Careers in Technology

Your guide to finding a job in technology

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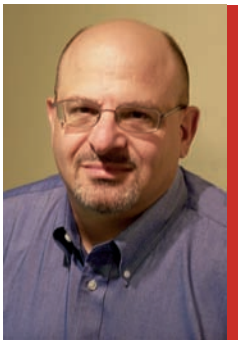
Welcome



Welcome to the first edition of *Careers in Technology*, from Dice. One of the most dynamic industries in the world, Information Technology plays a crucial role in global commerce. Even as the economy suffers one of its worst crises since the Great Depression, the technology sector continues to innovate.

Because IT encompasses many fields, it offers a wide variety of choices for someone who wants to pursue technology as a career. You can perform a variety of duties that range from installing applications to designing complex computer networks and databases. Just a few of the jobs available to IT professionals include data management, networking, computer hardware engineering, database and software design, and systems administration. You can work in cutting-edge data centers or be part of the critical, and growing, field of IT security.

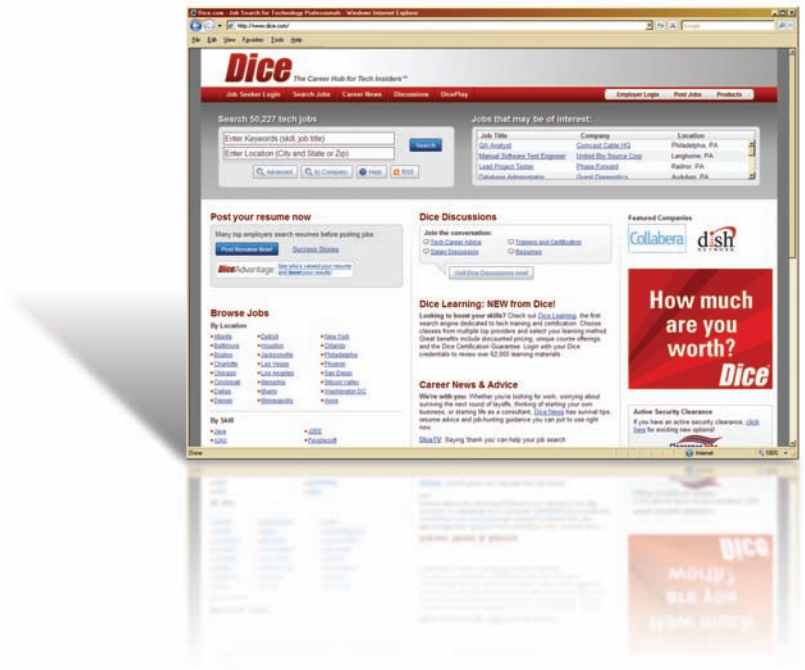
This guide is designed to offer real insights into the world of technology and the jobs you can pursue, while providing the knowledge you need to stand out as you begin your job search. As you develop your career, we hope Dice will be your online companion.

In addition to job listings, Dice provides job market and pay analysis, employment advice, and tools to help maximize your career opportunities. Our daily blog offers helpful articles on everything from IT job trends to preparing for interviews. Our Resume Center offers tips on creating effective resumes and a growing library of free samples. Our Local Market Reports provide snapshots of the employment situation in 20 regions including Silicon Valley, New York, Chicago, Philadelphia, and Seattle. Each week, DiceTV provides career news and tips in brief, even fun, nuggets.

If, having read this guide, you'd like to learn more about IT, conduct some pre-interview research or simply post your resume for your next job search, come and visit us at Dice.

With best wishes for your career,

Mark M. Feffer
Managing Editor, Dice News
www.dice.com



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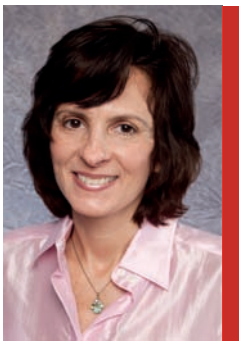
How to Use This Guide



Careers in Technology is designed to be used in conjunction with Dice, our Web site where you'll find up-to-date pay and IT job news, career advice and information on employment trends across the technology industry. This guide will give you the basics in understanding important trends in the information technology sector, while also providing background on different career paths and the skills you'll need to be successful.

To be credible at interviews, you have to know the difference between help desk support and desktop support, or how business intelligence influences business models, or why IT security expertise has become such a desirable and in-demand profession. That's why our *Job Profiles* section reflects the range of positions and skill sets needed for each area. *How to Get a Job* is a crucial section, as it provides tips in dealing with recruiters and agencies whether you're looking for a full-time job or contract position, while *Managing Your Career* explores strategies and tactics to help you proceed through your profession. The *Contracting* section offers insight on what has become a growing employment segment as many companies bring on professionals for short-term project implementations. Finally, the *Resources* section outlines the lingo of IT, and points to a number of online resources that should be helpful whatever specialty you pursue.

I hope this guide will inform and inspire you for your technology career. And I hope you'll use Dice - with its career-focused blog posts, resume center and general job advice - as you build your success. If you have any questions or comments, please be sure to let us hear from you.

Sincerely,

Sonia R. Lelii
Staff Writer, Dice News
www.dice.com

A Career in Information Technology

More than a billion personal computers are in use around the world today, and a billion more are coming by 2015. It takes legions of information technology experts to make them all work - and work together - in our increasingly connected world. In the U.S. alone, the Bureau of Labor Statistics counts more than 3 million people employed in computer-related fields, while millions more have job titles that fall outside of BLS definitions. As the world continues to become more digital, more mobile, and more Internet-dependent, eager new tech employees can take advantage of countless points of entry, and all sorts of interesting paths for career advancement.

In both software development and hardware and networking, workers find specialization matters and talents are improved (and judged) though a series of skill certification tests that, combined with good on-the-job experience, lead to career advancement. In large corporations, IT experts may find a military-like stratification, where promotion is based on time served plus achievement. With each advancement comes a higher salary.

Before the dot-com bust in the early 2000s, colleges reported record enrollment in computer science and IT courses. In the years that followed, enrollments fell by 50 percent. Today, the pendulum is swinging the other way as students see the IT sector almost always beat the national unemployment average and technology is increasingly recognized as a tool that can help corporations streamline their operations. In fact, new enrollment in North American computer science and engineering programs rose 8 percent during the 2007-08 school year, according to the Computing Research Association. That was the first year-on-year increase since 2002.

And companies are recruiting. "I have more recruiters here than I have seniors," Professor Cary Laxer, head of computer science and software engineering at Rose-Hulman Institute of Technology in Terre Haute, Ind., told *Network World* in March. "Our October career fair brought 213 companies on campus.... On one day in January, we had 12 companies here, and nine of them were looking for software engineering professionals." Yvonne Agyei, director of Talent and Outreach programs in Google's People Operations Department, told the magazine, "We've been hiring from colleges for many, many years, and we hire at all levels: bachelors, masters, and Ph.Ds for technical roles, which is primarily software engineering. We're looking for computer science majors and broad programming skills."

How Many Jobs?

Some credit for the surge in computer science must be given to Web 2.0. Today's high school and college students are infatuated with sites and services like Facebook, MySpace, Flickr, YouTube, and Twitter. They're energized by the possibilities these services portend, both inside and outside corporate America. Given that Wall Street is in such distress, computer-savvy undergraduates who might have been heading toward banking and finance are instead taking a hard look at Internet development and pure computing fields.

True, the current recession is doing damage to the tech sector, with everyone from IBM to Google suffering layoffs. But still, technology is seen as a key productivity enhancer and a route to increased efficiency. That means it remains in demand. Figures released by the U.S. Department of Labor predict IT jobs will see some of the strongest growth of any profession in the U.S. by 2010, with demand for application programmers expected to grow and the overall IT sector expected to expand by over a third. "Competitive advantage, driven by innovation, has never been more important," says Daniel Reed, current chairman of the CRA.

Between now and then, things may be tight. According to Forrester Research, the total number of jobs in IT may be down 1.2 percent in 2009. However, says Forrester, "While the recession will be painful for those in IT occupations, the pain will be relatively mild compared with past recessions. IT vendors in this environment will find opportunities to acquire new talent, hold costs under control, and create new offerings to replace some of the IT department staff." That generational shift, a real concern for IT veterans, is an opportunity for new arrivals.

How Are The Salaries?

Salaries among tech workers remain relatively strong. In late 2008, a survey of 19,000 tech workers conducted by Dice showed a spike in salaries despite the recession: a 4.6 percent increase in average pay from the previous year to $78,035. Research firm Gartner surveyed more than 1,500 CIOs through December

2008 to ask about plans for 2009 and found IT budgets largely will remain flat. "In times like these, 'flat' is not bad," observes Gartner. Where are salaries the highest? The biggest paychecks to be found are in the Northeast (Boston/New York/Washington) and the West (Silicon Valley), two regions where the cost of living demands higher pay. All things considered, IT remains a well-paid profession despite challenging economic times.

Many Specialties

The IT industry consists of job roles across several levels of responsibility. According to training firm Global Knowledge, nearly half are at staff level, while 30 percent are middle management positions. Eleven percent of jobs are held by senior managers, while 10 percent are supervisors. Four percent hold executive positions.

While computer science graduates often become software developers, there are many more areas to investigate, everything from networking and e-commerce to business process management and security. In fact, traditionally trained "coders" may find themselves at a disadvantage as they compete with other comp sci graduates who've found time to study business, business analysis, or business systems. After all, technology isn't just for technology's sake. It's for making businesses run better. Overall, the subsets of information technology can be broken down this way:

Application Development

This is the world of the coders, where job titles include computer scientist, software engineer, programmer (in C and C++/Java, JavaScript, Visual Basic, Unix, Linux, and more), software engineer, and graphics programmer. According to Global Knowledge, this year there is especially strong demand for C and C++ programmers.

Data Strategy and Management

These are the very smart people who collect, massage, store, and present raw information. Job titles include database developer and database programmer, and some software engineers and application developers specialize in this field. Industry research firm Foote Partners says that in 2009, there is "urgent demand for talent" in the database arena.

Networking and Telecommunications

The huge business of connecting computers and helping people communicate only keeps getting bigger. Job titles include computer and information systems managers, network systems and data communications analysts, network management software specialist, network engineer, network programming consultant, telecommunication specialist, and data center designer and manager. This field is also seeing a growth spurt in so-called "Green IT" specialties. Between 2000 and 2006, data center power consumption costs doubled to $4.5 billion and could double again by 2011, according to the U.S. government. Making computers and data centers run more efficiently through better data center management and virtualization is a skill in demand.

Internet and E-Commerce

Opportunities exist to make a mark on the Web. Job titles include Web developer and Internet software programmer (Unix, Linux), and there's rapidly increasing interest in cloud computing, the art and science of moving as much processing, storage, and other computing services onto the Internet (think of Google's many online-based apps and storage schemes as examples). By providing a single point of access for its needs, a company can cut costs and create a streamlined workplace.

Security

Along with our increasingly connected world come increasingly complex security problems. Experts in e-crime fighting and fraud prevention are in demand, as are experts in the arena of compliance, a specialty that exploded in the post-Enron world of government-enforced record keeping and archiving for corporations. New rules and regulations must be turned into procedures and technology solutions. It's a growth industry, especially after the Wall Street meltdown increased legislators' interest in corporate bookkeeping.

Other Areas

Technology smarts meets business savvy in this field, where systems administrators, project managers, procurement directors, trainers, business intelligence experts, and enterprise solutions specialists (who administer huge deployments of programs such as SAP and PeopleSoft) work together to create technological solutions for more efficient businesses. According to Global Knowledge's State of the IT Profession 2009, business intelligence and enterprise solutions are hot specialties this year. "As businesses tighten their belts, they are looking to IT to streamline, automate, and find new efficiencies. In some cases, this is saving jobs in IT by helping reduce the number of needed positions in other departments."

Cover Letters

Even in today's frenetic world, a well-written cover letter can give you a boost

Talk to career experts, and they'll tell you resumes and cover letters are like bats and balls. One just doesn't work without the other. But at today's accelerated work pace, particularly in IT, hiring managers often beg to differ.

"Hiring managers in the tech field don't tend to read cover letters a lot," says Yvonne T. Ryan (who calls herself "the techie leadership coach"), founder and president of Leader's Edge CA in San Jose, Calif. "They have time constraints and are more interested in the experience aspects (you bring to the table). They're more interested in seeing specifically who you've worked for and what you've done."

While you'll hear such things a lot, that's not to say you should forget about cover letters and focus exclusively on your resume. Why? A well-crafted cover letter strengthens your application package. It tantalizes. In a maximum of four well-crafted paragraphs, it should make the hiring manager eager to get to your resume to learn more about you.

Making Them Work

When sending a cover letter, use the job title and/or reference number as the subject line of your e-mail. In the first sentence, mention the position you're applying for. Then explain why you want the job and what you can offer the company. In other words, make clear why you're the best person to fill this particular vacancy. If someone at the company has referred you for the position, or if you've previously met the person to whom you're sending the letter, mention it here, as well.

An effective cover letter will take time and preparation, research about the company, rewriting, honing, and careful proofreading. Format it as a business letter, with a salutation and a signature. Double-check everything. Triple-check that you've spelled the addressee's name correctly. Remember, the way you present yourself in the cover letter is a way for the hiring manager to assess your "soft" skills, attention to detail and interest in the position.

Clearly and concisely, you want to communicate that you're more than the sum of your tech skills, that you have big-picture knowledge of your industry, and that you're enthusiastic about your work.

"Cover the salient points in the first few sentences," Ryan says. "Get to the point of what you're looking for and who you are."

Tips from the Trenches

Matt Jones, senior mobile Web content manager at eBay/PayPal, says the cover letters he's received and responded to have the following qualities:

- Genuine personality. Don't offer "stiff" and prepackaged clichés. Instead, explain why you want this job.
- Realistic interest. Don't make "over-the-top promises." Rather, try suggesting what you can accomplish in your first 90 days.
- Concrete citations of current relevant work. "Match your accomplishments to the job description."
- Evidence that you have researched the role and the company. "Refer to something you read that you liked about what the company has done well."
- Mention of any peers or mentors within the company, or the immediate field, who have encouraged you to apply. It's a way of providing a "quick, up-front reference."
- Listing of legitimate abilities and competencies and certificates. Highlight your major tech skills and special tool use (design software, content management systems, analytic tools, and Web platforms, for example).
- Notation of any tech skill awards or recognized innovations by respected organizations.
- Links, links, links to digital media. "This helps the reviewer quickly, if at a glance, see real-world examples of your talents, awards, or references."

In addition, Jones says, "Offer to provide additional credentials or work samples, or to take tests as may be required. Or point to your own Web site, if that's pertinent."

Problem Solving

Cover letters aren't one-size-fits-all. If you're applying for multiple jobs simultaneously, make it a point to craft each letter separately, customizing it to the particular position and company.

And if you're responding to a posted job vacancy, Ryan says, "Try to assess what kinds of problems the company is trying to solve." In your cover letter, she says, "Identify the kinds of things you can do for them. Companies are interested in what problems of theirs you can solve."

Resumes

Communicate your value

Resumes are marketing pieces that connect your skills and experience to employers' needs. So approach creating yours as if you were a marketing director: Research the target audience, brainstorm ideas, and design a marketing and communications strategy before you start writing.

The Basics

Organization simplifies the resume-writing process, so before you begin, find free resume samples on Dice or through your campus career center. Avoid ornate formats. Instead, choose a simple, easy-to-read Microsoft Word document that will convert easily to plain text. Use no more than two font types (preferably 12-point Times New Roman or Arial), and use bold type or bullets only to emphasize key points. Select a design that lists your education and coursework before your experience, and includes a section for computer languages, operating systems and other technical expertise. Students with less hands-on experience are best served by a functional format. Always use quality 8 1/2-by-11 white bond paper.

Next, look for resume action verb lists. These are available online by searching "resume action verbs" plus keywords based on your interests, like "software."

Finally, have handy all pertinent information. It needs to be accurate, so refer to a recent transcript for your GPA and course titles. You'll also need a list of your student projects, internships, awards, extracurricular activities, and the exact dates of paid or volunteer positions.

Research Phase

To uncover the needs of prospective employers, print out job descriptions outlining the requirements for your targeted positions. Highlight keywords describing the skills, competencies and traits required by employers. These include job titles, software program titles, hardware names, soft skills and attributes like strong communications skills, teamwork and problem-solving capabilities - even industry buzzwords. Pepper your resume with these because employers select candidates based upon the keyword match between resumes and the job description. In addition, the keywords will give you a glimpse into the desired candidate profile.

"Research the industries where you want to work to find out the problems companies are facing," says Louise Kursmark, president of Massachusetts-based Best Impression Career Services. "Ask yourself how can I provide a solution? Put yourself in the employer's shoes and think about what kind of person they need to hire to fix those problems."

Then map your previous experience, skills and attributes to the employer's needs and the job requirements, and highlight those competencies in your resume.

Writing Guidelines

Use these guidelines to create your resume:

- An objective statement is optional, but experts agree it's most effective when your goal includes a specific job title.
- Modern resumes often begin with a two- to three-sentence qualifications summary. This is your marketing pitch. It states why you're qualified and gives the reviewer a preview of what's to come as you provide specific examples from your education and work experience.
- Next list your relevant jobs, student projects and internships, beginning with one or two sentences describing the challenges you faced in each role and the specific results you achieved. "You need to find a way to distinguish yourself," says Kursmark. "Go beyond what you know and talk about what you've done and how well you did it."
- Provide a series of accomplishment statements for each job illustrating how you achieved results. Begin each statement with a past tense action verb and choose examples that demonstrate proficiency with the required skills.
- Include your overall or major GPA, if it's 3.0 or higher, and your anticipated or actual graduation date.
- Capitalize proper nouns and words that begin sentences or phrases. Use periods only at the end of complete sentences and use punctuation consistently throughout the document.
- Use "I" only in your objective statement. First person is implied in resumes.
- Limit your resume to no more than two pages. Some experts say even that's long for a newly minted graduate.
- Spell check and grammar check your resume, but also ask two trusted professionals to proofread and evaluate whether you've been effective in communicating your value.

Network Your Way into a Job

It's not about connections, it's about the right connections

Networking is more than something you do to land your first job: It's a life-long skill that, once developed, will pay dividends throughout your career. Ideally, you should start networking during your freshman year, giving yourself plenty of time to hone your skills before graduation. Where do you start? Wherever you are.

"Talk to people at the beach, on the plane, at school," says Barbara Hewitt, senior associate director of Career Services at the University of Pennsylvania's Wharton School. "Let people know what you're interested in."

Your school's alumni can be a good starting point. Your campus career center or alumni office may have searchable databases where you can find contacts based on traits such as industry, job function, home town, or major. But take advantage of other on-campus connections, as well. If you play a sport, for example, ask the coach for the names of alumni players who can mentor you as you choose classes and hunt for internships. If you want to become a security expert, try to build a relationship with the technology professionals who secure your school's systems.

Off campus, get involved with trade associations. Local groups, like a state or county tech council, will include a big mix of technology professionals, giving you a great opportunity to question people about their chosen niche. Even groups that don't offer student programs can be a way to connect with the local tech community, notes Jessica Varone, manager of student opportunities for the Pittsburgh Technology Council.

"Register for the events, be engaged in the tech council, make yourself available for internships and ask to work on small projects," she suggests. "If you see a company that is of interest to you, a tech council can help you connect to that company if they're a member."

If you're energetic, consider starting a technology club or a branch of the local tech council on campus. That will get your name out there as someone with leadership skills and can put you in touch with prospective mentors.

How to Enjoy Mixers

Many campuses offer formal networking events sponsored by student organizations or academic departments. While these create great networking opportunities, they also terrify even the most capable students.

What you may not realize is that networking events frighten professionals, too. "It doesn't matter if you're just finishing college or a multi-millionaire," says Shawne Duperon, a Novi, Mich., consultant. "Everyone has the same feeling of panic before networking events. Your game is to make friends. Focus on friendship and miracles will happen."

To prepare for these events, you'll need three things: a 60-second explanation about who you are (called an "elevator speech" or "pitch"), professionally printed business cards with your name and contact information, and background knowledge about the event's attendees.

If you're a student, your elevator pitch could highlight your internship experience and what you'd like to do eventually. Students with no experience can toss out other ice-breakers, even some that aren't business-related, says Jeff Thomson, president and chief executive of the Institute of Management Accountants. "Go in with a couple of things in your head so you're not at a loss for words," he suggests. "Who's your favorite sports team? Have you just read a great book or seen an interesting movie? You can ask if they saw it."

After your pitch, ask the person about themselves. Based on your background research, ask what it's like to live in their company's headquarters town or about its products. "People love to talk about themselves and when you listen to them, you can see if you want to connect," Duperon says. "Once a person is finished talking about themselves, they'll ask what you're doing." If they don't ask a question, or they're not engaged, move on.

Once you've established rapport with someone, ask if you can follow up with an e-mail or a call. Don't ask for a card - or offer your own - until you've made a real connection. "When you pass out a bunch of your business cards without establishing a connection first, it's like kissing someone on the mouth that you don't know," says Duperon. "Yuck."

Online Opportunities

To most college students, networking online is second nature. You've probably been blogging and posting to online social networking groups since middle school. The good news: You're comfortable online. The bad: The things you posted when you were 16 can come back to haunt you.

You must completely and thoroughly sanitize your image long before your job hunt. Rid every one of your online profiles of foul language, pictures of yourself or friends drinking or using drugs, your political views and anything even mildly outrageous. If you don't already have a professional-sounding e-mail address, get one. And don't mention dating or relationships in your posts, tweets or profiles. As you're cleaning, add your impending degrees, academic and industry association memberships and key job search terms to your profiles.

If a social site has an application for creating a professional profile, use it. Join a few special interest groups, so their icons show up on your home page to impress visitors. Add a professional picture, not something taken with your phone. Next, expand your reach: Create profiles for yourself on business networking sites.

The good news: You're comfortable online. The bad: The things you posted when you were 16 can come back to haunt you.

Online Business Groups

Now that you've cleaned up and set up, it's time to start finding leads. On each site, search for people you've met in the past and invite them to join your network.

Then "start to write reviews and recommendations for people on the system," suggests Paul Carpino, employer outreach and internship coordinator at the University of Nevada, Las Vegas. "The more activity and recognition, the better."

Set up a distribution list and when you do something significant, write a brief statement and send it out. "It doesn't have to be formal," Carpino says. "Just something like, 'I took a new job in L.A. and I like it.' Keep your degrees and professional development current."

Once you have a particular job goal in mind – you want to go into bank audit IT, or work for a particular company in Silicon Valley – begin reaching out to those in your network who can help, Duperon says.

