international student population (as of fall 2006), 44 percent comes from India, 17 percent from China and 10 percent from Korea.

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Certification for College Credit

A great deal of U.S. universities and colleges accept a range of IT certifications for college credit. Finding out whether the school you're considering accepts them is a simple process, and in many cases, schools work with incoming or current students to determine how to best credit them for and design their educations around certifications.

The American Council on Education (ACE) is the major coordinating body for all the higher-education institutions in the United States. ACE dedicates faculty teams to evaluating certifications in all sorts of disciplines, including IT, and providing written recommendations to schools of what and how much credit certifications should earn.

"Of course, every college has its own degree programs and curricula, so they look at the recommendations that we've provided and see if there's a match or not and then see how that might transfer in, whether it's credit for a particular IT course or an elective that might be in the program," said Mary Beth Lakin, associate director of prior-learning assessment at ACE's Special Projects Center for Lifelong Learning.

Lakin explained that some schools look at the recommendations and require further investigation.

"Other colleges and universities might look at the certifications and say, 'OK, I want to review these a little bit more. I want better information before deciding whether it will fit into our particular program,'" Lakin said. "They might require additional written information from the student or ask that a student do some kind of test out or put together a portfolio and describe the certification and the work they've done in the field."

Lakin observed this process herself in running prior-learning assessment programs for many different universities.

"On a particular college campus, I ran into IT certifi-

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cations all the time because students came in with those all the time," Lakin said. "At that particular university, certifications could meet entry-level requirements and some other requirements for the major, but then, when you got beyond that, and you were looking at courses where faculty members felt that there was quite a bit of theory and much less application, that's where issues and questions could arise."

In these situations, the additional methods of prior-learning reporting described above were employed, usually with a student working in concert with his or her academic adviser.

Lakin also said certifications generally are seen as part of and not exactly parallel to a course, depending on the level of the course.

"That's where the course-by-course match is tricky because a lot of the certifications and the kinds of experience and training that adults have don't neatly fit into the courses," Lakin said. "When there's a little bit of flexibility in the degree program, there's room for electives in the major, and that's sometimes where certifications can be put to their best use."

Lakin said it's essential that individuals who seek an IT degree consider how their degree and their certifications will best interact and to coordinate their educations accordingly. Students who fail to do so are "sorely disappointed" with the result, she said.

"If I were in a program and thinking about certifications that might help me academically, I would really work with the people in the IT or computer science department to see how certifications might fit or supplement my program," Lakin said. "The academic adviser within the computer science or IT program or other faculty within the program are good folks to get advice from, so you're not putting out a bunch of money both for the certifications and for what you're doing in coursework and not seeing how they all fit together for you — careerwise and academically."

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