Who in your network knows someone in IT audit? Find out by sending a note to your whole network saying, "I'm graduating and looking for a position doing bank audit IT, or at XYZ Company, and would appreciate any help you can offer." Can they give you a warm link by sending you and the contact a joint e-mail introduction? If no one knows anyone at your target company, search the business sites for someone you can contact directly in the department you'd like to work in.

Find a Mentor

Social networking sites can also be great sources for mentors, says Jennifer Lindsay, director of digital services at Eastwick Communications in San Francisco. "Students should take advantage of the transparency of social media to find and follow people they would like to be like in a professional sense," she explains. "See what they're talking about, who they're talking to and the events they attend. This lends incredible insight as to what's possible and where to go to network." Introducing yourself at networking events as a person who follows someone's tweets is a flattering way to start the conversation.

Feed the Beast

Once you get your network up and running, you've got to constantly feed it, or it will wither away. To follow up on your networking leads, forward relevant news items, invite alumni contacts for coffee and keep everyone posted on what you're doing this summer to further your career.

Once you land a position, start adding co-workers to your in-person and online networks. You'll soon be someone others turn to when they want to network.

Getting Real World Experience

Moving from the classroom to the work world

As a student, you've had ample opportunity to gain the experience and skills you'll need to succeed in the real world. That's because employers are looking for a broad portfolio of attributes, which can be acquired from the classroom to the dorm room.

According to the National Association of Colleges and Employers, a strong work ethic, the ability to work on a team and initiative are among the attributes employers prize most, because these are the type of skills that will help a new hire succeed as an employee and contribute to the organization. Employers also prefer candidates who've held leadership positions over those who were simply involved in extracurricular activities.

Employers are looking for a broad portfolio of attributes, which can be acquired from the classroom to the dorm room.

Technical Internships

More than three-quarters of employers say they'd prefer to hire new college graduates who have relevant work experience, according to NACE. For college students, that experience often comes through an internship or co-op assignment. At Stanford University, approximately 50 percent of the students seeking internships secure them through the campus career center, where companies post opportunities online, says Bev Principal, assistant director for employment services. The other 50 percent secure internships by networking.

Student Co-Ops

Cooperative education (co-op) is a partnership among employers, students, and the college, designed to provide students with on-the-job training, college credit and, in most cases, wages. Co-ops enhance the educational process for students by integrating classroom instruction with hands-on experience.

Student Projects

Besides providing hands-on technical experience, student projects give participants the opportunity to develop teamwork and problem-solving skills.

Freelance Work

"Co-ops or internships are ideal, but students can also acquire hands-on experience just by freelancing," says Dan Caputo, senior technical recruiter for Raytheon, a defense contractor based in Massachusetts. "Some even start their own companies. It doesn't matter how you get the experience, just that you have it."

Freelance work also develops initiative, work ethic, reliability and marketing skills because you have to solicit your own gigs and then deliver the results to clients on time.

Research Assistantships

Technology professors often take on outside technical projects or conduct research for outside companies, and engage research assistants to help them, notes Markel Quarles, career counselor at California Polytechnic State University in San Luis Obispo. Quarles also suggests students join technical organizations like IEEE, because they may be able to land internships or projects by networking with company reps who attend the group's meetings.

Volunteer

If your school is located in a small town, or if you spend summers in a rural area, you can still pick up technical experience by volunteering for the local school district, library, nonprofit organizations or city hall, suggests Principal. It may be possible to work a summer job and earn some extra money, yet still add to your technical portfolio by completing a few volunteer projects.

Study Abroad

Students can both acquire technical expertise and experience different cultures by studying abroad for a semester. Such an experience is a real plus when Caputo considers candidates for Raytheon, because the company has global operations and looks for employees who are comfortable working overseas.

Student Organizations

You can acquire leadership and teamwork skills by joining student organizations. Serve as a club officer or dorm resident advisor, organize a campus event or mentor incoming freshmen.

Student Jobs

Being successful at any job, especially over time, builds your work ethic and commitment. So don't give non-tech jobs short shrift. You can use them to build the track record that will help you succeed in the real world.

Certification: The Ultimate Test

You thought you were done with classes? Wrong

As soon as you enter the IT field—perhaps even before—you'll start hearing about certifications. These are the credentials you earn through testing that prove you have mastered a particular software program, coding language, hardware implementation, or network technology. While no one wants to graduate from college only to face more years of classes, studying, and tests, certifications are a necessary measure of competence in a field where the technologies are constantly evolving.

Employers and recruiters often use certifications to make their first cuts when hiring. "If I'm looking for a project manager, the certifications help me when I'm searching through resumes," says Mike Giglio, Boston-area Recruiting Manager for IT staffing firm Sapphire Technologies. "I may just search on 'PMP.' At least that way I know I'll get a list of seasoned project managers who have passed what's known to be a very tough test."

Most certification courses and tests are created by, or in conjunction with, the vendors who created the software or hardware you're studying (Cisco for Cisco products, Microsoft for Microsoft products, etc.) In fact, whether you choose to study from books, in a classroom, online, or at an immersive "boot camp," you should only use officially endorsed coursework.

Certifications are often required for advancement in fields such as software engineering, database administration, network management, Windows administration, and even mobile technologies. Costing anywhere from a few hundred to more than $8,000, and taking weeks or months to master, certifications are a serious career investment. Not only does the string of acronyms on your resume make it float to the top, it also indicates you're committed to continuing education and keeping up in a rapidly changing field. "Certifications give me reassurance that the person took the class and passed it, and that tells me something about his or her personality," says Giglio.

Of course, companies are also in search of candidates with real-world experience, a problem for recent college grads. As Stephen Crandall, assistant professor of information systems at Notre Dame College in South Euclid, Ohio, puts it, "It's the chicken-and-egg question. The companies are only hiring people with experience, but how do I get experience if I can't get hired? I advise candidates to get experience any way they can—entry-level jobs, non-profit organizations, or anything else."

Industry experts such as David Foote of Foote Partners devote a lot of time to tracking IT salaries to see whether certification holders outpace other IT experts consistently. While the findings are inconclusive, it's easy to spot areas of growth where salaries do outpace the norm. For example, Foote is currently excited by anything related to security and compliance, no surprise given America's challenges at home and abroad. "Many companies have been seriously understaffed and under-skilled in their IT security departments for a long time, and they know it," he says. "Security is a deeply technical domain, and certification is an important qualification in areas where technical skills dominate." Indeed, nine of the 18 fastest growing certifications are in the security arena.

One danger of certification is a perception of overspecialization. "You can get pigeonholed into that specific technology, and may have trouble advancing in your company," says Crandall. "Although they don't say it, the company is thinking, 'We can't promote you. We need you to run our Exchange server.'" The lesson there is to look ahead and plan your continuing education to embrace what's new. Foote, for example, points to virtualization as a skill all IT experts should be learning.

Ultimately, it's up to you to assess your competitive environment and keep up. "You have to look around. If everyone else in the general IT population has a certain bunch of certifications and you don't, then you're behind the game. There's no way around it," says Giglio.

"Getting a job in IT is a process, not an event, and keeping a job in IT and progressing in your career is a process, not an event," adds Katherine Spencer Lee, executive director of RHI Consulting. "You don't stop with one certification and quit. The best IT professionals are into ongoing education."

But even as you prepare to go to class and crack the books, always remember that while certifications may tell an employer or recruiter something about you, they don't tell the whole story. As Crandall puts it, "Certifications aside, there's no substitute for being good."

Working with Recruiters

The basics of an important relationship

Recruiters don't exist to be your career coach or friend. They're there to serve as the middlemen between you and an employer, the person who tries to match the right person to the right job. Always treat them as you would professional colleagues or respected co-workers. That's the overarching rule IT job seekers should abide by when working with recruiters.

To start, understand their role in the hiring process: If you believe the recruiter's mission is to "help you get a job," you hold a misconception that could leave you feeling disappointed and betrayed, even when recruiters properly go about their work.

A lot of candidates start out thinking the recruiter is working for them. In reality, recruiters work for the employer, who's paying them to find the right professionals for the open job.

Because the recession and its resulting layoffs have made today's market for full-time positions extremely tight, you'll face strong competition as you look for a job. Many recruiters are working harder just to hunt out the right potential candidates from piles and piles of resumes. But though you might think they hold all the cards, it's important to research any recruiters and agencies you might work with. The best are those who care about applicants as well as their corporate clients.

And, you want to work with recruiters who are knowledgeable about IT. When considering a firm, be sure to ask what they've specialized in, what companies they work with, and who they've placed recently.

Some agencies, especially large ones, specialize in verticals or particular fields within the IT industry. So, if you're a database architect, for example, find a recruiter who specializes in that area. You'll probably get better service, they'll have a better understanding of the industry, which companies are hiring, and which are good to work for.

However, working with a specialized recruiter only makes sense if you have a clear idea of what technology area you want to focus on. There are times when working with a recruiter with a broad focus makes sense. For instance, if you're a recent graduate who's not sure what specialty interests you.

Live and In Person

It's to your benefit to arrange face-to-face meetings with recruiters whenever you can. That way they can see your personality in action, get a more detailed sense of your experience and capabilities, and better remember you when the right job opens up.

Recruiters stress the importance of open, candid dialogue. They'll need to know where you've applied, your specific career interests and needs, your required compensation, willingness to relocate, and any other factors that will affect your decision if you receive an offer. For example, if you're married, does your spouse have final say over where you can go?

When a recruiter contacts you about a position, be sure to get a written job description from them. Why? Because you want to be sure you're applying for something that matches your skill sets. Otherwise you'll be wasting your time, as well as the hiring company's time.

Good recruiters invest time in preparing candidates for interviews. They should provide information about the company, and about the people you're interviewing with, and they should help prep you for the interview.

The surest way to sour a relationship is to go on an interview arranged by a recruiter without telling him you've already approached the same employer. If that employer already had your resume, the recruiter might be ineligible for the fee if you ultimately get a job offer.

Another big turn-off is harboring doubts about an employer or job that you reveal only after you've received an offer. Negotiating is one thing. Deciding at the 11th hour that you don't want the job is something else. Employers hate getting blind sided that way.

Staying in Touch

Even when you aren't interviewing through a particular recruiter, it's smart to stay in touch. But there's a right way and a wrong way to handle these contacts.

First, don't be a pest. Although there's no consensus about how often is too often, following up at intervals of one to two months should be safe. Too many calls can be annoying.

At the same time, don't be afraid to pick up the phone. Phone calls are more personal than e-mail, and so may be more likely to draw a response. As one recruiter says: "I feel guilty if I get a voicemail and I don't answer it."

Recruiter Q&A: Deborah House

Technisource

How do you approach interviews with job candidates?

Whether I've initiated the search or the candidate has found me, my first choice is to set up an appointment to meet them face to face. The value of establishing an actual relationship is often overlooked, but it's essential for the candidate and the firm to have that opportunity. Many recruiters have deferred to the phone interview as a way to cut corners on time, but the only occasion I use the phone versus a personal meeting is if the candidate is remote from my specific area. I always approach arranging our interview as the beginning of a long-term relationship – even if there is an immediate opportunity, I explain that it's my goal to place the candidate today and become a valuable advisor throughout their professional life.

'I always approach arranging our interview as the beginning of long-term relationship.'

What are some of the common mistakes people make when they work with recruiters?

The most common resume mistake is creating a document that doesn't reflect the full spectrum of their skills, or isn't a clear snapshot of their value. A resume is a competitive marketing tool that must be simple in structure yet convey who the candidate is and why they're the best choice for the job. Using trendy structures or buying into the "one page" theory is not recommended. Stick to the basics and ask friends and teachers to weigh in on the content so they can help you ensure the end document is a real reflection of you.

Could you talk about the process involved in working with a recruiter?

It's not really different – most reputable, professional contract firms will offer the same "perks" or benefits as many full-time equivalent jobs would, like paid time off, medical and dental benefits, 401(k)s and advancement opportunities. The same concerns and discussions are relevant in both full time and contract pursuits, including compensation, worksite location and corporate culture. In my opinion, a bright spot in the economic downturn is that it's begun to erode the old notions and stereotypes of the traditional career. People are migrating away from the idea that a full time role equals security, and are embracing the reality that they are the arbiters of their security by investing in their skills and staying fresh in their chosen industry.

How much coaching and prepping should I expect from a recruiter?

You should expect to be coached on interview etiquette (what questions are typical, what questions are not) and how to articulate answers to common questions – both skill-based and behavioral – as well as trained on how to ensure your threshold acceptance is as sharp as it can be. People have a short window to make a first impression and your recruiter can help you put your best foot forward.

The recruiter should also give guidance on how to sharpen your resume so that it best reflects your skill and education, relevant experience and what you want from your job search. A great recruiter will help you to construct two or three resumes that are directionally different and targeted at specific roles that you're seeking. The different resumes will reflect your "fit" for these roles and make it easier for you to apply for multiple jobs. The candidate market is flooded, so speed of response and accuracy are key.

Any final thoughts?

I encourage all recent grads to do internships in their chosen field. Often these internships are no to low pay, but the practical experience is priceless. An internship can help you to narrow down a specific role within an organization, or it can even help you decide to redirect your career focus. The transition from academia to the workforce can be rocky if there are no real world experiences to fuel the ride.

I also encourage all new grads to align themselves with networking groups that support their industry focus or vocation. The relationships that are built from these affiliations have enriched my career and given me a strong foundation.

Hiring Manager Q&A: Elvis Cernjul

Vice President, Spiegel Brands

How did you become interested in IT leadership?

For me, serving in an IT leadership role was a natural fit. Growing up, I always felt a strong draw toward leading others, no matter the situation, so my objective from the onset of my IT career was to find a way to leverage my leadership strengths and make a positive, lasting impact on the people I work with and the business. This is an ideal role for me: I get to work with leading technologies, create and implement innovative solutions, interact with all lines of business, directly impact the bottom line, and work with great people.

What was your path to the VP's chair?

My path to becoming a VP actually began when I graduated a year early from high school and enlisted in the Army. Serving as a senior leader with Army special operations for eight years taught me a great deal about managing others and gave me a unique perspective on how to handle a variety of high stress situations. I've relied upon that experience throughout my IT career.

After I left the service, I felt heavily drawn to IT for a variety of reasons. I received my Microsoft Certified Systems Engineer certification, and once I was employed as a systems engineer, I volunteered to take on as much project work as my bosses would give me. I wanted to prove that my leadership talents went well beyond the gates of the military, so I quickly proved myself and was promoted from engineer to manager to director and now vice president.

In parallel to my efforts at work, I achieved my college degrees, studied various leadership and technical materials, obtained certifications, listened to seasoned IT vets, and found an outstanding mentor who taught me a tremendous amount about coupling IT with business. My end objective was then and remains: To be the best IT leader in the field.

Could you describe a typical day?

My days vary from managing complete system outages to meeting with the CEO on strategic initiatives. I spend time quantifying projects, working with various business leaders on projects, researching new technologies, managing vendor relationships, providing direction to the IT team and doing actual hands-on technical work as needed. I spend about 20 percent of my time in a hands-on role, which allows me to keep my technical skills fresh and satisfies my passion for technology.

Which skills and traits lead to success in IT leadership?

Today's IT leader has a highly diversified role, so here's a list of the requisite capabilities:

- Leadership skills
- Communication skills
- Understanding of the business
- Impartial view of vendors and technology
- Finance and analytical skills
- Ability to deal effectively with stress
- Recognizing that you don't know everything
- A positive outlook and an unwavering "can and will do" attitude
- Patience

What advice would you offer to aspiring VPs?

I actually achieved my bachelor's degree in IT and an MBA while working full-time, so I believe that any route can lead to senior management. Here are my top three pieces of advice to those seeking leadership roles in any aspect of business:

First, step up and take charge when the opportunities present themselves, but do it in a meaningful, non-disruptive way that is respectful of your teammates. It's important to show your peers and supervisors that you are a capable leader, even in the absence of orders or clear direction. Some people are natural leaders and often do this without being aware of their actions, but the behaviors can be learned.

Second, over time and through experience, you'll be able to hone your ability to make sound decisions and lead others. But if possible, find a mentor who is willing to provide you with direction and real-time feedback, as it will speed up the learning process.

Lastly, jot down the things you and your team disliked when your leaders did them, so you can remind yourself not to do those same things when you reach a leadership position!

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Office Politics

Yes, they exist. But you can turn them to your advantage

Politics exist in every workplace, and the IT department is no exception. Amidst the constant competition for projects, resources, promotions and raises, nearly everyone has a story of unscrupulous coworkers who took advantage of a situation by cutting corners or stomping on toes.

But despite its negative stigmas, office politics should not be considered the exclusive domain of back-stabbers and manipulators. To the contrary, those who can understand their organization's political landscape can use it to a career-boosting advantage.

Office politics most often boils down to a struggle for control, usually over resources, information or people, says Timothy Johnson, chief accomplishment officer for Des Moines, Iowa-based consulting firm Carpe Factum, and author of *Gust: The 'Tale' Wind of Office Politics.*

Those who can understand their organization's political landscape can use it to a career-boosting advantage.

Individual or group success typically depends on tough tasks like pushing a project to the top of the queue, finding the right people to work on it and getting the time and tools to do the job right. Each department will have its own dynamics in play at any given time, as well. For example, "Show me an IT pro who doesn't answer to at least two different bosses, either implied or not," says Johnson. "Then you look at all the different technical issues going on, like who has the best software selection, who can make decisions about operating systems and compatibility. Information is also part of it, such as who has what information at what time."

Skills Trump Politics?

Oddly enough, because the need for certain specialized skills is so great, those who don't play well with others often still succeed. "I've seen people who seem to offend anybody, but their phones ring all the time with people asking them for advice because they're good at what they do," observes one executive.

Still, left unchecked, unhealthy office politics can lead to more overtly offensive behavior, such as emotional bullying and all-out sabotage of others' efforts. When coworkers are doing a number on each others' psyches day in and day out, absenteeism, poor-quality work and a high rate of turnover are often the result.

The answer to all this: Play the game the right way. That means mastering a few simple strategies and avoiding a couple of key mistakes.

Perhaps the biggest *faux pas* is to make inappropriate comments to coworkers without considering their ramifications. For example, don't remark on the ugly car parked in front of the building: It could belong to your new vice president.

Another common mistake is simply being too trusting, especially with potentially career-damaging information. If you call in sick with a family emergency, don't go to a party that night and post pictures of it on Facebook. It's not much of a stretch to imagine one of your coworkers spotting them and alerting the boss. Remember: In the world of social networking, you never really know who's connected with whom.

Careful Communication

Being a successful office politician means developing a rapport with coworkers - without being gossipy or delving into personal issues. It's important to understand the communications style of your group or department, especially since those who rise to management positions tend to be good communicators.

That extends to e-mail and electronic communications. Be judicious when using the "reply all" and "bcc" options, and write every e-mail calmly and respectfully. A good rule of thumb: Imagine the CIO will read it.

Finally, do more observing than talking. Before long, it'll become clear what most people's motives are. Be cognizant of who's around you at any given time. It might be okay to say something controversial to a friend, but if they're not a friend, what you say may come back to haunt you.

Mentors

How to find them and work with them

Mentors can help you find the right niche in technology, steer you down the path to success, and link you to a ready-made network of industry contacts. So where do you find them? Start by checking to see if your school has a mentor program, then expand your search to alumni and industry experts.

Whether they come from campus programs, a trade association or you find them yourself, start gathering your own group of experts who can act as a "board of directors" for your career as early as your freshman year.

Look first to your instructors. "Many professors have real-life business experience, especially adjunct professors," notes Jeff Thomson, president and chief executive officer of the Institute of Management Accountants (IMA).

Alumni also make great mentors, so check to see if your school has a program like DePaul University's Alumni Sharing Knowledge (ASK) program, in which students can search for mentors by the industry they work in, the company they work for, their country of origin, their profession or their location. Gillian Steele, managing director for the Career Center at DePaul, says on-campus events as well as student technology club meetings offer opportunities to find mentors.

Real World Resources

Off campus, trade associations at the state and local level offer programs for students including discounted memberships, scholarships, conferences, mentor-matching and networking.

And in today's world of remote workplaces, social networking sites are another source of mentors. The same trade associations that offer in-person networking events may have online message boards where students can lurk until they get a feel for the site, then present relevant questions and seek out relationships with those who post answers.

Once you've signed up for an event, how do you find a mentor in the crowd? "Talk to as many people as you can and look for someone you feel comfortable with, who impresses you," Steele says. "You don't need to say to someone, 'Will you mentor me?' You just tell them you have a lot of respect for them and their knowledge of the area and you'd like to talk to them about what you're thinking." Then, you stay in touch.

Once you've found your first mentor, don't stop. Susan Battley, a New York-based executive coach, recommends finding multiple mentors. One person may help with concrete ambitions like learning a new technical skill, while another may be a sounding board for sensitive, interpersonal topics. "Cast a wide net and build a personal advisory board," she recommends.

Build the Relationship

To get the most from your mentor relationships, be sure to select at least one mentor who's different than you, says Chip R. Bell, author of Managers as Mentors: Building Partnerships for Learning. "People who are different can bring a perspective that can be instructive," he explains.

As you talk with mentors, know what you're seeking. Early in the relationship, communicate your goals and your expectation for the outcome, Bell says.

If improving performance is on your list of goals, remember you're going to have to let the mentors see the real you for that to happen. "Make sure that you're authentic, real and genuine, and that you show your foibles and less confident side," Bell says. "Only through a genuine relationship is the mentor able to focus on how they can be most helpful."

Be prepared to hear the good, the bad and the truly grim. "Many times when students come out of college they're a little bit full of themselves," Bell warns. "That sometimes makes it more challenging for students to hear and value feedback and advice, particularly when it's not what they were expecting to hear."

And no matter how much your mentor's words cut, the best reply is one that's accepting, such as: "Thank you. I appreciate your candor. I'm going to think about that." Denying the problem or giving excuses will only discourage your mentors from giving additional candid advice.

Finally, remember that a mentoring relationship is like a marriage. "Honesty is critical," Bell says. "If it's not working, you need to say, 'This is not what I want to do' and allow both parties to adjust or abandon the relationship."

Is It Time for a Change?

Recognizing when to move on

Your grandfather may have retired with a gold watch, but it's unlikely today's graduates will become lifers with any one employer. Recurring business cycles, outsourcing and changing technology require modern IT professionals to be ready, willing and able to launch a job search on a moment's notice.

"New graduates must learn to be proactive," says Patricia Dorch, president of Six Figure Career Coach in San Diego, Calif. "The time to update your resume is right after you pass your probationary period."

Since the question isn't "if" you should change jobs but "when," here are signs that can help you recognize when it's time to move on.

Red Flags Require Immediate Action

- **Financial troubles:** Staff reductions are common during economic downturns, and layoffs may not affect you or portend severe financial problems for your employer. But if your company is consistently losing money, seeking a buyer, divesting major business units, considering IT outsourcing, or indefinitely suspending technology investments, you should consider other options.
- **Limited growth opportunities:** If you're stagnating, your career has plateaued and you foresee no changes on the horizon.
- **Passed over:** If your contributions aren't being recognized, and your peers with similar skills and experience are passing you by or being given special assignments.
- **New boss hiring old cronies:** A new boss doesn't always necessitate a job change, but if she's terminating current employees and hiring former loyalists, chances are you're on borrowed time. Also, if it's public knowledge your new boss was brought in to clean up the IT department, then it's probably time to go. It's difficult to salvage your professional reputation and keep your career on track once you've been associated with an underperforming business unit.
- **Bad vibes from management:** While it's not always fair, being liked by company management is critical for success. So if your boss or company executives give you the cold shoulder, and there's no leadership change in the offing, it's time to look for a new job.

'New graduates must learn to be proactive. The time to update your resume is right after you pass your probationary period.'

Yellow Flags Are Warnings

If you have little control over a yellow flag situation, and things haven't been resolved within six months, it's probably time to move on, says Hallie Crawford, a certified career coach specializing in young professionals and recent college grads.

- **Poor performance reviews:** Anyone can make a mistake or occasionally miss some goals, but don't ignore serious performance issues or a situation that is de-motivating you from giving your best performance. "If you've received bad evaluations and negative feedback from your boss and co-workers, you either need to work on your performance or leave," says Crawford.
- **Organizational changes:** Whether it's a new boss, a company-wide reorganization or a lateral transfer, give yourself time to adapt to the situation so you can evaluate how it will impact your career. Also, don't get caught up in the post-change frenzy of co-workers. Make a stay-or-go decision based solely on an unemotional evaluation of what's best for you.
- **Poor cultural fit:** Poor fit with the organization's culture is one of the primary reasons employees change jobs. Unfortunately politics, red tape and frustration abound in all organizations, and new grads must learn how to adapt and survive in tough business environments. Give yourself time to acclimate to the culture, before deciding to jump ship.
- **Recruited away:** While it's flattering to be pursued, remain grounded. You don't want to view a new opportunity through rose colored glasses, only to have regrets later. Do your homework and ask tough questions before deciding to accept another offer. "Learn to appreciate what you have," says Crawford. "Because the grass isn't always greener at another company, it's sometimes just more grass."

Networking as a Professional

It never stops

Like many a business buzzword, "networking" is a victim of its own success. Over the years it's become so enwrapped in oversimplified myths, its central idea was lost. The unfortunate result is that many people who'd benefit if they put enough effort into networking give up before they've given it a serious try.

For instance, one widespread myth portrays networking as a parlor game built around trading business cards the way school kids once traded baseball cards. Attend a variety of business/social events, press the flesh, make a few good impressions, and presto! A newfound acquaintance will refer you - or even introduce you - to someone who's interviewing candidates for your dream job.

Of course, it's never that easy.

Even a less pie-in-the-sky version - request job leads from people you already know professionally - rarely yields results. Does that mean nurturing a network is a waste of time? Decidedly not.

One reason many people have difficulty networking is they don't appreciate what hard work it is. Networking with strangers is hardest of all. Advancing from a new acquaintance to a potential job referral usually means cycling through multiple levels of contacts (one refers you to another, who then refers you to another, and so on) and informational interviews - whose only return on your time invested may be the opportunity to secure yet another informational interview with a next-in-line contact.

Even when networking with people you already know, success requires tenacity, creativity, a willingness to take chances, and a willingness to do favors for others.

However challenging it is, effectively building and leveraging a network of professional contacts is essential to your continued success. The good news: Even if glad-handing isn't your style, there are several ways to make it more comfortable.

The Myers-Briggs Type Indicator, a widely used personality test, defines people according to where they get their energy on the extrovert-introvert scale. Typically, extroverts get theirs from interaction with other people and taking initiative in work and personal situations, while introverts tend to get energy from thoughts, memories, and feelings.

Conventional wisdom says extroverts jump into networking easily. However, the reality is introverts are often more successful because they prepare so well. Extroverts are often so used to "winging it," they often don't develop good contacts and good information.

Improve Your Networking:

- Don't try to become a master networker overnight. Instead, take baby steps. If networking hasn't been a regular part of your life, take it slowly and build confidence.
- Don't assume you're bothering people. Most will be glad to hear from you based on a mutual contact, friend or colleague.
- Rely on your supporters. Network first with mentors, close colleagues, and friends.
- Remember all the times when you have been successful in other group endeavors.
- Try to take a colleague, friend or manager to meetings or conferences so you'll know at least one person there.
- Don't underestimate the power of listening. It's a valuable and appreciated talent.
- Make the most of what you know. Take the time to read an industry newsletter in advance of attending a business/social event or in preparation for an informational interview with a contact, so that you will be comfortable sharing the tidbits you have learned.
- Develop a well-crafted pitch, focused on your goal and what you bring to the table.
- Rehearse, rehearse, rehearse. Many people get tongue-tied when meeting someone new, so practice what you plan to say.
- If you have news or a problem to solve, try picking up the phone and telling someone else about it.
- Attend events that have a purpose. If you're uncomfortable at gatherings set up solely for networking, try to attend those that have a purpose - listening to a speaker, for example - since they tend to have a planned agenda.
- Reach out as often as you can, using the phone or sending an e-mail.
- Try to get out of the office. It helps to get away from your desk, get out of your comfort zone, and walk around. Almost all encounters are worthwhile.

Cultural Adaptation

Operating effectively in your company's culture

Organizations are like families. Each has its own personality fostered by the values, beliefs and actions of its members. While some environments are a better fit than others, most new employees manage to acclimatize – maybe even thrive – once they get the lay of the land.

"Treat your first 30 to 60 days on board like an interview," says Judit Price, president of Berke & Price Associates, a Chelmsford, Mass., company that provides career counseling to recent grads.

Understand the Culture

To operate effectively in your company's culture, you have to understand it. A coach or a mentor can be a great help, but it may take time to identify a prospect. In the meantime, because cultures are nebulous and the published culture may not match the actual environment, you'll need to be a keen observer, looking for overt and covert examples of characteristics to complete your analysis. And remember, a culture is defined not only by what people say, but by the actions they take.

A company's culture flows from its values, which might include things like "integrity" and "respect." The alignment between your personal standards and the company's ethics is a predictor of your compatibility with the environment.

Executives greatly influence the culture, and their beliefs run deep. Listen to and read their communications to understand the culture they're advocating. Sub-cultures are also common, especially in large organizations, so watch the CIO's behaviors to gain an understanding of the IT environment.

How a company derives its revenue and the maturity of its industry greatly influences its culture and values. A company is also defined by its employees and their interactions, even their dress and demeanor. Is the group homogeneous or diverse? Is there little interaction, robust camaraderie or dog-eat-dog competition? "Meet as many different people as possible, so you can get a clear idea of the whole company and the roles played by everyone in the organization," advises workplace expert and author Joel Zeff.

Your performance and compensation plans reveal what's truly valued in the organization. So does how work gets done. The pace, the balance between individual and team contributions, and the decision-making processes are all indicative of the environment.

Operating Strategies

Here are some examples of company cultures, along with tips for getting along in each:

Growth Cultures: These companies are often part of an emerging industry and employ less-experienced executives and staff. The founder makes most of the decisions. They feature low-structure, informal working environments, a fast-pace and they value results over processes. Risk taking and innovation are encouraged.

- Show initiative. Don't wait to be told what to do.
- Bring ideas to the table, especially ways to generate revenue through technology.
- Work quickly and put in long hours.
- Demonstrate comfort with shifting priorities and working without guidelines.
- Take advantage of the access to senior leaders.

Maturing Cultures: Growth is slowing and perhaps the industry is consolidating. The founder may have moved on. Executives are looking to add processes and infrastructure, and mergers and acquisitions are possible. The priority is taking the company to the next level.

- Be solution oriented. Suggest ways to drive productivity and lower costs.
- Suggest technology processes that add value while offering greater control and security.
- Prepare a mini-business plan when presenting an idea, demonstrating the long-term value of implementation.
- Demonstrate your leadership skills and your ability to build consensus among team members.

Mature Companies: These are often industry leaders. Their priority is protecting market share. Process-driven, they're highly structured organizations that use formal decision-making processes and are fairly risk averse.

- Use formal business etiquette, especially when communicating.
- Vet your ideas and win support before elevating them.
- Demonstrate patience and a penchant for detail.
- Take advantage of training programs and mentoring opportunities, volunteer for additional responsibilities.

Asking for a Raise

How to have an effective conversation

Want to initiate a conversation with your boss about a raise? Do some research. Present him or her with some creative ideas, quantifiable goals, and a can-do attitude. Stay "friendly, firm, and focused," in the words of one IT professional. Add a fourth F, flexible, and you'll get an A-plus in negotiating skills.

"Have at least a couple of pay/benefits-increase scenarios in mind, provide documented, positive peer- and cross-team member reviews, understand the going rate in the company and the industry for the same skills and role, present a set of achievable, measurable goals, and be prepared to offer 'value-added' ideas to garner bonus money," advises Matt Jones, senior mobile Web content manager at eBay/PayPal. In addition, Jones says, "Volunteer for additional training to augment a group's goals, and, if at all possible, have in your back pocket leads for a job transfer and/or a new job if your desired raise doesn't materialize."

But it's important to understand: You don't have to threaten to quit to make negotiation work to your advantage, especially if you like your job. In fact, in most cases, you probably shouldn't.

"The most important thing is not money. It's probably the least important, as long as you're getting a competitive salary," says Lee Miller, author of *Get More Money On Your Next Job in Any Economy*. What's more valuable, he says, are opportunities for training and professional development, jobs, and the projects and teams you may be invited to work on. "Frankly," he says, "the company wants to develop you. And companies like employees who are proactive in developing their own career."

That doesn't mean you should agree to be woefully underpaid, however. Research the salary range in the industry and geographic area for the position you'd like. (Sites such as Salary Expert, Moving.com, and CNN Money are good places to start.)

"If the salary isn't competitive, you can ask for more," Miller says. But, he cautions, "Ask, not demand." In other words, say, "Would it be possible," rather than, "I need to have..."

And never mention your high rent, significant student debt, or materialistic romantic partner as justification for wanting more money. Underwriting your private life isn't your employer's responsibility.

If you think an offer is lacking, restate what you think you're worth and why, and wait for a counteroffer. "Show why you think the salary isn't competitive and ask whether they can improve it," says Miller. "Be very prepared. Know your value in the market, what you bring to the table, and what you want."

And here's where flexibility enters the picture: Find out whether there's wiggle room in the benefits package or miscellaneous perks such as tuition reimbursement and in-house training. Look for continual opportunities to update and upgrade your skills so you stay competitive. Ask about other options like flextime, telecommuting, or covered commuting expenses.

Speak for Yourself

Before you begin any negotiation, make sure you're able to articulate clearly and cogently what you're asking for, and why you think asking for it is justified. Have an acceptable bottom-line figure in mind. Jot down your talking points beforehand and rehearse them until you feel confident enough to express them to a decision maker.

During the negotiation, be sure to listen as much as you talk. A win-win negotiation is a two-way street.

While these guidelines are the same for men and women, the sexes "tend to behave differently," at discussion time, Miller says. "Women tend to negotiate less, especially when it comes to negotiating for themselves." If you don't feel confident acting as your own best advocate, he recommends taking a course in negotiation skills and reading books on the subject. "You have to feel comfortable negotiating for yourself."

Finally, in any negotiation, don't become emotional or confrontational. Stay objective and be armed with facts. That's the firm and focused part. Have a goal in mind, then try to find mutually beneficial ways to achieve it. And regardless of the outcome, don't burn any bridges. Be gracious. You don't want to alienate the person with whom you've negotiated, especially if he's your current or potential boss.

Weighing Multiple Offers

Comparing the hidden values beyond salary

The world's appetite for interconnectedness and greater productivity continually expands the need for software and systems that provide better solutions and, in turn, a need for people who can build and maintain them. As a result, technology professionals are in demand. Even today, you shouldn't be surprised if you end up with more than one job offer to consider. If nothing else, you should be prepared for the possibility.

While you might want to jump at the highest salary, it's smarter to take a more holistic approach to mulling multiple job offers. Considering the often overlooked factors that affect your quality of life can make the difference between being deliriously happy at your new job, or growing to hate it over time.

Commute

One thing to consider is the length of your daily commute. Aside from the obvious transportation expenses, being stuck in traffic for hour upon hour every day costs something else: time you could use to do other things, either at work or in your personal life. That's to say nothing of the stress involved in long, crowded commutes. When comparing offers, then, be sure to look at distances and travel times.

Work Environment

The size, maturity and overall culture of a company should also be a consideration. Remember, you'll be spending most of your waking hours at work, so you want to be sure your personality and work ethic is a good match for the environment you'll be in.

Start-ups, young businesses, and small companies tend to be dynamic and require employees to wear multiple hats. If specialization isn't your thing, you may be happier in a place that will require some juggling.

Large corporations are generally just the opposite. Roles and duties are clearly delineated, and the overall environment is consistent. If you like stability and clarity, a bigger, more well-established employer may be the way to go.

Career Goals

Weigh any offer you get in the context of whether it advances your long-term goals and increases your value. The position you accept should provide the opportunity to develop skill sets that will take you to the next level.

You should also consider the resume-building power of a strong brand. For years to come, having Intel, Microsoft, or Google on your resume will make you stand out from other candidates, and can make the difference between getting a future foot in the door or being placed in the heap of other resumes under consideration.

Travel

Also consider the amount of travel a job requires. While 25 percent travel time may not seem like a lot, it's nearly 13 weeks on the road each year. Although some people thrive on constantly going places and meeting new people, others like to stick close to home. Carefully think through how the absence from home will affect you.

Geography

Each region of the U.S. has its own unique culture and idiosyncrasies. When considering work outside your geographic comfort zone, research the company's home base and, if possible, take a scouting trip. You don't want to turn down a local job for a higher paying position elsewhere, then end up being miserable because you have irreconcilable differences with your new home town.

Benefits

Benefits are often overlooked in job offers. Don't make that mistake. Consider:

- Medical/Dental Coverage: This can have huge hidden costs. The difference between what's paid by your employer and what's actually covered at your doctor's office can account for a sizable portion of your wages over the course of a year.
- Paid Time Off: How many sick days are included? How many weeks of paid vacation per year, and how do they accrue?
- Education Opportunities: Is there a tuition reimbursement program? Internal or external training opportunities? Does the company encourage conference attendance?

Having the opportunity to mull over competing job offers is a great position to be in. By thinking about these and other issues besides money, you'll be able to zero in on the natural fit that can lead to a great career.

Becoming a Manager

Plan to succeed - Work your plan

Each year, thousands of new technology graduates descend on the business world with aspirations of becoming IT leaders. Given the competition, it's not surprising those who ultimately climb the corporate ladder began their preparations during college. After setting their sights on senior management, they started amassing the skills and experience that would eventually propel them into a corner office. By the time they arrive in the workplace, they're ahead of the pack because they're ready to launch the next phase of their plan.

Student Experience

Here's how to acquire the skills you'll need for a successful climb, even before you earn your degree.

Manage Yourself: "As cliché as it sounds, students should prepare for senior management roles by being able to manage themselves, especially when it comes to time management and taking personal responsibility," says Long Yun Siang, author and publisher of Career-Success-For-Newbies.com. "You must be able to manage yourself before you can manage others and you must be able to lead yourself, before you can lead others."

Gain Leadership Experience: From serving as a technology club officer to managing student projects, take advantage of every opportunity to gain leadership experience. Because management skills are universal, even managing others in a part-time job will help you prepare to reach your goals.

Find a Mentor: It's not your technical knowledge that will catapult you into a senior manager's chair, says Steven Cerri, a trainer and coach who works with technology professionals. Senior IT managers are selected for their leadership skills and their ability to use technology to create business solutions. Students shouldn't expect to acquire that knowledge in the classroom, Cerri observes, because the only way to learn critical thinking is from a mentor.

"It's important to ask mentors not what they do, but why they're doing it," says Cerri. "What you want to learn is their way of thinking, because managers get paid for their judgment."

Many schools offer formal mentoring programs, but don't hesitate to network with alumni or local business leaders to identify a senior IT leader who may be willing to share their expertise. The faster you demonstrate your wisdom in the workplace, the sooner you'll begin rising up the ladder.

Acquire Hands-On Technical Experience: Real technical experience will not only prepare you for the workplace, it will expose you to a variety of industries, positions and managerial roles so you can target your desired position and begin planning your course. Internships, co-ops, summer jobs and student projects all provide opportunities to receive such experience, but if you aspire to be a senior IT manager, don't just focus on the technical aspects of your assignments. Interface with users and managers to understand the business challenges you're solving, and bring those analytical and problem-solving skills to the workplace.

New Employee Success Plans

Once you're hired, demonstrate your penchant for leadership, but not in a brash or overbearing way.

Bring ideas: Both Cerri and Yun Siang agree that offering up ideas is the best way to establish yourself as a candidate for leadership. Meetings are an excellent venue for demonstrating your innovation and leadership potential, Cerri adds, because they allow you to influence others without having authority over them. "Come to meetings with ideas, but show your leadership capabilities by not fighting for your ideas," he says. "Be open to the ideas of others and make sure all ideas get put out on the table by facilitating discussions and asking questions."

Find a Mentor (Part II): Successful business leaders have often been coached by a series of mentors throughout their careers. Find a mentor who has already travelled the path you want to take and ask them to share their wisdom with you.

Connect Technology to the Business: Understand the company's agenda and demonstrate that you can communicate effectively with users.

"Show that you can bridge the gap between technology and the work environment and you'll advance more quickly," says Cerri. "Interact with people by spending time in the trenches, dealing with internal and external customers. Ask questions to elicit their perspective and understand their position first, before you tell them yours."

Q&A: Jim Burnham

Senior Technology Analyst, Independent Contractor

You've been in this industry for about 30 years. How did you get started?

I'd gotten a degree in psychology but decided not to pursue that as a career. I moved to Boston from Austin and heard about a computer training program at John Hancock in Boston from my sister. An initial aptitude test qualified me for the program. That was the beginning of my career in computers, in an eight-week starter course based on mainframe computing: COBOL, JCL, and structured programming and business procedures of the time. After a couple of years as an application programmer, I applied for a position on the systems software technical team, doing mainframe network support.

How has the IT industry changed?

Computers have evolved from mainframes using "dumb" green-screen terminals to a world of devices with embedded task-specific computing: phones, entertainment devices, homes, offices, retail, security, medical devices, etc. All of these require support and must be kept up-to-date. It's a fast-paced world with new devices, new applications, new security challenges, and new support strategies arising all the time. IT professionals have to try to keep up with the pertinent challenges that come their way, whether on the job, at school, at home or on the street. There's so much happening that often all you can do is be in "react mode," and deal with what comes at you.

What advice would you give students who are choosing IT as a profession today?

If you want to go into information technology, find a niche that combines it with other related skill sets, such as medicine, music, gaming, aeronautics, communications or security, for example. This will give you real-world applicability, and lead to more opportunities to expand your marketability.

Try to understand how all technology relates to all people – and other devices – that use it to accomplish their intended purposes. Look at how those intended users will actually use it and how a product can evolve with their needs, along with other technologies and maintenance needs. Look at IT as a set of tools, realizing that the tools can and will change, that things will go wrong and need adjustments and corrections.

What's the most challenging aspect of your work?

At times, day-to-day tasks may become boring or drudgery. You have to learn to deal with unreasonable users, malfunctioning equipment, unreal deadlines and promises, unclear specifications, and still prioritize all the urgencies and necessary requirements that come your way. Then the hard part is to be proactive: to stay up, or ahead of, the newest technologies.

'Look at IT as an important facet in your career toolbox, but have other tools that interest you in there, as well.'

Networking is your specialty. What advice would you give to students who want to focus on this?

Learn which products are the current leaders and how they are deployed. This can differ by size of network, user population and industry. Talk to those who know technologies like Cisco, Avaya, Apple and Microsoft, and try to get some real-world experience with their care and feeding. That will give you a feel for them.

Look into certifications, internships and entry-level positions. Gain understanding from all viewpoints, from the 50,000-foot view to the up-close, from end-users to global providers, upper and middle management, as well as your peers. If you have an opportunity now to get certifications, then get those initial certifications, but do real world work before progressing to more advanced ones.

Any other thoughts?

Look at IT as an important facet in your career toolbox, but have other tools that interest you in there, as well. They'll work together better if you have a good understanding of their interactions. Plus, you may want to segue into one of those other careers sometime, if you see greener grass in that other pasture, or if the industry changes and you need other alternatives.

Q&A: Michael Statmore

Post University, Director of Information Technology

What advice would you give someone considering a career in IT?

If you're looking to learn a lot in a short time, start off by working for a small company. You'll have more exposure to more things, whether it's infrastructure, application-related or data-related responsibilities, or all of the above. Smaller companies move much faster and have a greater need for people with a can-do attitude to take on more projects and more responsibilities. Working for a larger company is good, too. But, again, it all depends on what feels right for you. Larger companies tend to have more training resources and allow you time to train. These resources may take the shape of classes, books or mentors. In a bigger company, you'll have the chance to specialize in one or two areas.

Which skills do you expect to be more in demand during the next few years?

I'm going to stay away from predicting what the next hot area will be. Instead, I'll say the real skill that's in demand is a can-do attitude. This means you have to be willing to do any job or responsibility, no matter how big or small. Another is the willingness to learn. When you combine these two things, you create opportunities for yourself.

How do you approach an interview?

If I'm the person being interviewed, I perform as much research on the company as possible. Get a good night's sleep the night before. It's important to have a lot of questions and be prepared. It demonstrates that you've done your homework and are interested in the job.

If I'm the person conducting the interview, I review the candidate's resume thoroughly. I look for something that I can speak to them about to put them at ease. I also make a mental list of areas I want them to give more information about.

What do you look for in job candidates?

In general, you need to have the proper amount of experience in relation to the position. I wouldn't be talking to you if you don't demonstrate that on paper. When someone is in front of me, I'm looking at their soft skills. Anyone can be taught to be a project manager or programmer or systems administrator. But you can't teach someone to be curious. You can't teach them to be responsible. You can't teach them to be a quick learner. These are the main skills I look for.

'When someone is in front of me, I'm looking at their soft skills. Anyone can be taught to be a project manager or programmer or systems administrator…'

How much weight do you put on education versus experience, and experience versus certifications?

Experience is the most important. Education is next. Certifications are last. There are many good people who have valuable experience but don't have any certifications.

Do you think it's a good investment for an IT worker to earn an MBA?

It really depends on what you want your career to be. If you want to take a more technical track, then I suggest you look at pursuing a post-graduate degree like a master's of science. If you want to be a technology entrepreneur or reach an executive management position like CIO, then an MBA might be a good thing to shoot for.

So, what made you choose the career path you've taken?

The short version is that I was drawn to technology over time. I'm a classics major who went into sales and management right out of college. From there, I tried my hand at my own business. When that didn't work out, I looked around for what I wanted to do. I realized that I really enjoyed working with technology so I went back to school for programming. From there, I kept trying new things. I took on responsibilities and learned skills that few people in the organizations that I worked in wanted to do or learn.

Life as a Contractor

It's not for everyone

Contracting is a work model where you "lease" your skills to a company in exchange for a salary. You're hired to do a specific job or project for a limited amount of time. Because you're not an employee of the organization, your compensation is different.

For the most part, contractors find work in one of two ways: They work with an agency that finds projects and clients, and are paid a portion of the fee the agency earns. Or, they work their own channels, in which case they receive 100 percent of the negotiated fee. While contractors don't get benefits like health insurance, retirement savings, vacation or sick pay, they do have flexibility, freedom from office politics, and larger earnings.

To succeed as a contractor, you need the right skills and temperament. You have to look beyond your technical strengths and weaknesses to understand what makes you tick. You need a realistic view of your people and marketing skills, in addition to your technical knowledge base. In addition, you have to understand the market and how you fit into the world of work.

To help determine whether you'd be happy - and successful - as a contractor, ask yourself these questions:

Can I manage an inconsistent flow of income?

As a contractor, there will be income fluctuations depending on the flow of the work. It is very important that you have good budgeting skills and are able to account for boom and bust periods. If you are someone who can handle an inconsistent income stream, you will be able to handle contract work better than if you prefer the same paycheck every two weeks.

Additionally, when looking for work and setting your fees, you will need to account for more than just the actual hours you are performing a given task for a company. You will not be paid for vacation time, sick time, holidays or time looking for your next assignment. You need to account for this time yourself, and figure these blocks of time into your rates.

Finally, you will need to have a broad lens when looking at billable hours. Many people don't make time to network, as they see it as competing against billable hours. However, if you don't take the time to continue to build your network of contacts, when your contract is over, you may find yourself without a next job and no income.

The bottom line: You have to balance time working with time looking for work, and factor both of these into your fees.

How good are my marketing and communication skills?

You have to be comfortable with self-promotion. You must be able to promote yourself, to communicate to others what you've accomplished, and get them to understand your value. You need to look closely at what skills you possess or can develop beyond your technical knowledge that will allow you to communicate comfortably with others.

You have to be comfortable selling the product "you" to others. You must utilize the same skills to market yourself that you would use to promote a company's product or service. However, you are now the entire company performing all of the marketing functions.

The bottom line: You are your own marketing firm.

What is my marketability?

Often, people both under- and overestimate their abilities. In today's marketplace, it's important to have a realistic view, to understand what technology is hot and which companies are using it. It is helpful to get honest feedback from friends and colleagues about the compatibility of your skills and work style with the current state of the industry.

A careful analysis of how you fit into the needs of the industry will allow you to see if there are areas you need to improve to make yourself competitive with the marketplace.

The bottom line: Know your skill set, and be prepared to add to it.

Do I take initiative?

Contractors need a mindset of initiative, perseverance, and determination. In many ways, you need to be in constant job search mode. You have to be willing to go to networking groups, stay connected to other people in your industry, and remain knowledgeable about the news within your industry.

Additionally, you must be in charge of your own learning and development. You will be expected to be independent, self-motivated and self taught at work.

Companies will want you to learn on your own time and they will not invest in your training and development.

The bottom line: You are always running your own job search.

What motivates me to do good work?

If you command a high enough wage to cover your benefits and account for time spent looking for work, you can make a good living as a consultant. However, other factors besides money might motivate you, such as avoiding crazy bosses and office politics. Or, time flexibility, or the excitement that comes from being exposed to many different environments, industries, technologies and people.

Since you won't have performance reviews, validation for a job well done has to come from your own personal satisfaction that you're doing good work and making the right trade-offs.

The bottom line: Your satisfaction needs to come from within.

Do I have decent time management skills?

You need to balance your time working with time off. You need to build in time to network for future jobs as well as make time for ongoing training and development. Ask yourself if you are someone who may have difficulty working from home. Can you buckle down and structure your time well, or will you get distracted by watching TV, surfing the Internet, or texting friends?

The bottom line: You'll need to crack the whip on yourself.

How important is it to me to have colleagues?

You aren't part of the company or part of an ongoing team. For many, contracting can be lonely, especially if you are someone who needs connection with others. However, if your self-esteem comes from getting the technical aspect of the job done - as opposed to being social and connecting with others – you will be better off. Ultimately, you need a thick skin, and you can't worry if people like you or don't like you.

The bottom line: You're a hired gun, not one of the townspeople.

How do I view my contributions?

Do you need to see projects through to completion or is it enough to know your individual contribution was well done? As a contractor, you will be working on one piece of a larger project. You most likely will not have a say in the development, nor see the people use the code you wrote. You probably will be working on term projects, and won't see a them through to fulfillment.

The bottom line: You need to be happy with only pieces of the puzzle.

Can I tolerate ambiguity and risk?

Are you the kind of person who's willing to live with a level of uncertainty? As a contractor, you rely solely on yourself. You have much more flexibility and freedom, but you are on your own. When you are an employee, there is a larger entity that supplies support and a degree of predictability.

If you have a family, are they capable of supporting you through the ups and downs of contract work? Can you ride out the slow times with a degree of calm and certainty?

The bottom line: Can you survive hard times?

What environment do I do my best work in?

Are you energized by the kind of risk, change and undefined rules you would find working for a start-up - or do you prefer stability and structure? Do you want to work as part of a problem-solving team, or do you want to be independent? Do you need the buzz of an office environment or the ease of working from home? By identifying the work structures that support or stifle you, you'll be able to seek out opportunities that allow you to be most productive and happy.

The bottom line: Are you looking for security or adventure?

Do I have good negotiating skills?

Negotiating is often difficult for people. It's one thing to know what you want, but it's another thing to ask for it. From childhood, people have been conditioned not to be greedy or pushy. You may fear that if you ask for too much, a company won't want you. If you've done your homework, know your value and the going rate for the type of work you do, negotiating will be much easier.

The bottom line: You need to ask for value to receive it.

Contracting is a complex work commitment with its own pluses and minuses. By taking an inventory of yourself beforehand, you will be going in with your eyes open and you will have a better chance of success.

Marketing Yourself

How to get the word out

Networking and marketing are skills many people ignore or don't properly develop. However, your ability to earn a consistent and decent income as a contractor will be hurt if you don't make time to do so. You want to be the person people think of when they need an IT professional for their projects. Here are some tips.

Stay Current and Informed

Regularly read industry news in journals, blogs and Web sites. This will allow you to anticipate work needs and trends. You should be well-versed in industry news so you can converse knowledgeably with others who could be a connection to projects down the road.

Join Professional Associations

Associations are a great way to connect with your peers and to get industry buzz about who is hiring. Conferences often feature guest speakers and discussions to keep you informed. Showing up to meetings tells people you're interested in your industry, and in keeping yourself up-to-date. Often, they provide the chance to give a brief introduction about yourself, what you do, and what you're looking for - your very own 30 second commercial.

Be the person people think of when they need an IT professional for their pet projects.

Follow these few steps:

- Know what you're walking into. Call or e-mail ahead and find out the structure of the meeting. Ask about dress code and what the general flow will be.
- Develop a 30-second commercial about yourself so you're not caught off-guard when someone asks who you are or what you do.
- Wear a name tag on your right side (so people can easily read it as they shake your hand), make sure you have a firm handshake, and look people in the eye.
- If you want to meet a certain panelist, or you notice a person who works for a company you're trying to break into, simply ask for their card. You can e-mail or call the next day. Since you've a connection from the meeting, many people will accept your request.
- Don't spend your time huddling in a corner with a friend, or sitting at a table checking your Blackberry. Look interested on the outside, regardless of how you feel on the inside.

Stay Connected to the Past

Make sure you stay connected with past colleagues. Send occasional e-mails. Share an interesting blog post or article. Give a job lead. Let people know what projects you're working on, and what you're interested in doing. Schedule regular coffee dates or lunches for face-to-face meetings. These conversations might generate leads and will keep you fresh in people's minds.

Maintain a Positive Public Persona

Your goal is to have people see you as competent, hard-working, and positive. Regardless of the economy, you need to show the work world you're confident, upbeat, and can handle change. If you don't feel it, fake it.

Get to Know Recruiters

Learn who the best recruiters are in your field. Ask them for a face-to-face meeting. Showing that you're willing to take the time for a personal meeting helps you stand out. This is especially useful when you have similar skills and expertise to others in your field.

Become a Known Expert

Share your expertise through writing and speaking. If you're comfortable speaking in front of groups, look for ways to speak at professional association meetings or industry conferences. If you're less comfortable in the public eye, get your name out by writing articles for industry publications and Web sites, or set up your own blog.

Use Social Media

Online networking is another way to stay connected and get your name circulating. Find out which social networking sites are used by people in your industry. Take the time to create a well-written profile and make sure the message you're sending is one you're proud of. Use the sites to find connections to past employers, old friends, colleagues, vendors, and fellow alumni, and initiate conversations that might generate leads. Also, by participating in relevant discussion groups, you can further brand your name and expertise.

Recruiters and Agencies

An important relationship for contractors

Independent contractors can be called "ICs," "consultants," "freelancers," "free agents" or just "contractors." Whatever you call it, to make this type of work, well, work for you, it's important to find a good recruiter or agency.

Many recruiters advise tech professionals who are trying to land jobs as contractors to find an agency that specializes in, and is knowledgeable about, the IT business. "You want to work with IT recruiting specialists because they have deeper ties to the IT industry," says John Reed, a district president with Robert Half Technology. "They also have strong relationships with IT managers."

Steve Feest, a business development manager at staffing firm Manpower Professional, says it's perfectly acceptable for contractors to work with several agencies. Eventually, he notes, you'll develop a longer relationship with the agency or recruiter that regularly offers the best opportunities and service. "You'll end up working with the one you have a good relationship with because you know they're going to bat for you," he says, adding, "You should partner with those that have presence and credibility in the marketplace."

When seeking an agency, follow the same approach you would if you were researching a full-time employer. For instance, look at the culture and personnel of the different organizations. It's a good idea to find one staffed with recruiters who were once IT consultants themselves. That way, you'll be dealing with people who have the perspective of both client and consultant.

Good firms have people who'll return every phone call, answer every e-mail and follow the instructions given by a candidate so they won't, for example, enter your name into the company database without your permission.

"I treat my consultants like they are my clients and my client like they are my boss," says Feest. "It's a two-way street."

Positioning Yourself

When pursuing contract work, keep your resume clear and concise by leading with your specific IT skills and outlining the hands-on experiences you've had with those technologies. Have you written code for an application? Have you installed a database or rolled out a network? Be sure such accomplishments are high up on the page.

"You want to list that quickly but concisely," says Reed. "That is one of the first things a recruiter will be looking for, so you need to paint a picture of the types of roles the recruiter should be calling you for."

As for interviews, it's important to emphasize the kinds of projects you've done that were more short-term. "Because that is the nature of contract work," says Reed. "For example, give a recruiter ideas of projects that you worked on that were three months long."

Good communication is a key element to a good relationship. For example, it's always worth making a call to an agency after submitting your resume. This will show you're serious about a role and will give you a chance to build a strong rapport. Some of the typical questions to ask an agency and recruiter include: How many placements do you do on a monthly basis? What's the size of your client? What is the scope of responsibility for a particular job? Will the job lead to a permanent position?

Depending on the type of work involved, contracting jobs can be as short as three months or as long as a couple of years. Before you set out to become a consultant, you should have expectations of your market rate, where you want to work and what type of roles you want to be considered for. You may well receive calls for roles which don't fit your requirements, so be firm and hold out for the right ones. This is easier to do when times are good, but you may need to compromise when the market dips.

Agents will typically expect to be paid a percentage of your contract rate in return for negotiating the role for you. In an ideal world, you could easily work directly for clients, but in reality many companies prefer to outsource their contractor recruitment to agencies. Always ask what commission the agent is charging, and if you feel it's too high, suggest that your rate should be adjusted accordingly. For this reason, if an agent initially asks what you'd expect to be paid for a given role, be noncommittal, and try to get them to suggest a range first.

Contractor Q&A: Angela Didde

What's your specialty?

My area of specialty is project management and business analysis. As a PM, my primary responsibility is to pull the team together and keep the ball rolling. Scheduling, estimate development, cost tracking are all elements of this function.

Probably the most critical is the ability to anticipate problem areas - for example, risks, early indications of slippage, or scope expansion. Then, I deal with them before they cause an issue and impact the bottom line.

I keep the project on schedule, and I'm responsible for reporting its status to senior management. This can include a combination of project risk rankings, financial issues, resource constraints.

As a PM you need to be a quick study. You need to figure out what's going on fairly quickly and on your own. You may not be familiar with the particular application or group of applications that make up a project, but you need to be able to assimilate on your feet.

As a business analyst, I work at the detail level for a specific function or range of functions, and am responsible for quickly becoming the subject matter expert, or at least knowing who to go to for answers.

Why did you stick with contracting rather than go for a full-time job?

I've been a PM/BA for the last 30 years, and primarily a contractor for the majority of the last 12. Before that I was a full-time employee. During this time period, it appears the hiring model has changed, especially with work related to new development. Contracting is a way for companies to handle the need for flexible staffing levels.

What are the pros and cons to IT contract work?

The pros:

- You're always learning, and you usually don't get bored since you're always in a different environment with new business applications and processes.
- The ability to live and work in different physical locations.
- You may be able to take extended periods of time off (say, for travel).
- I've found contracting usually pays better than what you'd get as a full-time employee, even if you factor in health insurance.

The cons:

- You're always an outsider.
- You don't get benefits like insurance or a pension.
- You're continually interviewing
- During hard times, you're the first to go and the last to get put back in.
- You may need to spend extended time in locations away from home.

'You're always learning, and you usually don't get bored since you're always in a different environment...'

What's your typical day like?

For the contract I'm working on now, it's the same as being an employee. I have the option to work from home or telecommute. Depending on the home situation and the tools I need, I have the choice. I've worked on contracts that were 100 percent telecommuting and others that were 100 percent in the office. It depends on the company.

Aside from IT expertise, what other skills does someone need to be a successful contractor?

A sense of humor, people skills, self-confidence, and some armor. You're not treated like an employee. Invites for Christmas parties, company or department functions will not usually include you.

Bookkeeping 101

What new contractors need to know about running their own business

If you're considering contracting - or any kind of self-employment - you need to understand these essential pieces of tax and financial information.

Get Relevant Tax and Financial Advice

The most important piece of financial advice for new contractors? "Secure the services of a tax consultant or preparer knowledgeable in your field," says Kathleen M. Morris, a certified tax and financial consultant for Donahue & Associates in South Boston, Mass. "Friends and co-workers may be able to recommend someone. You want someone who knows the ins and outs of your area of expertise so they'll be able to guide you appropriately," she says. Be discerning. "Usually you'll work with that person for years to come, so it's vital that you choose someone you have confidence in, and sense too that they're comfortable working with you."

Be a Record-Keeping Pro

Track all income and expenses: Know how your money comes in, and how it goes out. "Keeping good records is the key to success in any business," says Morris. "Bookkeeping software can help you out. Find out what your colleagues use. Perhaps they'd be willing to help you get started." Or ask your tax advisor to recommend a professional bookkeeper.

Pay Estimated Taxes

Some clients will withhold taxes from your earnings. Others won't. "If an opportunity arises for you to do contract work and no taxes are going to be taken out, meet with your tax person to find out which expenses are tax deductible, how to track them, and discuss the need to prepare estimated tax payments," says Morris. "It's easy to end up in a tax penalty situation if you don't prepay your taxes."

Get Business Plastic and Checking

To simplify record-keeping, your tax advisor may recommend using a dedicated checking account and credit card for all business-related expenses.

Keep Invoicing Simple

Invoicing need not be complicated. Indeed, for a solo or small business, software such as QuickBooks may be overkill. Invoicing clients using a simple Excel spreadsheet, or even a Word document, can suffice.

Invoice Promptly

You need to eat. But before you get paid, your client typically needs to see an invoice. So the sooner you invoice, the faster the accounts payable department will cut your check. (And if it's been 30 days, by all means send your client a polite follow-up inquiry.)

Track Hours, Billable or Otherwise

Lightweight software tools (such as TimeLog for Mac) can help track your hours, billable or not. Typically, you select the project you're working on, then hit start/stop. The benefit of such software is its ability to slice and dice information and export it in multiple ways. This simplifies invoicing for hourly work, or determining the total time invested in a fixed-price project.

Rank Clients

By logging your work time, you can regularly divide your earnings by hours worked. This will show you the relative dollars per hour each client pays. Use this information to help rank your clients. Then over the long term, try to get more work from your best clients, add better paying clients, and eliminate the least remunerative ones.

Become a Better Entrepreneur

What's the best way to refine your business skills, while also learning from peers and marketing yourself? "Local colleges and communities sometimes offer workshops on becoming an entrepreneur," as do alumni groups, says Morris. "This is a great way for a person starting a business to share ideas and network." It's also a good way to advertise your services, or even find someone to design your business Web site.

Anger Not the Taxman

Feeling flush after your first paychecks arrive? Savor it. Just don't forget to set aside taxes. One effective strategy is, "out of sight, out of mind." Meaning, immediately move what you'll owe in taxes into a separate savings account.

Are You Contracting Material?

These skills aren't rocket science, but they're essential for succeeding at self-employment. If you can't be bothered with them, consider a day job.

Green IT

Trends, technology, and specialties

Green IT is emerging as a hot information technology specialty. It's not necessarily because corporations have suddenly become enlightened about carbon footprints and the battle against climate change, but rather for a far more prosaic reason: Green IT saves money. Building and maintaining large, power-hungry, underutilized data centers is expensive. IT experts who can design smaller and leaner infrastructures will find themselves in high demand.

What is green IT exactly? While there's no single definition, Simon Mingay, the author of the Gartner report *Green IT: The New Industry Shock Wave,* defines it as, "optimal use of information and communication technology for managing the environmental sustainability of enterprise operations and the supply chain, as well as that of its products, services, and resources, throughout their life cycles." By using more efficient "eco-friendly" technology and techniques, enterprises also save money, thereby addressing two important issues at once.

If green IT came to prominence for environmental reasons, it got more attention when oil climbed above $100 a barrel and energy expenses were on the top of everyone's minds. When oil prices fell and the economy collapsed, the new impetus was to increase corporate efficiency and address total cost of ownership. Green IT does it all, and it's catching on quickly. Forrester Research projects the $500 million spent on green IT services in 2008 will grow to $4.8 billion by 2013 as old hardware is replaced, new data centers are designed, and corporations brace themselves for the inevitable arrival of new rules and regulations about emissions and energy use. A survey from Deloitte and CFO Research shows that by the end of 2009, as many as two-thirds of all large companies may have put in place strategies for making their tech departments more environmentally and energy friendly.

According to the Environmental Protection Agency, U.S. data centers and standalone servers consume 1.5 percent of the country's total electricity supply, and are on course to nearly double their use of power by 2012. If that happens, they'd require the equivalent of 10 massive new power plants, and by 2020 would indirectly generate more greenhouse gases than all the world's airliners combined.

Helping make IT go more green is a big opportunity for job seekers who are looking to specialize in an area that's guaranteed to grow. Companies are eager to streamline and optimize their infrastructures in ways that promise to lower their energy use, lower their overall equipment costs, perhaps save money on real estate and, yes, even cut down on personnel. Can they do all that and still increase their overall use of technology? A green IT expert can certainly help. Anyone who can deploy energy-efficient computers, servers, and peripherals, or create the software and services aimed at making systems run better, will be in demand.

Virtualization

For some IT experts, green IT is synonymous with virtualization, the science of squeezing more performance out of underutilized servers by creating "virtual machines" inside them that can handle multiple tasks simultaneously. A survey by McKinsey found that among a total of 458 servers at four production data centers, 32 percent (146 in all) were running at or below 3 percent peak and average utilization. That's no way to run a data center.

Do virtualization the right way, and data centers can cut the number of installed servers, save on space and cooling costs, and cut back on the labor needed to keep multiple servers up and running. IBM experts say even a first try at virtualization can cut energy consumption by an average of 23 percent. The cost of implementing it is paid back in under two years. And evidence from the trenches shows that it works. Agricultural giant Monsanto, for example, uses just 16 physical servers to run 350 virtual servers. The United States Postal Service went from 3,000 servers down to 2,000. Its server utilization rates have risen from a low of 30 percent to an average of 50 to 60 percent. Citigroup plans to go from 52 separate data centers as of 2005 to just 14 by 2010. That's less hardware, less energy, and less real estate, all of which add up to savings - not to mention a healthier environment.

Classes and certifications in all aspects of virtualization are available, with many students gravitating toward learning the ins and outs of VMware, the leading virtualization software platform. Microsoft also has its own set of virtualization solutions that students can study for certification.

Data Center Management

Another emerging green IT specialty is data center design, management and maintenance. The energy consumed by data centers goes mainly to servers and cooling systems, so the more crowded a data center gets, the more energy is consumed. One Gartner survey found almost 70 percent of data centers are constrained for power, cooling, and space, meaning they need to be redesigned and redeployed. Energy-efficient servers run cooler and demand less cooling. Still, 90 percent of companies with large data centers expect to add more power and cooling within the next two years, unless, of course, an expert can come in and show them how to do things differently and better. With new server and intelligent cooling options, an average 20,000 square foot data center should be able to cut its energy consumption by 40 percent, a potentially huge savings, and one that may also reduce carbon emissions by almost 7,000 tons per year.

Alternative Energy

Anyone interested in green IT should study up on the types of alternative energy sources that have made news during the past few years. Many of the nation's largest data centers have implemented some sort of solar collection on their vast roofs. Wind power continues to be explored even though falling oil prices and the global recession have knocked it out of the headlines. And don't forget about waves: In 2007, Google filed a patent for a floating data center that would incorporate wave energy converters that use the motion of ocean surface waves to create electricity. Google says 40 such units could create 40 megawatts of power, and the data center would have no real estate costs or property taxes. That's green IT thinking at its most inventive.

Business Process Management

Making the transition to a more paperless workflow and culture is one part of total business process management (BPM), the study of improving corporate efficiencies from top to bottom. IT plays a huge role by consulting on advanced networking technologies, including pay-as-you-go networked services designed to acquire and store electronic documents while keeping them secure but readily accessible in off-site locations. This is one way green IT can improve not just the bottom line but also the very nature of day-to-day business operations. Green IT can encourage top management to find ways to redeploy employees whose job it is to literally "push paper."

Helping make IT more green is a big opportunity for job seekers who are looking to specialize in an area that's guaranteed to grow.

Cloud Computing

At a time when virtually every organization is looking for innovative ways to "do more with less," one way to gain efficiency is to implement an Internet-based utility computing mode, in which the precise amount of networked resources needed at any given moment are provided by a trusted third party. You use only the infrastructure you need but always have the opportunity to adjust it on the fly, which allows companies to reduce costs for internal hardware, software and IT services while maintaining a state-of-the-art networking environment.

Green Product Procurement

Today, hardware manufacturers are taking more responsibility for the entire lifecycles of their products - from factory to recycling. At the same time, government agencies are demanding all new purchases be environmentally friendly as defined by such standards as Energy Star or EPEAT (Electronic Product Environmental Assessment Tool), which today has more than 30 participating manufacturers registering more than 1,000 eco-friendlier desktops, laptops, and monitors. Consulting on the proper purchase, deployment, decommission, and recycling of hardware has become a specialty of its own.

Making IT Environmentally Friendly

How-tos tech professionals should know

How can you help a company go green? By being a well informed manager, by buying new kinds of hardware and software, and by redeploying existing technology in cost-cutting and carbon-saving ways. As organizations look to cut costs through energy savings and more efficient use of the infrastructures they already have, each of these areas become specialties in high demand.

Before you unplug a single server, it's vital to get complete corporate buy in. The way to do that is to focus first on potential cost savings, not environmental issues. Saving the planet may be a noble goal, but bolstering the bottom line is certain to be more important to the CEO. Determine how much energy your total IT assets consume, and how much that energy costs. Create a "green team" that includes people from facilities, business units, and marketing. Work together to set a first round of realistic goals that, once achieved, will spur enthusiasm and lead to more ambitious plans. Then roll up your sleeves and get to work.

As organizations look to cut costs through energy savings and more efficient use of their infrastructures, each of these areas become specialties in high demand.

Here are the big steps you'll be taking.

Virtualize and Consolidate

Studies have shown that up to 10 percent of servers in operation consume power but do little work. Virtualization increases server utilization, which means fewer servers are needed. Less power is consumed, less cooling is needed, less space is required, and ultimately fewer staff members may be needed. Virtualizing servers can also slow or eliminate the need to build a new data center down the line. As Albert Esser, vice president of data center infrastructure at Dell, has said, "The greenest data center you can have is the one you don't build."

When procuring new equipment, look into high-capacity yet compact blade servers (essentially entire servers built onto an expansion card). They're typically ten percent more efficient than traditional servers. When you do buy servers, look for energy-efficient multi-core CPUs that reduce redundant electronics and save on energy. Investigate CPU performance-stepping technology that dynamically adjusts the energy processors require as their load varies. Try to cut back on the amount of storage hardware you require by using storage area networks or network-attached storage that make consolidation easy, thereby saving on power.

Even if you can't totally eliminate your data center, consider managed services. By turning to outsourced services where you can and buying computing resources in a pay-as-you-go scenario, you can control costs without sacrificing capacity or reliability (if it is done through a trusted provider with a strong Service Level Agreement).

Replace Old Hardware

When you set out to procure new hardware, choose only models that have been certified as energy efficient either via EPEAT or Energy Star standards. Look into low-power flat-screen displays, solid state rather than traditional storage, and thin clients where they're appropriate. You may find that in some cases, equipment classified as state-of-the-art energy-efficient costs a little more, but Climate Savers - a nonprofit group of consumers, businesses and conservation organizations - says that in the case of PCs, the difference is likely to be only $30 per system, dropping to nearly zero for volume purchases.

Look for Efficient Software Apps

Software can aid in efficiency, as well. Look for applications that are multi-threaded to take advantage of multi-core-processor systems. As has always been the case, hardware evolves faster than the software that runs on it, so new state-of-the-art hardware can be overpowered for yesterday's applications. Keep that in mind as you investigate new software purchases.

Update the Physical Plant

Reportedly, 90 percent of companies with big data centers will need to add power and cooling within the

next two years, so data center design is more important than ever. Laying out a data center is a science unto itself. Since the 1990s, for example, experts have been recommending a hot aisle/cold aisle arrangement, where cool air flows into servers' front air intakes and flows out the back as near as possible to the air conditioning return ducts. Liquid cooling systems are also becoming prevalent. While relatively expensive to install, they usually pay for themselves over time.

You may also want to consider letting the temperature of your data center rise just a bit. Increasing the set temperature by just one degree can reduce energy consumption by four to five percent. However, you must proceed with caution and make sure to check all warranties before attempting this technique.

Learn Power Management

Most of us neglect to optimize the power-saving settings on our home computers, and the same is true in many corporate network centers and offices. It's vital to create policies for power settings to achieve the appropriate hibernate/sleep/shutdown on idle systems. Employees should be encouraged—or forced—to turn off computers and devices that are not in use overnight. You should also activate the sophisticated power-management features that are available on your servers.

Change Corporate Culture

What's your company's telecommuting policy? When employees can work from home even part of the time, their morale goes up and their automobile use goes down. At the same time, you can look into consolidating office space. Also, investigate videoconferencing and "telepresence" systems make it possible for companies to consider cutting back on business travel. Video collaboration can happen not only among employees but also among your partners, customers, and suppliers. Such technologies aren't just for talking. Documents, presentations, and almost any kind of application can be shared and worked on long-distance by collaborators.

Where the Green Jobs Are

While the job title "Chief Sustainability Officer" isn't yet prevalent at most large corporations, Green IT jobs exist anywhere data centers exist. In a recent survey by Deloitte Touche Tohmatsu and CFO Research Services, the majority of senior finance and IT executives said their company spent at least 5 percent of its IT budget explicitly on green IT initiatives. More than one third said their spending is at least 15 percent of the IT budget, and 14 percent said that at least a quarter of their IT budget was earmarked for these expenditures.

Once you understand that Green IT is about organization efficiency as much as energy efficiency, you'll see anything that makes business processes run better—and leaner—falls under the Green IT umbrella.

That could mean specializing in growth areas such as server and storage virtualization and cloud computing technologies. Today, no other technology talent is more highly prized than the ability to consolidate, optimize, and right-size big and expensive data centers that are operating inefficiently. Along those same lines, distributed networking, power management, data center design, remote data archiving, and management of remote hosted services are all skills that should keep you in good stead - not only today but in years to come - as more corporate computing moves from the servers in the basement to the cloud. There's also the opportunity to become the guiding force behind new ways of doing business, such as telecommuting, mobile access to company data, and videoconferencing and telepresence technologies.

Software developers will find work creating front-end interfaces to virtualized systems and managed services, and designing automation schemes to keep server loads optimally distributed at all times. And as new environmental compliance rules from the federal government start to kick in, compliance experts will be in demand to advise on everything from low-emission building materials and recycling to alternative energy technologies.

The truth, of course, is that successful green IT initiatives lead to more streamlined and automated technology, which needs less staff to maintain. If IT can do more with less, it will. Your goal is to be in the position to help design that green IT future - and not be left behind with the old IT guard intent on protecting its increasingly outdated legacy systems.

Q&A: Steven L. Sams

VP of Site and Facility Services, IBM

How did you develop an interest in Green IT?

We found there were a number of customer issues bubbling up that turned out to center around energy inefficiency. It was becoming a huge inhibitor to the future capability of IT to continue to provide more productivity and capabilities, and we wanted to find ways to address that problem.

How do you define Green IT?

Green IT is anything that can be done to cut down waste of all kinds committed by IT.

The IT explosion is continuing. One estimate says that in this decade, the average data center will increase its server capacity by six times and its storage capacity by 69 times. That increase is creating an explosion in the use of energy. In data centers energy use is doubling every five years, and it represents 2 percent of the total energy use on the planet. The UN estimates that worldwide energy use will increase by 50 percent by 2030. It all means IT will represent 12 percent of all the energy use of the planet by then.

How do you attack the problem?

By focusing on reengineering data centers. A typical data center uses 30 to 80 times the power per square foot of a typical office. It's an energy hog. In a data center, 40 to 50 percent of the energy is consumed by the gear itself, with the rest being consumed by the center's infrastructure, everything from cooling systems and generators to uninterruptible power supplies.

Do you talk more about saving energy or saving money?

Both. When a company builds a big data center, the cost to run it for the next 20 years will be about five times what it cost to build, and about 75 percent of that cost is energy. One of our largest clients was consuming as much energy in its data centers as the entire state of Connecticut. We can typically reduce that energy consumption by 40 percent, potentially saving a big client hundreds of millions of dollars over time.

So the ROI is readily apparent?

We find that energy efficiency metrics are also good operational efficiency metrics. Green IT makes for better-run corporations.

What kinds of skills should Green IT experts have?

This area covers both engineering and IT. On the engineering side of the equation, we need mechanical engineers to design power and cooling systems, and we need electrical engineers for electrical design of efficient technologies. On the IT side we need strong operational skills and people who can build software packages that provide clients a best-of-breed dashboard to give them real-time information. Our clients are really lacking data. They don't know where they can improve. Our engineers build apps to help them monitor and eventually automate these savings.

What's that automation about?

It's very exciting. For example, in a bank, many applications start to wane at the end of the day. Why not migrate those apps to smaller servers at an appointed time and then power down the big servers until they're needed again?

What about cloud computing?

It's clearly one of the solutions that we'll all move to eventually. Every one of the virtualization schemes that tries to run multiple apps on individual devices is a movement toward a cloud environment. If we are all using an asset at 5 to 10 percent of its capacity, and we eliminate 30 to 40 percent of the assets and run what's left at higher capacity, we're improving efficiency. It's like public transit for technology. Why buy your own car if you have other, cheaper methods of getting where you need to go?

What should college students who are interested in this field study?

You might be surprised to hear me say international relations. Data center environments are growing very rapidly, but they're growing the fastest in China, India, and central and Eastern Europe, where the applications are large and sophisticated, and domestic needs are growing rapidly. The largest telecom companies, insurance firms, and banks are in Asia right now, and they're expanding and facing the same issues. These aren't local problems, they're international problems, and they'll get solved in many places around the world in many ways. I would encourage people to get a view of the world, not of just their own town or state.

Q&A: Jean-Jerome Baudry

Founder and CEO, Cybernomics; Founder, Think Green Alliance

How did you get started in IT?

I studied economics and computer science. Right after graduation I started my IT solutions company, and from the beginning I was always looking to maximize the benefits of technology for my clients, to come up with technologies that would fit well within their business operations. At the same time, it's always been a personal passion of mine to find practical ways to address the issues of the environment, sustainability, and the reduction of carbon emissions, so now I do both at the same time.

Has it been hard to bring an environmental message to your clients?

Traditionally, businesses had developed a very despondent attitude toward anything that had to do with the environment or "green" things. Activists always talked in terms of doomsday scenarios and used very dramatic, reactionary, and activist rhetoric. There was a sense that a for-profit business couldn't work with an environmental agenda. But then the industry as a whole began to look at how technology could be more efficient and how they could make better products that were more recyclable and more efficient. About five years ago, everyone started talking about very pragmatic and quantifiable ways to reduce the need for electricity through consolidation, virtualization, and power-saving schemes, and we were on our way.

How do you define Green IT overall?

We define it as any product, technology, or methodology that shows a reduction in waste and consumption. The other area we focus on is management, the framework by which organizations execute IT strategies, link them to their operations, and make them as efficient as possible.

Is it important to keep the focus on cost savings?

Yes, we take a good hard look at how a company can reduce its carbon footprint and be environmentally sound, but do so in a way that ensures it can still do what it needs to do to succeed. It's about taking a practical, gradual, concrete approach to dealing with the needs of the business world while still dealing with environmental issues. In fact, 90 percent of our clients are using pieces of our sustainable methodology. Some of them may not even care that our techniques have the added benefit of helping the planet. They just like the savings.

What kinds of talents would you look for in a person you were planning to hire as a Green IT consultant?

I'd look for a person with three characteristics: someone who has a good sound technical background; someone with business and economic sense so he or she can talk about technology in terms of business productivity, not just as technology for its own sake; and someone with an open mind who displays a social conscience, someone who can see that each installation is part of a much larger whole that ultimately impacts the entire planet. Someone who says I can change my own habits, my own environment, my own community, and I can communicate what I do to others.

What should college students interested in this field be studying? It sounds like a mix of environmental science, economics, and computer science.

It won't take long for universities to catch up with these concepts. I expect to see more multidisciplinary programs where the environmental studies department hooks up with the economics department or the computer science department to talk about sustainable issues. The consciousness has already taken hold.

What are your hopes for your Think Green Alliance?

Our vision statement is about building a more economically and environmentally sustainable world, one valued customer at a time. All the members are organizations or businesses who understand they need to be profitable, but also need to have sustainability plans. Dell, Intel Canada, and Whole Foods Markets are the types of companies who are already involved. We try to supply multidisciplinary task forces to help companies become greener and more sustainable in practical ways that we can measure.

Application Development

When off-the-shelf won't do

When a company needs to streamline a business process and no off-the-shelf product fits its needs, it turns to the professionals in application development to craft a custom solution.

From large corporations to privately held small businesses, companies often need to leverage technology to reduce costs and improve efficiency. Application development offers that powerful leverage by creating solutions specifically tuned to the way a particular business operates.

At its core, application development is about creating software solutions that aid end users in accomplishing a task or resolving a pain point. This is done by guiding users through a discovery process, translating the business needs into functional requirements, then building and testing the end result. Unlike its cousin, product development, application development generally creates specific solutions for one particular client rather than attempting to address the needs of users in the mass market. Although the applications created may not be as visually polished as boxed software, they're no less technically complex. Working in this sector of IT, you may be required to build a complete software application from the ground up, or forge together both custom and off-the-shelf products into one coordinated system.

The Landscape

The recent downturn in the economy, and the accompanying "do-more-with-less" attitude, has revealed an even greater need for technology experts who can offer better business efficiencies through the creation of software applications. A recent Forrester Research report says that even in a recession, "business will still generate demands that require creation of new applications, extension of existing applications, and customization of packaged applications."

But no matter what state the economy is in, the outlook is good for application development. According to the Bureau of Labor Statistics, employment opportunities in application development will be on the rise in coming years. The bureau's *Occupational Outlook Handbook for 2008-2009* predicts development work will be the fastest growing area of the technology job market through the year 2016. A recent report by the Software and Information Industry Association (SIIA) shows this sector has experienced net employment growth of 17 percent over the past decade and significantly outpaced growth of the U.S. economy as a whole.

The most sought after candidates in the field generally will have at least a bachelor's degree in computer science. Having a CS degree lets employers know you've mastered a body of knowledge and principles that will allow you to materially contribute to projects soon after being hired.

Roles and Career Paths

Individuals involved in creating applications may work in a software development division within a large company, be part of the IT group, or work for a consulting firm. Within those three areas, the jobs break down along the key phases of the development process:

- Coordination
- Requirements gathering
- Design and construction
- Quality assurance (QA) testing

Depending on the size and structure of the company, you may be involved in all phases of development, may contribute in only one of the phases, or anywhere in between. Major positions in each phase are:

Coordination

Project managers are tasked with herding stakeholders toward a realistic plan and schedule that meets all expectations. After the need for a solution arises, it's the project manager's task to conduct interviews and create a project charter. This is a document that defines the scope, objectives and stakeholders, and sets out the project's primary roles and responsibilities. After consensus is reached on the charter, the project manager creates a project plan and schedule so what was contained in the charter can be executed, and progress can be tracked. From beginning to end, the project manager is communicating progress to all stakeholders, and identifying and removing any roadblocks that arise along the way.

Requirements Gathering

Analysts play a central role in studying the business problem and creating software requirements that will be used in constructing, testing, and maintaining the application over its entire lifecycle. It's the analyst's job to interview end users, determine how the software should function, then write down the steps that need

to be accomplished. Developers use this information to create software to produce the desired results. Individuals working in the requirement phase must be able to communicate effectively with a wide range of users and technologists with varying degrees of technical aptitude and vocabulary.

Design and Construction

Using the principles of computer science, roles in design and construction develop software to solve the problems stated in the software requirements documents. In the design stage, the developer chooses the computer language and associated technologies for the solution, and plans how the system will operate overall. In the construction phase, the developer actually writes the code that will make up the application, and often writes unit tests to confirm the code written meets its requirements.

Other positions involved in this phase include software engineers, programmer analysts, and database administrators.

Quality Assurance

The role of positions in QA is to verify that the application performs to the written specification and is free from defects. Using the work that the analyst and developer have done, the QA engineer creates test plans to exercise the application. Any defects revealed in the process are reported to development, and once resolved, are verified.

Skills and Qualities

- Excellent communication skills
- Leadership ability
- Superb planning skills
- Superior programming ability
- Strong analytical and problem solving
- Adaptability to changing technology

Q&A: Shaun Martin

Software Engineer, RevQ

Tell us about your career path?

My first 'real' job was writing low-level controls software for hydrogen fuel cell systems. During this time I learned C, which is a great foundational language and provides great insight into to how computers work, in general.

After several years of writing exclusively low-level software, I began seeking positions that would allow me to expand my knowledge of higher level platforms, such as Java, .NET, and so on, and I have held two such positions since.

Can you walk us through a typical day?

I arrive, review all new e-mail, and tackle any urgent issues that may have arisen while I was out. Once those are dealt with, I move on to general development work. Normally, those are assigned features and defects. Completing each task normally involves reading and understanding the description of the feature or defect, resolving any misunderstanding or unclear instructions, and then planning and implementing the solution. Once a solution has been implemented and developer-tested, it's submitted for review to the project manager, and possibly to QA for rigorous testing.

What are the must-read blogs for a developer?

Most development technologies have an associated developer community with pertinent blogs, news websites, podcasts, and discussion boards. I've found such resources to be invaluable for keeping up-to-date with current trends, practices, and news. It certainly helps me feel more plugged-in to the community. If you have no idea where to start, just do an Internet search and start poking around at different sites. If you find a blog you like, follow its links and go from there.

What advice would you give to new CS grads on how to be a successful developer?

Develop a voracious appetite for learning, and stay connected to the greater programming world as it will provide critical guidance on what and where to learn. Read books, blogs and articles, all the time. As a developer you'll be learning until you retire, so get used to it.

Next, be personable. You won't be successful if people don't like to work with you. Be articulate. The power of communicating well is greatly underestimated by most developers. Reading non-technical, quality books goes a long way toward developing written and spoken communication skills.

Data Strategy and Management

Making information accessible, secure and useful

In today's increasingly globalized economy, data has become a vital business asset. So the people responsible for the processes and systems used to organize, manage and control access to information have become critical resources.

"How an organization uses its data can be the difference between average performance and competitive advantage," notes *Teradata* magazine. "For this reason, it is vital to have a data management strategy that focuses on the creation of accurate, consistent and transparent data content that can be integrated into the business applications and business processes."

That means it's necessary for companies to come up with data management strategies that support their goals and objectives. With the exception of very large corporations, most organizations are struggling with the complexity surrounding data management and strategy. The area takes on even more importance for companies dealing with mergers and acquisitions, evolving market tactics and dynamic regulatory requirements.

The people responsible for the processes and systems used to organize, manage and control access to information have become critical resources.

As *Teradata* says, data-driven processes help companies make decisions with confidence. IT maintains the enterprise data warehouse (EDW) architecture, which provides an "ecosystem" that serves new data management processes while accommodating future needs.

It follows, then, that database managers, data/information architects, modelers, analysts and administrators are becoming increasingly crucial to firms as they attempt to get a handle on this dynamic and evolving area. Develop an expertise in this sweet spot and you could find yourself in high demand, particularly if you also develop a business sense that can help C-level executives align data with business goals.

"There's a lot of data out there, and there are a lot of people who do programming," says Sanjay Bhandari, an independent consultant who works in data management. "They may know how to manipulate the data out of a system, but they are not always able to extract the business meaning of the data. That creates a gap."

Roles and Career Paths

One of the more strategic jobs in the area is that of data/information architect, who's typically responsible for the overall design of the enterprise-wide data/information architecture. Mapped to the enterprise's overall IT system, the information approach must balance the need for access against security and performance requirements. In addition, architects must anticipate needs for enterprise-wide data modeling and database designs. They may have the opportunity to take on a deeper leadership role, as they're the ones who define data and information architecture standards, policies and procedures.

A person targeting this type of position - which generally requires a bachelor's or master's degree in computer science, information systems or related field - should be knowledgeable in most aspects of designing and constructing data architectures, operational data stores and data marts.

Those who want to attain a more middle-level position could consider a job as database manager. These folks are responsible for ensuring the design, maintenance and implementation of database management systems. They should possess the technical expertise to manage the design and development of their organization's database environment.

Data modelers serve in a more intermediate-level role, responsible for analyzing and developing complex but logical database designs, data models and relational data definitions to support the corporate and customer information systems.

Another intermediate-level role is that of database analyst. They're responsible not only for designing and developing database management systems, but also for analyzing data requirements, application and processing architectures, data dictionaries and database plans. The job requires a bachelor's degree in computer science,

information systems or a related field.

Database administrators manage and maintain all production and non-production databases and are responsible for standards and design of data storage, maintenance, access and security.

Security is taking on a more prominent role in IT operations, which is giving rise to a newer role called the database security analyst, says Noel Yuhanna, principal analyst at Forrester Research. These individuals should be well-versed in Oracle, IBM and SQL Server databases, but also understand best practices around, and the technologies used to improve, database security. The job requires a high-level understanding of government regulations and how applications, operating systems, firewalls and networks interact.

"People have ignored database security for many years," says Yuhanna. "Typically, database administrators have other things to do. But there is a gap we started to see two years ago, and now we are seeing this role emerging in the industry. This should be a separate role and it could be a career path for any database administrator. This area continues to be important, despite the economy."

Skills and Qualities

- Strong computer science background
- Understanding of business goals and processes
- Good communication skills

Q&A: Sanjay Bhandari
Independent Consultant

Tell us what you do exactly.

I provide consulting services covering strategy, development and execution of programs in the area of direct marketing, database marketing analytics, data mining, business intelligence and reporting.

Can you walk us through your career path?

I have a BS and MS in electrical engineering, and an MBA in marketing and finance. I started work as an analyst in database/direct marketing on the service side. Then, I gained experience of the client side, product development, consulting and developing solutions over the years.

What advice would you give to someone who's just starting in IT?

Keep your focus on the real business needs as you learn new tools and techniques. The business results are what make your solutions worthwhile. While speed is important, quality is even more important, particularly for long-term success. Take responsibility for your actions, solutions, or whatever you do. This is not a paper or test that only gets graded with no real impact on a business.

What's the difference between business intelligence and database programming, architecture, and that sort of thing?

The business and analytics side brings a depth of understanding of business goals, the quality of available information for the database, practical user aspects of a project and what factors may influence input going forward. It also considers things like return on investment.

People on the other side mostly pay attention to creating a solution that meets or exceeds the technical requirements and specifications. They build a solution that performs all the required functions efficiently. However, having a business focus and understanding in addition to technical skills can produce far better results, because it means the technical team also can appreciate and focus on the business needs rather than just creating a solution that meets the technical specifications.

Support

On the very front lines of IT

In many ways, the help desk and desktop support people are the face of the IT organization within any company. They're the frontline techies who help regular employees do their jobs by making sure desktops, laptops, applications and networks are installed properly and working seamlessly. They troubleshoot and diagnose computer problems - and they must do it with a smile and their best customer service skills.

Simply put, starting as a help desk or support technician can be a good way to get your foot in IT's door. In the last year, as the economy shifted, a number of companies began putting more emphasis on maintaining - rather than replacing - current equipment. That only increased the need for help desk and desktop support specialists across the country.

Some IT workers started in support through happenstance. Take Austin Williams, a help desk technician at Oakland-based Arcadian Management Services. After serving in Iraq with the Army National Guard, he stumbled into IT while looking for work.

"I had filled out a survey and got a call from a technical school," Williams recalls."I went down to see what they had to offer, and I really liked their pitch for computer networking. I'm a smart guy, and I think computers are cool. I wasn't a nerd or a hardcore gamer, but rather a guy that liked the job because it looked fun and challenging. I signed up and started taking classes while finishing my Army obligation."

Williams now believes he's acquired skills that can be carried over into other parts of business. "Help desk/desktop support is the best starting point," he says. "It's the best place to learn about the company and business you work for. I've been doing this for a while with my current company, and now I really grasp what different departments do, how they do it, and who in the company is directly responsible for revenue." Developing such a big-picture view, he adds, helps him "learn about how to meet the needs of the people I serve, while saving the company on resources."

Roles and Career Paths

While job requirements vary from company to company, help desk and desktop support often center on basic business skills.

Although the technologies involved in support may overlap, they can be separated into two areas, says Dave Willmer, executive director of the recruiting firm Robert Half Technology. Help desk support technicians are more likely to aid people in diagnosing and troubleshooting problems over the phone, so excellent communication and customer service skills are paramount. More often than not, these folks are dealing with impatient people who just want to get on with their work or are up against stiff deadlines. Desktop support specialists are more likely to deal with hardware and software issues on the company premises. These professionals need to be comfortable with a more hands-on approach, and more comfortable with details. In general, desktop support technicians need more experience - generally three to five years - than their colleagues on the help desk.

Technicians usually need an associate's or bachelor's degree while taking on an entry-level role, notes research firm Gartner. They provide maintenance and support for basic client products, peripherals and networks, but also configure and install software for desktops and laptops. They also maintain desktop software and hardware, while providing support for basic software and hardware end-user systems.

Technology analysts, who typically have three to five years of experience in support, problem solving or troubleshooting, configure, install, monitor and maintain desktop hardware and software. They also support the mobile workforce. They consult with users in all aspects of end-user computing and desktop-based LAN systems software, as well as provide technical support and guidance to questions help desk technicians may not have been able to solve. They also may train users while evaluating, maintaining and documenting desktop application packages.

There are plenty of chances to serve in management roles in support. Obviously, desktop support managers are responsible for ensuring technology users get the equipment and support they need, but also determine user needs and develop plans for support services. The position, which is a mid-level management role, often reports to the IT chief operating officer or a department IT executive. Responsibilities can also include hardware and software planning, vendor selection, acquisition, resolution of more advanced problems as well as the set up, integration, testing and installation of equipment. These managers generally need a bachelor's degree in computer science, information systems or equivalent work experience.

The customer support manager is a mid-level manager. He or she is involved in defining service levels, service agreements and managing the help desk operation. They also analyze the technical performance and reliability of products, systems and services against industry standards to ensure customer satisfaction.

Skills and Qualities

- Patience
- Good customer service and communication skills
- Ability to work with others in stressful conditions
- Attention to detail

Q&A: Austin Williams

Arcadian Management Services
Desktop Support Lead Technician

What are the primary skill sets someone needs to do this job well?

My former supervisor told me a good technician needs to have a "trifecta" of skills. In other words: a good memory, excellent customer service, and excellent problem-solving ability. The thing about support is it encompasses so much stuff and so many different scenarios, it's pretty much impossible to rely on book-smarts. You have to be willing to learn.

'A good technican has a 'trifecta' of skills: a good memory, excellent customer service, and excellent problem-solving ability.'

What's your typical day like?

My company has sites across the country. I happen to work the first shift, from 5 a.m. to 2 p.m. I spend 30 percent of my day on the phone assisting people with various issues.

The rest of the time is at my desk or on the floor, visiting and helping people. I'll assist with phones, printers, computer hardware, software, access and setup of the different applications that my company uses.

As the lead, I'm responsible for triaging issues and assigning them to the other technicians. It's a rewarding job that leaves me tired at the end of the day, but I know how important it is to my company.

Networking

Connecting systems near and far

Networks, defined as a series of points or nodes interconnected by communication paths, form the backbone of the information highway. The most common topology or general configurations of networks include the bus, star, Token Ring, and mesh topologies, but networks also can be characterized in terms of spatial distances such as local area networks (LANs), metropolitan area networks (MANs) and wide area networks (WANs).

The IT networking world is set for another evolution as the technologies behind unified communications - which includes three or more of elements such as voice, unified messaging, video, Web/data collaboration and conferencing – prepare to make their mark on the sector.

Hamid Abdollahian, director of the Cisco Technical Training Institute at Cuyahoga Community College in Cleveland, says the level of expertise an IT network professional needs depends on the type of network they work with and its complexity level. When you connect multiple computers to a network, you've formed a LAN but once the LAN is connected to a WAN, the network specialists will need a different skill set since WANs involve different routers and higher bandwidth performance levels.

Although in the last several years most colleges and universities experienced a decline in the number of people taking computer science and engineering classes, some are starting to see a comeback, Abdollahian says. Emerging technologies such as cloud computing, green technologies and unified communications will all impact network infrastructures. For instance, Abdollahian estimates there are 490 million land-based, legacy phone systems and, as of today, only about 18 to 23 percent have been converted to VoIP. That means there's plenty of room for the market to grow for voice and wireless network specialists and storage network specialists. Demand for network security expertise also is likely to grow as the threat of cyber-attacks increases.

Networking is the most democratic expertise in IT, says Abdollahian. "It's wide open for a lot of people, people from all walks of life," he explains. "Those who are coming back from the military or those who are in a career transition." Aside from a bachelor's or master's degree, those who want to work in networking must attain certain certifications. The Cisco Certified Internetwork Expert, or CCIE, is the most active certification, with 24,000 people certified worldwide.

Most companies with up to 100 employees need a network specialist with the Cisco Certified Network Associate (CCNA), one of the basic certifications. Most medium-sized companies need network specialists who have the Cisco Certified Voice Professional (CCVP) or the Cambridge Certified WAN Associate (CCWA) certifications. In June 2009, Cisco unveiled a new top-level network certification that could open a network engineer's career path straight into the executive boardroom, according to SearchNetworking.com. The Cisco Certified Architect program is a new certification that sits atop Cisco's most elite career certifications, the Cisco Certified Internetworking Expert (CCIE) and Cisco Certified Design Expert (CCDE). The Cisco Certified Architect certification is about translating business requirements into technical specifications as Cisco Certified Architect candidates must go beyond demonstrating expertise with network architecture and show that they can communicate with C-level executives to understand business objectives and translate them into technological blueprints.

Roles and Career Paths

Those who choose to focus on networking can take advantage of established job opportunities ranging from network administrator or technician, analyst, and architect up to manager, then director, of network operations. Computer network technicians, who are also known as computer network engineers or network specialists, must know current standards and terminology used for LANs and WANs. They often help plan their employers' computer networks and then implement the planned networks. Most commonly, network technicians administer existing computer networks and troubleshoot problems as they arise.

Network analysts and network administrators are more intermediate-level roles. A network analyst is responsible for designing, installing and troubleshooting networks to make sure their systems perform to meet business objectives. This person is involved with configuration and maintenance of the physical network components, performs capacity and resource planning, and assesses network risks.

Administrators also monitor, troubleshoot and maintain the LAN, WAN and wireless multiplexers,

hubs and routers that move traffic through the network. However, their duties may also include installing new workstations or other devices, along with overseeing password protection and monitoring usage of shared resources. The person in this role provides daily operations support, maintenance, and administration of network systems, working on one or more projects as a team or project leader.

The network architect is responsible for high-level network planning. This person, who defines the network designs for a company, works on multiple projects as a subject matter expert. Since network architects handle issues that are highly complex, they require an in-depth knowledge across multiple technical areas and business segments. They also approve and modify network design to ensure compliance with government regulations, while also configuring and maintaining routers, switches and hubs for the network systems.

Managers of network operations are mid-level mangers who typically are responsible for operations and service levels for data and voice networking equipment and software. They also develop and implement standards, procedures and processes for the network operations group, and plan and manage the support of new technologies. They generally work under the direction of senior management, which mentors project leaders and technical staff.

The director of network operations, generally a senior-level manager, has overall responsibility for department decisions and management. Reporting to the chief information officer or IT chief operating officer, they provide strategic direction, along with coaching and training more junior IT staff. On a more granular level, directors of network operations are responsible for all work on network operations, including the integration of new technologies, including wireless.

Skills and Qualities

- Good communications skills
- Ability to keep pace with changing technology
- Good organizational skills

Q&A: Robert Felton

Network Liquidators Pre-Sales and Technical Support Manager

Could you describe your career path?

I joined the United States Air Force in 1987 to gain a technical skill set in computers/electronics. I spent about 10 years working in tactical communications that included digital voice and data communications. After leaving the Air Force I worked for a couple of Value Added Resellers (VARs), primarily doing field-service work focused around networking and client server communications. Starting in late 2001, I began focusing on delivering network security services to financial institutions. I did a stint as a network engineer for a large Cisco reseller. Then, I moved to an internal IT architectural role, and finally to Network Liquidators. Most of my network training has been hands-on and through self study.

How much stock do you put in IT certifications?

IT certifications offer value in some cases, with some people. They can give a competitive leg up to less experienced technical folks. I personally don't put much stock in certifications. I've met way too many certified IT people that haven't a clue. I put more stock in what an IT person can do rather than what they have memorized.

What's your typical day like?

I run around like a chicken with my head cut off. I spend 60 percent of my day speaking with customers, helping to identify their networking requirements or helping solve a technical problem. I spend 30 percent of my day focused on internal infrastructure projects

What advice would you give to someone who wants to break into this area?

Learn to be self motivated and learn to communicate with all facets of the business, not just technical people.

What qualities does your job require?

Patience, persistence and ingenuity.

Internet and E-Commerce

A range of opportunities around the World Wide Web

It's often said the Internet is like a mirror that reflects the entire world. Just imagine how big that mirror must be. In North America, 251 million of us are now connected, but that's just a drop in the bucket when we count a worldwide Internet population of 1.57 billion, the majority of whom are actually Asian. In the U.S., e-commerce in the form of retail sales has defied current economic trends, rising 17 percent in 2008 according to Forrester Research. Americans spent $204 billion online last year ($24 billion on computer equipment alone), and the ever-increasing amount of time they're using to surf motivated marketers to devote $23.4 billion to online advertising campaigns in the U.S. in 2008, according to PriceWaterhouseCoopers.

Since its inception in the early '90s, the Web has let us reinvent almost every aspect of our lives, and the sudden spectacular rise of social networking—12 percent of all Internet users are on Facebook—along with the increasing availability of WiFi and 3G-enabled mobile devices, portend a future in which more people will spend more time online working, shopping, communicating, entertaining themselves, and generally getting things done. The possibilities for anyone with technological smarts and a head for business are still limitless.

Since the beginning of 2009, recruiters from all around the country have reported job openings throughout the tech sector, including Internet specialties, have been relatively scarce. However, one interesting trend playing into this is the increasing interest in "cloud computing," the practice of moving at least some of a company's computing power and storage off its own internal servers to a Net-connected provider that charges the company with a pay-as-you-go pricing scheme. While this phenomenon is causing traditional server room IT experts to be laid off, it's also opening up new specialties for Internet experts who can create the management tools that make the cloud model work efficiently and securely.

As the total number of Web sites worldwide inches toward the 200 million mark, it's important to remember the sites people regularly visit for information, entertainment, and shopping are only part of the Internet story. Virtually every company large and small is online in some form, and most use an assortment of Net-based services to run their businesses. Google may be one of the largest examples, employing 20,000 of the world's smartest Internet experts and maintaining some of the world's largest data centers, but even local real estate brokers are likely to have relatively sophisticated Web sites and tools to help them make sales. Anywhere there is a connection to the Net, there is the potential for someone to come in and help make it work better.

Entry-level salaries across the wide world of Web development tend to vary regionally, but in general, recent college graduates with proven skills can expect to make somewhere between $40,000 and $60,000. According to Salary.com, Level I Web designers earn an average $50,555 nationally, while entry-level programmers earn $52,000. Web software developers earn around $60,000, Java developers can earn up to $78,000, and e-commerce marketing managers (who may need a business school degree) can earn over $80,000.

Roles and Career Paths

There are many paths to a career focused on the Internet or e-commerce. Technological entry points are usually through some form of Web development expertise acquired during college or grad school computer science courses, ideally combined with the kind of practical real world experience recruiters look for.

On the client side (also called the "front end"), coders use development technologies such as HTML, Flash, JavaScript, and AJAX to build the sites and interfaces that Web users see and interact with. On the server side (the "back end"), several technologies, including Adobe's ColdFusion, IBM's Websphere, and Microsoft's .NET environment are popular building blocks for the underpinnings of any site or service.

In recent years, an explosion of open source (and often free) tools has made Web development more collaborative and less expensive than ever, sharply reducing costs and opening up new possibilities for coders who want to create reusable (and resalable) widgets, and for cash-strapped entrepreneurs who want to start their business on a shoestring.

Since, as some technologists are fond of saying, everything is a database problem, there are also fields of Internet expertise that center around back-end database

tools such as Oracle, DB2, MySQL, and Microsoft SQL Server. E-commerce operations have a particular need not only for such online database gurus, but also experts who can attach payment systems to catalogs of products. Making everything secure in an age of increasingly sophisticated e-crime and identity theft is yet another growing specialty, not to mention an important focus of the 2009 economic stimulus bill, which targets $111 billion overall for technology projects.

All these technologies are just the basic building blocks of the Net. On top of them are wide open worlds of search engine optimization, e-commerce tools, graphics, video and content creation, and marketing. It's in these specialties that people who may not have deep software engineering or programming experience can find a path to an Internet career. All sorts of opportunities have opened up in recent years for writers, editors, content creators and managers, graphic designers, project managers, and marketers to add their expertise and polish to the foundations being laid by the development teams.

Skills and Qualities

- Boundless energy to keep up with constantly evolving technologies and trends
- A sense for business and how Internet traffic can yield dollars
- Ability to move between solo work (coding) and teamwork (site building) easily
- Flexibility to try new techniques and designs on the fly

Q&A: Christopher Wu

Paper Culture, Chief Executive Officer

You've worked at the VP level for huge companies such as Yahoo! and HP, but now you're running a startup. It must feel very different.

The biggest difference is that in traditional businesses, the development cycles are so much longer since the organization is set up to avoid mistakes. The greatest thing about the Internet is that the cycles are faster, and so is the pace of innovation and change. For me, the cost of making a mistake is actually far less than the cost of doing nothing.

What kind of people can handle that pace?

We need what I call "athletes," people who can do everything, not just back-end or front-end specialties, but also the nitty-gritty like basic IT and keeping servers up and running. They have to be able to work in what I call a "leveraged environment." These days you don't need a big upfront capital investment in servers, hosting centers, and data centers. You can outsource a lot of that infrastructure, so someone with strong computer knowledge who is basically literate with all those technologies can manage them without having to be an expert.

What's your hiring process?

We try to start it with references from our personal network of contacts, but we also use job recruiting sites. We first do a phone screen and administer a very basic technical test that anyone with a few years of experience should be able to pass. Then we do interviews, but we follow up by going deep into references. We're usually networked enough to find people who have worked with the applicant in a close environment. The good news is that all this happens very fast, sometimes within a week.

What would you tell college students who want to pursue an Internet-related career?

In college, the hardest challenge is figuring out what you really want to do. Don't take just any job to get a foot in the door. Find a job in an area you're passionate about.

Operations

Keeping it all up and running

Data centers, which often are housed in concrete-encased, temperature-controlled environments, are the most crucial part of most operations – particularly in corporations. Comprised of servers, disk arrays, networking equipment and layers of applications, companies rely on data centers to keep their day-to-day, 24x7 business operations moving along. So it's an understatement to say companies place a top priority on ensuring their data centers are performing at optimal levels, while at the same time protected from security breaches or natural disasters. Bottom line: Data centers must maintain high standards for assuring integrity and functionality of the disparate computer environment connected to them.

If you're thinking of building your career within data centers, realize you'll be working in an environment that's similar to the military. Rick Sawyer, executive vice president for data center designs at Hewlett-Packard, likens data centers and the people who work in them as being no different than highly disciplined military operations, with each individual requiring the ability to work as part of a top-notch, coordinated team. It's a place with well-honed processes, security standards, and little room for error. After all, a corporation's survival depends on it.

In most organizations, data center operations involve multiple layers including storage, server and networking hardware along with the software and applications that run on the equipment. Today, data centers are experiencing a lot of technology innovation, which makes it a dynamic time for students who want to point their careers in this direction. Suffice to say in recent years, the data center has become a more complex environment that requires a broader set of job skills. Network security, virtualization, cloud computing, unified communications, software as a service, and information management are just some of the technologies IT people focused on data center operations will need to be familiar with in the coming years.

Roles and Career Paths

Server and storage virtualization already has started to transform this part of the industry, particularly in large American corporations as they seek to consolidate hardware systems and seek more flexibility. Next-generation technologies like virtualization are having a huge impact on how the data center is managed. "This process will continue in coming years as many data centers look to consolidate their networks into a unified environment in which virtual machines will play a major role," says Rich Miller, a data center industry observer and editor of the Web site Data Center Knowledge. "That means expertise in virtualization in general will be valuable to for some time to come."

While there will always be specialized skills in data center operations, another movement's afoot that likely will put more emphasis on generalists: energy efficiency.

Cloud computing will also be a major trend in the next few years, with more applications being shifted from in-house data centers to third-party facilities and Internet platforms. This is an area with enormous promise, says Miller. While cloud computing expertise is already in demand, it's extremely important that specialists stay current on the latest conversations about where the cloud is in its development and how best to use it.

Unified communications involves merger of voice, phone, and e-mail that is delivered via networks, meaning it unifies all forms of human and device communications into a common user experience. Another area of growing importance is information management or content management, the process of storing data, classifying it, making it more easily retrievable and archiving it. Even throughout the current economic crisis, many content delivery networks have continued to hire staff, according to Miller. However, he expects there will be some consolidation due to the large number of venture-backed startups getting into the field.

Today, the biggest question many IT workers face is whether to become a generalist or IT specialist. While there will always be specialized skills in data center operations, another movement's afoot that likely will put more emphasis on generalists: energy efficiency.

Traditionally, data center workers have operated separately from those in IT power facilities. As Sawyer describes it, the "raised floor" of the data center is home to those involved in IT processing: hardware managers, software and application developers, networking and storage workers, all working under the direction of the data center operations managers. Behind the raised floor are electrical and cooling systems overseen by electricians, mechanics, and facility engineer and power experts.

As more demands are put on corporations to cut their energy consumption, those two sides of the data center house will have to communicate more effectively and achieve a better understanding of how the other side works. "In most organizations, there is a dividing wall between the IT process and the facilities," says Sawyer. "But the IT side will have to communicate more with the facilities side. We already are starting to see it with the more mature companies."

This means the crucial data center jobs – the data center facilities manager, the hardware manager, the software manager and the networking manager – will need a broader knowledge base that includes how IT power facilities operate. Miller says increasing cooperation between facilities and IT staffs requires successful data center professionals to be conversant in a broad range of issues that touch the day-to-day operations of the modern data center. "Folks in the IT department now have to consider how much power an application might require to ensure that the facilities staff has the capacity to support it and the ability to cool the resulting application," he says.

Skills and Qualities

- Ability to work on a tightly coordinated team
- Flexibility
- Good communications skills

Q&A: Rich Miller

DataCenterKnowledge.com
Founder and Editor

Talk about the changes you've seen, or expect to see, in data center operations?

In recent years, the data center has become a more complex environment that requires a broader set of job skills. Next generation technologies like virtualization are having huge impact in how the data center is managed. This process will continue in coming years as many data centers look to consolidate their networks into a unified environment in which virtual machines are used to rapidly migrate workloads around the data center and across the Internet.

It seems like energy use is becoming a big issue. What do you have to know about this topic if you plan to work in data centers?

It's not about tree hugging. It's about the bottom line. Because of the amount of power these facilities use, energy efficiency is a business imperative for the data center. It's very important to be familiar with the metrics that are being used to measure energy usage in the data center, especially the Power Usage Effectiveness (PUE) metric developed by the Green Grid, which is widely used as a comparative benchmark by data center operators and customers.

It's also helpful to be familiar with the best practices in data center design being developed by industry groups like the Green Grid and Data Center Pulse.

What kinds of job opportunities are available for students?

Virtualization is transforming the data center operations of large American corporations. This is a process that will keep tenure for some time. Most companies start off by using virtualization to consolidate servers in their data centers. In the next few years, we'll see a transition in which they'll begin using virtualization as a tool to enable new services and support more precise and sophisticated management of data center assets. Expertise in virtualization in general, and VMware and HyperV in particular, will be valuable for some time to come.

Is it better to go into this field as a specialist or generalist?

There will always be specialized skills with particular value in data center operations, particularly as new technologies take hold and are broadly implemented. But the increasing cooperation between the facilities and IT staffs requires successful data center professionals to be conversant in a broad range of issues that touch the day-to-day operations of the modern data center.

Telecommunications

Mastering constantly evolving technology requires constantly updating your skills

Telecommunications as an information technology discipline covers a gamut of careers paths, jobs, and skill sets. Among other technologies, it generally comprises voice, video, Internet, cable, satellite and wireless/mobile communications. In the enterprise, any time an employee checks into voicemail, accesses the Web, talks on a cell phone or answers a page, some form of telecommunications is involved. As technology advances, more services are provided wirelessly and the way we transmit and share data goes mobile, telecom technology will become even more important to the enterprise. The increased demand for wireless services alone will add to the number of jobs and career paths available to telecom professionals.

While the telephony of yesteryear was based on analog systems, today's telecom is becoming ever more reliant on software and the Web. Today, technology solutions are being deployed that weren't dreamt of only ten years ago. For example, current PBX systems, while still in use around the world, are slowly giving way to configurations such as the Internet-based IP-PBX. Such modern approaches make use of TDM (time-division multiplexing) technology, but can use existing analog trunk lines or digital T1 circuits to access the public telephone network.

Telecommunications is clearly a vital, growing part of the technology landscape, and its jobs are as varied as the installations and technologies are myriad. Whether you're interested in development or design, engineering or project management, be prepared to think on your feet and learn on the fly.

According to the most recent Bureau of Labor Statistics forecasts, employment in the industry is expected to grow 5 percent between 2006 and 2016 as demand is fueled the increasing need for telecom services. In many cases, jobs will be created as large numbers of those already at work in the sector retire. What's more, the building of advanced communications networks that incorporate fiber optic lines, faster wireless networks, advanced switches and the like will further spur employment. In some cases, however, improved services and increased transmission capacities won't benefit the telecom professional. To have the best shot at new opportunities, telecom workers must stay not only current – but on the leading edge of technology.

Breaking into telecom can be a bit tricky, but the general road can include certificate programs, bachelor's degrees and master's programs. Among the many paths that can be followed are computer software engineer, network systems and/or data communications analyst, engineering, and programming.

No matter what avenue you choose, training is the most important component of a telecom career. The rapid and continual introduction of new technologies makes this industry one of the most demanding to work in. Both new workers and old hands must keep their skills up to date. No matter what your career level or path—manager, executive, or equipment technician—staying abreast of what's going on in both the hardware and software worlds is key.

Telecom professionals are expected to have the requisite knowledge and skills in computer programming and software design; voice-telephony technology; laser and/or fiber optic technology; data compression; wireless initiatives; and Web/broadband technologies. A bachelor's degree in engineering or computer science is usually necessary to get started. Continuing your education—either by earning a master's degree or pursuing other advanced programs—is essential.

Roles and Career Paths

While there's no single path to a telecom career, a degree in computer science is a good start. Other accepted degrees include those in information science or management information systems.

If you plan to specialize in telecommunications, there are three main areas to consider: telecommunications systems management, computer software engineering, and computer programming.

Telecom systems managers are involved in the development and maintenance of systems and services. In this role, you'd be tasked with staying on top of changing technologies in order to create systems that can gather and transmit data quickly and securely. These professionals are often responsible for managing teams of engineers and systems analysts.

Software engineers create the computer-related software technology used in telecommunications, which is crucial to the smooth running of an up-to-date infrastructure. Designing, building, and testing make the software engineer a key cog in the telecom machine. A background in computer science and/or engineering is required, and most companies expect professionals to communicate effectively and manage others, as well as play a key role in developing new systems and services. A recent job description for a software engineer required a computer science degree and five years of experience.

Programmers write code, of course, and telecom programmers are no different. Here, a computer science or information systems background is necessary, but bear in mind coding for telecom applications isn't your father's "C." Here again, continuously updating your knowledge, and learning and adopting new languages and applications, is expected in a requirement for a successful career.

In addition to working for an enterprise, myriad career opportunities are available within the telecommunications industry itself, at companies like Alcatel-Lucent, AT&T, Cablevision, Cisco, Comcast, Ericsson, Google, Intel, Microsoft, Motorola, Nokia Siemens Networks, Nortel, Siemens, Sprint, Verizon, and Vodafone. Among these companies are voice carriers, wireless companies, cable companies, and chip makers, all of which can provide interesting career choices. Jobs such as "Director, Multimedia Services Integration," "Senior Engineer, Network Transport Planning," "Senior Engineer IP Solutions" or "Software Packaging Programmer" are available at these and other telecom giants.

Skills and Attributes

- Communications and management skills
- Interest in continuously upgrading knowledge
- Adaptability.

Q&A: Wray West

Whaleback Systems Founder
VP of Engineering

How did you get into telecommunications?

I had played around with telephones as far back as college, 30 years ago. I was always interested in phones and telephony and knew that I wanted to work in that area. I have a BS in computer science from the Massachusetts Institute of Technology. Just to give you an idea of how many different career paths there are in the telecoms world, I served as vice president of systems engineering for Cedar Point Communications, where I oversaw the integration of the company's products into carrier operations. I also helped develop next-generation switching equipment for cable system operators. Before that I was a co-founder and the chief technology officer of Indus River Networks, a developer of managed remote networking solutions. In the end, at heart I'm an engineer.

What do you see as some of the requisite skills or traits needed for a career in telecom?

Almost nobody starts out with working in telecom, that's for sure. People who are interested have the right amount of curiosity, a desire to make these systems better and to solve problems. There are still hardware aspects to today's telecom, but it really is mostly software at this point.

Can you explain that in more detail?

Sure. Software is probably the most important part of communications today. Telecom and IT used to be separate but now, for the most part, they're all one. When we work with the larger medium-size companies on an installation, we're always working with an IT person and not a telecom-specific person.

You wouldn't think it, but robotics and game design are two areas you could study that would help a lot in a telecom career: Games because the user interface for a telephony system has to be easy to use, easy to understand, and familiar-looking. And robotics because that's one of the newer disciplines in which one can learn about the latest in technologies, many of which are applicable to communications design.

What do you look for in a new hire?

I look for people with fire in their eyes and a keen interest in telecom and learning, rather than what they studied in school. Electrical engineering is a good background, because it teaches you how to think, but these days software development is really where the action is.

The one problem I find with younger people, however, is that they really don't understand that much about actual telephony, the analog kind. Even with all the computerization and bells and whistles, today's systems are still a version of that. Without that perspective, it's sometimes harder for them to grasp what it is we're trying to do and why. Again, that's why I believe it's more important to be able to learn.

Business Intelligence Systems

Turning data into information and empowering decision makers

Businesses produce and capture incredible amounts of data. Sales figures pour in from one system, purchasing numbers come in from another, and HR metrics roll in from yet a third. Out of these vast and disjointed streams, executives are expected to gain the insight and context needed to not only run their business day to day, but also develop the strategies that will steer the business toward continued success. The technology professionals working in the business intelligence sector help provide that insight by leveraging technology to turn raw data into usable information.

Business intelligence (BI) is about distilling and presenting relevant and timely data to the end user for analysis and action. By creating systems that gather the appropriate slices of data from disparate sources, BI provides decision makers with the tools to sift though mountains of facts and measurements to find actionable meaning. Using historical data, business leaders can use BI systems to measure the achievement and current health of their company, or look to the future using predictive analytics. If you've ever had Amazon make a particularly prescient suggestion based on your historical buying habits, you've seen the power of the predictive analytics side of BI.

Business intelligence professionals help provide insight by leveraging technology to turn raw data into usable information.

After several rounds of buyouts and consolidations in the industry over the last few years, the biggest players in this market are Oracle, SAP, IBM, and Microsoft. Many BI systems are implemented using software products from one of these vendors, or a combination best-of-breed, using a mix of solutions from the big four. Each of the major software vendors, and smaller tier providers as well, have strong consulting and services divisions that employs hundreds of BI professionals.

While the recession hasn't hit the BI sector as heavily as other areas of IT, the job market has softened. The most recent *Magic Quadrant for Business Intelligence Platforms* report from researcher Gartner offers some reasoning behind this trend saying, "BI platform revenue will be less affected by the economic downturn than some other technologies because of the heightened need to make better, fact-based decisions — BI is a vital competitive tool of increased importance in an environment where doing business more smartly, in order to maximize share of the reduced revenue in circulation, is a necessity."

While the report goes on to caution that the double digit growth of 2008 could cool to about 7 percent in 2009, it predicts growth will continue steadily through 2012. As businesses implement BI systems, there will be steady demand for the analysts, developers, and data warehouse professionals that are involved with both large and small implementations.

In addition to the steady maintenance of the early BI adopters in national restaurant chains and large retailers, there are two new bright spots for BI: Both the healthcare and energy industries are currently investing in large intelligence initiatives. While not recession-proof, organizations in these areas currently have the revenue to spend, and an increasing need for BI systems.

Companies are also trending away from consultants toward full time employees. "Some of the trends right now are that organizations that have money to invest in BI are rolling off their consultants and bringing on full-time employees because it's much more cost effective," says Matt Mueller, president of CBIG Recruiting and Staffing in Chicago. "Instead of paying a consultant at $100 an hour, or in many cases a lot more, they can find someone at $100,000 and save themselves $60,000 - $70,000 per year."

On the other hand, other IT executives note that as the economy recovers, many companies are sure to bring on consultants to handle the backlog of projects that were deferred when business conditions softened.

Roles and Career Paths

Jobs in BI fall into three categories: analysis, data warehouse and reporting/presentation.

In analysis, the business analyst's role is to walk between the worlds of business and technology. Analysts interview the business domain experts to gather the business requirements that need to be met. They then write functional specification documents that the technical teams use to design and construct necessary solutions.

Individuals working in the data warehouse are involved in building, populating, maintaining, and managing data structures and databases. Data architects and modelers design both relational and multidimensional structures to accomplish the goals set out in the technical specification. Developers generally work in the "Extract Transform and Load" (ETL) portion of the data warehouse. They create systems to extract data from different sources, transform it into the desired format, and load it into the data warehouse.

The BI professionals working in reporting and presentation create the tools that allow the business decision makers to consume the data in a format that has context for them. Developers working in this area work with analysts and business domain knowledge experts to create dashboards, scorecards, and reports from the extracted data residing in the data warehouse. Other professionals in this area include report developers, reporting analysts, and BI Architects.

Skills and Qualities

- Technical aptitude
- Strong database and data model knowledge
- Ability to understand and speak the language of business
- Knowledge of financial accounting procedures and standards
- Excellent oral and written communication
- Strong programming ability

Q&A: Ken Jones

Claritee Group, LLC
Owner/Director of Operations

How did you get into business intelligence?

I have a computer science degree, and am very technical. When I started out, I ended up working for Anderson Consulting as a consultant, as a programmer, but mostly on transactional systems. The first 10 years or so I worked building transactional systems, OLTP systems, the systems that run the business of the business, and reporting was always an afterthought. To imagine that I would be doing what I am doing now when I first started out is quite a stretch.

Around the time of Y2K, there was a tremendous turnover in systems. Companies were spending a lot of money getting off their old legacy platforms and implementing newer ERP systems and Y2K compliant systems. At that point, my sense was that - and what we heard from our customers - was, well, I put this new system in but I still can't get the reporting that I want. That's when my partner and I decided to create a company that was a BI consultancy company, being very deliberate in going after the BI market, and that's what we have been doing ever since.

What advice would you give to someone just starting out?

I think, personally, that if you're coming from that computer science bent, you'll be fairly limited in what you can achieve if you don't recognize that you're going to need to have to engage with the customer, with people. For some software engineering types, that's a pretty scary prospect.

Ralph Kimball has a wonderful quote: the best data warehousing people are half DBA and half MBA, and I would agree with that. So, for those people who have those computer science skills, that's great and you're going to need them. The very good BI data warehousing people are excellent engineers. But the other side, this MBA side, understanding and having an active interest in business and the particular industry that you are going to specialize in - get engaged in that. Those are the people that I think are ultimately the most successful.

Enterprise Resource Planning (ERP)

The foundation on which many businesses are built

ERP—Enterprise Resource Planning—is a widely used collection of business software systems and strategies that are implemented across an array of industries and organizations. ERP's main goal is to streamline a company's business processes into a single system that serves the many departments and functions within an organization.

In essence, ERP runs on a central database so that different departments within an organization can share information and better communicate with each other. Components of an ERP implementation might include software modules that handle manufacturing, supply-chain management, financials, project management, human resources, customer-relationship management, resource planning, product planning, inventory control, order tracking, and distribution. The major benefits of ERP are improved coordination across departments and increased efficiencies of doing business overall. It also facilitates better day-to-day management.

Ultimately, ERP offers many and varied opportunities with some clear paths that can be followed.

The ERP landscape is as specific as it is vast. Without question, the major vendors in the field are SAP and Oracle. Of course, there are other players, and today something of a sea change is taking place as SAP and Oracle, traditionally focused on the large enterprise market, move to serve mid-size and smaller customers even while Microsoft makes a move to serve those same customers with ERP applications of its own. Additionally, specialists in the field are hearing rumblings about "ERP as a service," cloud implementations, and even as open source software. In other words, innovation and change is on the horizon.

Roles and Career Paths

By all accounts, ERP professionals remain in high demand. As more companies recognize the value of automating business processes with some form of ERP applications - especially in the current economic climate - the field continues to grow. This is good news for those thinking about working in the ERP world, with this proviso: It's not an easy area to break into.

The best way to break into the field is to have a strong and passionate interest in ERP technology and/or business processes, together with a proven background in IT and knowledge of one of the major vendor's products. Most offer formal training and, by taking these courses, it's possible to become "certified" in one or another ERP application or module. At the same time, remember certification doesn't guarantee a position in ERP.

Ultimately, ERP offers many and varied opportunities with some clear paths that can be followed: You can work for the vendor, for the user, or as a consultant.

Working for an ERP vendor offers roles in such areas as program management, research, software development, sales, and consulting. Any number of opportunities involve development, implementation and deployment of ERP tools. The majority of opportunities, however, are at user companies – those implementing ERP – or working as a consultant.

In many ways, which path to pursue can be a lifestyle choice: the difference between living out of a suitcase for some number of years as a consultant versus staying in one place working for one company. The consulting path affords the opportunity to see a variety of installations and instances of ERP implementations—something that can be very valuable down the line.

The next career choice is from among three different avenues: Do you want to practice ERP from the business side, the development side, or the technical (systems administration) side? All are important aspects of any ERP operation. Of course, within these areas are hundreds of permutations, and the direction you choose here must be made based on your overriding interests.

Those interested in ERP's business side have a great many choices to make: There can be careers in Human Resources, Payroll, Benefits, Workforce Management, and Succession Planning, among other areas. If you're interested in the tech side, especially programming, the trends are toward object-oriented programming—

the building-blocks type of code—Internet scripting (XML) and Java. On the sys admin side, it's key to understand networked environments and virtual environments. Companies are looking more and more to host ERP applications on virtual servers and in the cloud, so connectivity and systems-architecture knowledge is extremely important. And because users want to be able to share information with suppliers and customers, a keen understanding of enterprise architecture is imperative, along with skills in security and authorization.

In the end, it's imperative to choose an area and become an expert in it—be that a vendor package or a functional discipline within ERP. In any event, you must have a real appetite for it, because moving forward in this industry takes time. No aspect of ERP can be mastered in six months. But the benefit is that it's going to remain intellectually challenging and exciting for many years to come.

In the ERP world, you create stability by making forward-thinking choices about your skills. Because it can be a hard career to break into, flexibility early on is important. Go where the opportunities are - don't restrict yourself to one vendor or another. If a chance to acquire skills is available externally, fine; but exploring internally for such opportunities at your current company is fine, too. The bottom line: The more direct ERP experience you have, the better.

Skills and Qualities

- A long-term view
- An understanding of business issues
- Flexibility

Q&A: Jon Reed

www.JonERP.com, SAP Mentor

How can someone decide whether to go the business or technical route in ERP?

A lot of people gravitate toward the business side because they think it's not as easily outsourced as development and systems administration can be. That's not necessarily true. Some of that can happen on the business side, as well. But you can't choose a career like this for such a cynical reason. You really have to have passion, because that's what elevates you in the field in the long run. It's the distinction you can make that will help you compete. For example, those individuals who take that ERP book on an airplane and actually enjoy reading it, the guy who devours that ERP implementation guide is the one who's going to advance.

Also, some people think they can make more money taking the ERP financials route. But if the technical side is what they really like to do, that's where they'll ultimately succeed. Of course, technical people can do very well on the business side. Having the technical background gives them a leg up on working with the tech teams. They become an extremely valuable liaison. But if you prefer not to interact in meetings with business people, you might want to stay away from the business side and concentrate on tech.

What can someone expect a typical ERP project team to be like?

You can think about ERP installations as always involving opportunities on both the user side and the consulting side. People are always coming in from a variety of places—an integrator, say, or the ERP vendor itself. ERP teams are really comprised of a variety of folk, and that includes offshore workers now, as well. It's always a mix, and it's going to vary from company to company.

What can one expect in terms of compensation in the ERP world?

Sure, it can pay well, but the person new to the market must understand that to get to that level—to hit that payoff—takes a great deal of time and determination. If you want to get involved in and be successful at ERP you have to commit yourself for the long haul. Some people are scared off by that. They want immediate satisfaction. You need the ability to stick with it. Those that do make the best ERP professionals.

Business and Management

Leading the way for software, infrastructure and support

As technology advances throughout the business world, the demand rises for leaders who can leverage management and technical skills. To succeed, managers in the tech industry must possess a unique combination of broad technical expertise, business acumen and the ability to lead groups of people toward a common goal.

Despite the economy's turmoil during the last year or two, the long term outlook for technical leaders is good. The U.S. Bureau of Labor Statistics predicts technical leadership to be a fairly stable sector over the coming decade. In its *Occupational Outlook Handbook for 2008-2009*, the BLS forecasts 2 percent growth during the period from 2006 to 2016.

The current hiring state for this sector of the job market also shows little movement. The good news is there hasn't been the rapid decline in positions seen in other segments. On the other hand, broad growth isn't occurring, either. Some observers predict a rebound in hiring will begin in late 2009. Says one: "Most companies are holding their staffing levels as tight as they can, but recognize that to grow and move out of the recessionary period and into a more robust economic recovery, they're going to need some additional staffing, and in tracking what our recruiters' clients are indicating, that seems to be coming later this year."

CIOs with business savvy are coveted as corporations focus on driving greater efficiency by leveraging technology.

Even in a stagnant hiring environment, a few sectors show promise. Healthcare, green/clean technologies, biomedical device manufacturing, and the energy industry are all areas that currently have the revenue and need for leaders with expertise in increasing the bottom line through the use of technology.

Precisely because of the current downturn, one role in particular has begun to enjoy increased demand: The latest Regional Trend Talk report from executive search firm CTPartners says CIOs with business savvy are coveted as corporations focus on driving greater efficiency by leveraging technology.

Roles and Career Paths

Positions in technical leadership are involved in creating and executing business strategy and tactics within a company. There can be many variations on the titles, but they generally break down into three levels: managers, directors and, at the top of the food chain, officers/vice presidents. Some of more common titles and positions within the high tech world include:

Managers

The IT manager oversees the team that implements and maintains a company's infrastructure. In smaller companies, this position is a jack of all trades, and may do a lot of day-to-day systems and network administration work in addition to leading a small team. This role may also oversee the company's internal help desk.

Software development managers are experienced developers who guide and coach teams that create a company's software products. They're tasked with removing any roadblocks to their team's success and managing the time and resources available to meet scheduled deadline for software delivery. Quality assurance managers are accomplished test engineers who lead and coordinate the team of testers that validate the software produced by the development group.

Tech support/help desk managers guide the support team in quickly and effectively resolving user issues. These may originate internally, in the case of a help desk manager, or externally in the case of a tech support manager.

Directors

The IT director is responsible for all infrastructure, and usually reports to the CIO. In smaller companies, where there isn't a CIO, he or she usually fills the same technical leadership need. This position usually has direct reports such as the IT manager and help desk manager.

The director of software/product development is responsible for coordinating the teams that create and update the software products a company produces.

The position may report directly to the CIO, CTO, or VP of software/product development.

The director of technical support leads the teams that support business software products. He or she oversees the call center environment where tech support agents respond to incoming issues from end users. The position usually reports directly to the CIO.

Officers and Vice Presidents

Chief information officers oversee the IT organization of their company. They're responsible for planning and maintaining both the physical and network infrastructure of the entire enterprise. Individuals who reach this level of responsibility usually have years of technical experience, and have risen through the ranks of IT.

The chief technical officer stands at the top of the product development organization, and is responsible for planning and maintaining the products a software company produces, as well as researching and exploring emerging technologies. CTOs generally have risen through the product development organization, and often have an engineering background. This position is more often seen in high tech companies than in other sectors, such as manufacturing.

The vice president of software/product development oversees the development and maintenance of a software company's products. The position directs and coordinates the activities of all software teams, with the development managers usually being direct reports.

Skills and Qualities

- Excellent written and oral communication
- Keen knowledge of business administration
- Deep technical knowledge
- Leadership and team building skills

Q&A: Scott Bloomquist
Vidoop, Chief Technology Officer

How does one get on the path to becoming a CTO?

I think the real overarching theme is to deeply and broadly understand technology. It's honestly more than a full time job. It has to be what you do in your spare time as well. You need to be up on the latest technologies, which can only come from spare time tinkering, and research and that sort of stuff. Chief technology officers, in my experience, often come from development backgrounds, but I've seen exceptions to that. It's almost always from the engineering side, though, so sometimes programmers, product management, or test engineers.

You have an electrical engineering background. Do you think electrical engineering is a good background for a programmer to have?

I really do. There was one team of practicing software engineers that I worked with at Microsoft made up of one chemist, one physicist, one economist, one anthropologist, and an electrical engineer, along with a handful of computer science educated engineers or developers.

Computers have a certain way of thinking about things. They are very logical. They are very literal. You have to tell them step-by-step exactly what it is they need to do, and that causes certain biases in the sorts of people that are attracted to development. But if you end up with an economics perspective thrown in, it might put a different skew on the way you think about things. I really do think you can do technology development, CTO, all of that stuff, coming from many backgrounds. The real theme just has to be passion for technology.

What's a typical day for you as the CTO?

There's a lot of variation there. I generally think of CTO as kind of the outward facing techie and/or the future facing techie at a company, the guy that worries less about day to day operations. In my role I'm involved a lot in sales, business development, and evangelism activities at the company. The sales guys like me to sit in at meetings, answer questions, and build technical credibility.

In terms of a typical day, there is the obvious people management that comes along with a leadership position, so I spend a significant amount of time making sure people are doing the right things, understand what their priorities are, and have the resources they need to be able to do their jobs. I also spend time doing research on competition and market trends, and making sure I understand what's going on out there in the world. Some of my time is spent collaborating with our outside partners to help put together the right technology plan for our engagements with them.

Training

Educating the technology workforce, one job role and certification at a time

Training companies and self-employed instructors are the front lines for educating today's IT workers in new technologies, training them for specific job roles, helping them achieve the latest IT certifications, and developing the training course modules used to accomplish all of this.

Training is delivered in many ways: in physical classrooms, online classrooms, combined classrooms, virtual labs, problem-solving with an on-screen mentor and more. Accordingly, the ability to teach well in multiple media — and especially through "distance learning" — is in high demand.

Regardless of the modality through which training is provided, the best instructors balance great teaching abilities with extremely in-depth knowledge. "I've run a half-billion-dollar training company for Sun Microsystems, and the trainers who were good, you could put almost any piece of content in front of them and they'd teach it well," says Terry Erdle, vice president of skills development for the Computing Technology Industry Association (CompTIA), based in Oakbrook Terrace, Ill. Best of all, however, are the trainers who also live and breathe their subject matter, he says. "So do something you're passionate about, because it shows through to students."

Even in a down economy, the training market appears to be relatively recession-proof, although analysts do expect some training firms to consolidate. Overall, market researcher IDC expects U.S. revenues from training to increase from $924 million in 2008 to $1.1 billion in 2012, a compound annual growth rate of 4.9 percent.

Part of that growth comes from the nature of IT jobs: IT professionals keep getting new technologies thrown at them, which they must master. Then there's the issue of retaining their jobs, or someday finding a new one. Finally, there's the fact technology professionals themselves – or at least a sizable chunk of them - see training and certifications as important ways to make sure they stay current with the demands of their current jobs and are marketable for future roles.

From a corporate perspective, training remains popular as a way to make the existing workforce more productive. Says IDC: "Certification sponsors are beginning to market certifications as helping enterprises maximize the value of IT investments. Teams with a higher percentage of certified members outperform teams with fewer certified members."

Finally, technology executives see training, even in a downturn, as a way to help make their company stand out. "When the times get tough, a lot of companies look for things to differentiate themselves, for example through their security, healthcare informatics, networking, or programming," says CompTIA's Erdle. "So people will often jump in and look at certifying themselves with pertinent IT certifications."

Roles and Career Paths

To become a trainer, you might work for a large technology vendor with its own training organization or certification program (IBM, Microsoft or Sun), for a third-party training firm (such as Global Knowledge, Learning Tree or New Horizons), or for product-independent organizations (such as the SANS Institute). Typically, you'll teach course modules developed by others, though some positions involve developing the core materials, which may then be passed to third-party training firms. If you're a full-time employee of a training organization, expect to travel a lot.

Many training professionals prefer to work as self-employed instructors. They may develop and teach their own modules, and perhaps teach other trainers to deliver them. That's because when a new product comes to market, a high technology company (at least a smaller one) will usually want a large number of training courses to happen simultaneously, so they can quickly build customer loyalty.

Whether working for yourself or others, one of the virtues of training is that you can do it part-time, combining it with a day job. "I did this, and took the time off as annual leave, or leave without pay," says information security expert Fredrick Avolio, who's based in Woodbine, Md. "You need to do the math, of course, and make sure it's worth it. Depending on the subject matter, it's usually a good value proposition."

Some IT professionals purposefully combine training and consulting, finding that one helps reinforce the other. For example, Joel Snyder, senior partner at consulting firm Opus One in Tucson, Ariz., has worked

with a number of information security startups —or startup groups within larger organizations — to develop training modules and then teach them to trainers. "Once you become really expert in a product, that begins to open up consulting opportunities with the vendors as well, either because you're so good that they begin to recommend you for consulting projects, or they bring you in-house to get your insights for future products."

You can become a trainer fresh out of college, especially if you have college experience in a relevant IT discipline, such as the help desk, networking or information security. But to become a self-employed trainer, lots of experience helps. Avolio, for example, says he began by giving one-hour talks at events hosted by his then employer, Digital, and slowly establishing himself "as a credible subject matter expert and a good instructor." Once he'd done that, he proposed and taught half-day and full-day courses outside the company.

Mixing training with an IT day job or consulting career also helps keeps you abreast of technology changes. "When I (became self-employed) full-time, I found a mix of consulting, teaching, and writing kept me fresh," says Avolio.

Beyond continuing to master the relevant subject matter, you'll also need to hone your ability to teach sometimes difficult and dense material to a paying audience. To learn the basics of teaching, Snyder recommends a master's-level course in pedagogy, as well as continually seeking out great instructors and practicing your delivery skills and techniques.

Skills and Qualities

- Passion for a particular technology area
- Skilled at helping people learn
- Dynamic in-person persona
- Excel at communicating essential details to others
- Effective classroom management (crowd control)
- Patience

Q&A: Joel Snyder
Opus One, Senior Partner

What are the top skills grads must master to break into training?

There are two skills that need to be really good if you're going to be a consultant and not just someone who works for a Value Added Reseller. One: You need to have the technical skills and chops, have your own lab, and have enterprise experience so you can put it into perspective for the people you're training. The other thing is the complementary training skill. I know a lot of people who have one but not the other. It's difficult to have both. But you really have to work on developing both of them.

How can someone hone their training skills?

Practice. Also, take training classes offered by very good trainers. Because it's not about what you do with PowerPoint, it's about how you communicate material, deliver it in bite-size chunks, or emphasize the best information.

At some of the big conferences I go to — such as Interop — they have someone who's very good do a full-day session on how to be a trainer, every year. I try to attend this every couple of years, because you can always learn from a good speaker, even if you spend all day and only learn two things. And that's probably better than these glossy catalogs with programs on "how to be a better trainer," because I find them to be too slow and elemental.

What's a new training technique you've mastered recently?

There's a guy in our field named Lawrence Lessig, and I strongly recommend you find a video of him speaking. He has a style called the Lessig style — I don't think he invented it, lots of people do it — where he shows a slide maybe every four seconds, and they are the equivalent of a verbal underlining. It's a fascinating style, I'd never seen it before, and I've done two presentations since then using it, and people loved it. They weren't just presentations, but rose to the levels of keynotes.

Security

Keeping organizations safe

Information security is a multi-disciplinary profession. You have to be adept with technology and the issues surrounding data confidentiality, integrity, availability, access, authenticity, risk management and security classification. You have to understand people and company culture. Above all, you have to think like a bad guy.

Information security specialists need to take on the mindset of a hacker – someone who wants to break into a company's system to steal data, or corrupt the system with malware or infect it with a virus. They have to be able to identify a system's vulnerabilities. As Will Kruse, a software security consultant with Dulles, Va.-based Cigital, says: "You have to think like an attacker. You have to think about things like, 'How can a system fail? How can it break?'"

> 'You have to think like an attacker. You have to think about things like, *How can a system fail? How can it break?'*

Information security continues to take on greater importance as the black market for e-commerce data has grown. In addition, companies now face a slew of regulations to comply with, while financial fraud has become an area of greater concern. Because of these factors, investments in security aren't likely to subside, even in the midst of an economic downturn. Certainly, the federal government is doing its part to keep the sector healthy. As part of the economic stimulus package signed into law in 2009, about $99 million of a $524 million capital investment fund will be available to the U.S. Department of State to carry out responsibilities under the Comprehensive National Cybersecurity Initiative, a highly classified effort aimed at bolstering the ability of the government to detect, respond to and mitigate cyber threats. And that's just one example.

"The opportunities for someone coming out of college are huge right now," says Kruse. "There's an opportunity to get your hands dirty with a lot of real-world problems." Kruse says companies are putting a lot of effort into recruiting "young folks," adding, "We need young, enthusiastic blood."

Roles and Career Paths

But, make no mistake, you need skills, too. On a high level, many organizations now employ an information security officer to craft security policies and guidelines. Depending on the vertical industry, this person also ensures the company is complying with the numerous government regulations that have emerged in recent years. Someone looking to work on this level needs to be intimately familiar with such regulations as the Health Insurance Portability & Accountability Act (HIPAA), the Gramm-Leach-Bliley Act, the Sarbanes-Oxley Act, security breach notification laws and the Family Education Rights and Policy Act.

Like many IT jobs, the security profession can be sliced into many forms. A newly emerging role is that of the database security analyst, according to Noel Yuhanna, a Forrester Research security analyst. They work closely with other IT staff to ensure enforcement of an organization's security policies. Such professionals not only need to have security expertise but a familiarity with Oracle, SQL Server or IBM's database software. They also need to know about application stacks, along with firewalls and networks.

There are other more narrowly defined security jobs. A security manager, who typically has seven to 10 years of IT work experience in all aspects of business planning, systems analysis and application development, is involved in the development and delivery of IT security standards, best practices, architecture and systems to make sure data is secured across the enterprise, according to Gartner's 2008 IT market compensation study.

A security analyst generally has about four to six years experience of combined IT and security work with exposure to system analysis, application development, database design and administration. He or she develops and manages security for more than one IT area – such as data, systems, the network or the Web. These professionals also prepare status reports on security matters to develop risk scenarios and possible responses. The network security specialist, who has about three to five

years of combined IT and security experience, assists in the development and implementation of security policies and procedures for the network.

Certain colleges and universities are providing master's degrees or Ph.Ds for people who want to approach IT security on a different level. For example, someone with a financial background can focus on financial forensics to investigate and prevent financial fraud. Such a person needs the ability to analyze financial data. Insurance companies, says one industry observer, "are desperate for these people."

Skills and Qualities

- Detail-oriented
- Ability to understand law and regulatory policies
- Comfortable working with multiple departments

Q&A: Wolfgang Kandek
Qualys, Chief Technology Officer

Can you walk us through your career path?

I have a degree in informatics from the Technical University of Darmstadt, Germany. While there, I worked part-time at the university as a Unix system administrator. I also owned a small IT consulting company involved in business programming in Basic and Turbo-Pascal.

After my graduation, I started working at IBM as an AIX system analyst, then joined a consulting company that specialized in Unix solutions. My next position was at MCI, and involved the design of large enterprise infrastructures, once again Unix and database focused. During the dot-com boom, I was in charge of operations for two Internet companies. This is where I started working with security, but only at a very basic level – at the network and firewall layer. In 2002, I joined Qualys as director of operations, where I was constantly exposed to advanced security work.

What skills should someone have if they're looking to specialize in IT security?

A solid technical foundation - university, practical experience or self-taught – is essential. Being a self-motivated individual, who has the ability to gets things done, the ability to question common knowledge and to educate oneself through the Internet, where knowledge on advanced security areas is very accessible.

Is it necessary to have more of a technology background, or a business/consulting background?

For technical security work, a technology background is essential. Once one gets involved into project and business-related work, it's helpful to have the experience to be able to see all angles of a project and help it succeed by offering assistance to find the right solutions.

What types of certifications, training, and educational background should people have?

When I look at hiring an IT professional, I focus largely on practical experiences. Certifications are secondary. I look for projects that have been executed, successfully or not, lessons learned, and try to gauge the understanding the person has of the technologies deployed, their impact and flaws.

My advice is to start working with security now. Build a lab at home, protect a server that sits on the Internet, and understand firewalling, SELinux and experiment in general with the available security software. On the desktop side, look for management solutions, how to discover all machines sitting on a network, how to identify the state or security posture of these systems, how to run software with minimum privileges. Once you have developed some background, apply for a work position that's related to security and where you can use the newly acquired knowledge and keep learning from your peers and daily challenges.

Product Development and Management

The work that's everywhere

Product development is the industry that powers the modern world. Every day, millions of people use software products to accomplish tasks in both their professional and personal lives. Whether it's an employee processing a shipping order, or friends connecting on Facebook, the breadth and depth of product developers is clear.

Product development is the art and science of building software solutions for the market. For software companies, the ultimate goal is to produce a great product that will meet the needs of the widest possible section of their chosen market segment.

As large companies seek to get lean in the tough economy, there's been a smattering of layoffs within the industry. Still, despite some decline in demand, the need in the wider mass market remains strong. For example, in just the first nine months of 2009, 1 billion applications were downloaded from Apple's App Store, indicating consumers remain willing to spend money for software that solves a problem or entertains them.

According to the U.S. Bureau of Labor Statistics, the software industry has a bright future over the next decade. In the latest version of its *Career Guide to Industries*, the BLS predicts employment in this area of technology will increase by 32 percent between 2006 and 2016. Another BLS publication, the *Occupational Outlook Handbook 2008-2009 Edition*, predicts most of the positions within product development will be fast growing roles over the next decade.

Increasingly, the reduced costs of ownership for products delivered using the software as a service model (SaaS) is making the Internet browser the delivery platform of choice for software products. While the two most pervasive languages, Java and the .NET family, are still being used for Web applications, two new technologies are on the rise: PHP and Ruby on Rails (ROR). Because of their tight integration with Open Source technologies, PHP and ROR are popular within the start-up community. Many of the most popular and heavily trafficked Web apps available today are written in either PHP or ROR, so skills in this area are in demand.

Roles and Career Paths

Individuals in product development will generally work for a software company. This may be through direct employment, or through a contracting arrangement. The jobs are distributed among product management, software development and quality assurance.

While the role of the product manager can vary widely from company to company, this is generally a position of leadership, coordination and evangelism. The product manager has to walk among the many departments that touch a product, communicating at a context-appropriate level. From marketing to software development, and on through quality assurance and post-release tech support, product managers have to make sure the product is moving in the right direction and that everyone involved understands their priorities.

Using market research conducted at the beginning of the product development cycle, the product manager will identify a need in the marketplace, then produce a marketing requirements document that conveys the overall definition of the new product or product release. The MRD is used as a base to guide the functional and design-level specifications that are later created and used in software development and QA. In some companies, the product manager may produce the second-level functional specs.

Once the product is in full development mode, the product manger will coordinate with the development group to review features as they are completed, making sure they'll meet the needs of the customer. As the product or release nears completion, the product manager may write press releases, blog posts, and other communications to customers or potential users. During the beta period, feedback is gathered from users and further tuning to the product offering may be undertaken. After release, the product manager works with the tech support group to identify trouble spots that may need to be addressed in the next release of the product.

Software development is where the real tangible and clickable software is built. Within this area, teams are comprised of a technical leader and the supporting roles needed to produce the product. The development manager is generally an experienced software developer whose job is to coach and guide the development

team through the process of creating or updating the product. Using the MRD, software engineers produce functional and design specifications that drill down to more technical levels. During the design stage, the development group selects the programming language and other associated technologies, and plans how the system will operate as a whole. The team then moves on to the construction phase, where the product's code is actually written. During this phase, the developers also write the unit tests that are essential in testing their code, making certain that the requirements are being met on a micro level. Throughout the development process, user interface (UI) and user experience (UX) designers coordinate with the engineers or developers to design interfaces that are both esthetically pleasing and easy to use.

In quality assurance, the primary task is to verify the product performs to the written specifications and is free from defects. The QA manager is generally a seasoned professional tasked with leading and coordinating the testing activities of the team. During the construction process, QA engineers create test cases based on the software specifications produced by the development group. The test cases can either be automated or executed by human testers.

As features are completed during the development cycle, the QA group tests them. If problems arise, a defect report is written and submitted to development. Once a fix has been implemented, QA retests and either verifies it, or fails the fix and sends it back to development. Once all features are completed, a complete regression test will be performed, and an eventual thumbs up will be given to the product for release.

Skills and Qualities

- Strong analytical and troubleshooting ability
- Ability to lead (with or without authority)
- Exceptional design and programming skill
- Excellent oral and written communication skills
- Teamwork

Q&A: Aseem Sood
Google, Product Manager

How did you get into product management?

I finished an undergrad computer science degree and an MBA from Carnegie Mellon. I didn't really know early on that I wanted to be a product manager, but after the degree I realized I didn't want to code full-time, but wanted to stay close to the technology.

What key skills does it take to be a great product manager?

The first and foremost is passion for technology or, if you're a product manager in a different area, passion for that industry. It's hard to "make" someone passionate.

Second, I would say interest in product design and strategy. When you start out as a product manager, you're basically in the nitty-gritty details of feature development. If you're a successful product manager, you eventually start thinking bigger picture, and you think about product strategy. So I look for both of those skills.

Next on my list are analytical skills. The best decisions are usually made based on solid data. So, the ability to identify key data and analyze it to make right decisions is very important. This can range from easy back-of-the-envelope estimates to teasing out subtle trends in (often) incomplete data available in the real world. For example, let's say you have a bug and you need to estimate whether it should block the launch or not. How many users would be affected by it? How often will they see it? A good product manager needs to be comfortable with that type of analysis.

Next I would say communication skills. Whether it's e-mail, IM, face-to-face meetings, or giving presentations, I spend a lot of time connecting with very different people. If you ever find that somebody is really bright, and has all the checks but you think they're not going to do well on the communication side, that's a big, big red flag.

What's a typical day like for you?

Depending on which phase of the product we're in, my time will be spent differently. If we're in the early stages of designing our next release, then maybe I am spending a lot more time with a designer or engineers. If we are in the later stages near the launch time, I am probably spending a lot more time in bug triage or prepping with PR and marketing for the launch. Either way, it's lots of time spent with other people, which can range from everything from design reviews, working one-on-one with a designer to flesh out part of a feature, taking it to upper management for an approval for launch, or drafting an external press release or blog post.

Glossary

Learning the language of IT

Biometrics: The technology of measuring and analyzing biological data. In information technology, biometrics usually refers to the technologies of using human body characteristics such as fingerprints, eye retinas and irises, voice patterns, facial patterns, and hand measurements, for authentication purposes.

Business Continuance/Business Continuity: Refers to the processes and procedures a company has in place to ensure day-to-day operations and mission-critical services continue with minimal interruption should a disaster strike. Any reliable business continuity plan includes a disaster recovery plan that specifies an organization's strategy for system failover procedures.

Business Intelligence: The idea of harnessing technology and data to make better business decisions. It involves skills, technologies, applications and practices used to help a business acquire a better understanding of information to more effectively target its audience. Common functions are reporting, OLAP, analytics, data mining, business performance management, benchmarks, text mining and predictive analytics.

Cloud Computing: This technology is defined differently by analysts, vendors and industry observers. Some consider cloud computing a narrowly defined, updated version of utility computing, in which virtual servers are available over the Internet. Others place the term in a broader category, saying anything consumed outside a firewall is "in the cloud," according to *InfoWorld*. Cloud computing services are broadly divided into three categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS).

Customer Relationship Management: Also known as CRM, refers to software used to support the processes an organization uses to track and organize contacts and customers. At its core, a CRM system contains information about an organization's customers and customer interactions that can be leveraged by employees within different parts of the company. Typical CRM goals involve improving customer service and using customer data for targeted marketing.

Data Center: Also called a "server farm," a facility used to house servers and disk arrays and telecommunications equipment. It's a highly secured facility that includes redundant or backup power supplies, redundant data communications connections and security devices.

Data Mining: The process of discovering meaningful correlations, patterns and trends by sorting through large amounts of data maintained in repositories.

Data Warehouse: A central computer repository that stores the data collected by an enterprise's multiple business systems. Data from online transaction processing applications and other sources is selectively collected, extracted, sorted and cleaned. Then, the data is stored in a data warehouse.

E-Discovery: Amendments to the Federal Rules of Civil Procedure, enacted in late 2006, require companies to preserve and produce electronic evidence for use in case of lawsuit. Electronic documents and data that fall under the term of evidence include e-mails, voicemails, instant messages, e-calendars, audio files, data on handheld devices, animation, metadata, graphics, photographs, spreadsheets, Web sites, drawings and other types of digital data.

Enterprise Resource Management: A computer-software, business-management system used to automate and interconnect different interrelated departments and organizations within a company or corporation. It manages and coordinates all resources, information and functions of a business from a shared data store. ERP has a service-oriented architecture, comprised of modular hardware and software units that communicate on a local area network.

Information LifeCycle Management: Also known as ILM, refers to the creation and management of a storage infrastructure and the data that it maintains. All information, or data, in a storage network has a specific lifecycle, from the time it enters an organization's system to the time it's archived or removed. There are three stages to data, which include creation or acquisition, publication, and retention and removal of archived data. Management of the information lifecycle involves keeping the data accessible to the users who need it and determining how the information should be stored based on its priority at any given moment.

IP Telephony: About 10 years ago, the Internet and its TCP/IP protocol suite began to revolutionize data communications and the telephone industry. Today, IP telephony

uses the Internet to transport voice, data and video communications globally. The two-way transmission of voice over a packet-switched IP network, which is part of the TCP/IP protocol suite, has become the backbone for transporting information, including voice over instant messaging and videoconferencing. The terms "IP telephony" and "voice over IP" (VoIP) are synonymous, according to *PC Magazine*. However, the term VoIP is widely used for the actual services offered, while IP telephony often refers to the technology behind it.

Mashup Applications: Describes a Web application hybrid, in which data or functionality from two or more sources are combined into a single integrated application. The term implies easy, fast integration, frequently done by access to open APIs and data sources to produce results that were not the original reason for producing the raw source data.

Online Analytical Processing (OLAP): A class of business intelligence products.

Search Engine Optimization: The process of improving the volume or quality of traffic to a Web site from search engines via organic or algorithmic search results. Typically, the earlier a site appears in the search results list, the more visitors it will receive from the search engine. SEO may target different kinds of search, including image search, local search and industry-specific vertical search engines.

Server Virtualization: A method of partitioning a physical server computers into multiple virtual servers via software, giving each the appearance and capabilities of running on its own dedicated machine. Each virtual server can run its own full-fledged operating system and be independently rebooted. Not a new technology, as it was perfected in mainframe computers, but another evolution of its being adapted for distributed systems.

Service Oriented Architecture: Also known as SOA, this is a software architecture that includes the use of loosely coupled software services to support the requirement of business processes.

Software as a Service: Also know by the acronym SaaS, this software distribution model is made up of applications hosted by a vendor or service provider which are available to customers via a network, according to SearchCloudComputing.com. Closely related to Application Service Providers (ASPs) and On-Demand Computing software delivery models, there are two different SaaS delivery models: the hosted application management model, in which a provider hosts commercially available software to customers, and the software-on-demand model, in which the provider gives customers network-based access to a single copy of the application created specifically for SaaS.

Storage Area Networks (SANs): The term used to describe how different kinds of data storage devices are interconnected via a high-speed network. Typically, a storage area network is part of the overall network of computing resources for an enterprise.

Storage Virtualization: Similar to server virtualization, storage virtualization is the idea of pooling physical storage from multiple network storage devices into what appears to be a single device managed from a central console. Storage virtualization is commonly used in a storage area network (SAN), and helps administrators manage a SAN more easily by disguising its complexity.

Unified Communications: A term used to identify the trend of integrating all forms of communications such as phone, e-mail, chat, voicemail, presence services and fax. In general, it enables a person to send and receive messages in one medium and read it on another, such as viewing a phone message on e-mail.

Unified Messaging: Also known as UM, this is the integration of different streams of communication such as e-mail, SMS, fax, voice or video into a single or unified message store, which is accessible from a variety of different services. UM is a subset of a fully integrated Unified Communications system.

Voice Data Convergence: Refers to the aggregation of voice, video and data into a single IP-based network supporting advanced networking features.

Voice over IP: The term most often used to describe telephone service over a provider's IP network.

Web Analytics: The practice of measuring, collecting and analyzing Internet data for the purpose of understanding and optimizing Web usage. There are two categories: off-site Web analytics, which refers to measuring and analyzing data irrespective of whether the user owns or maintains a Web site; and on-site web analytics, which measure a visitor's journey once on a particular Web site.

Web 2.0: Commonly refers to second generation Web development and design, which are focused on enhancing communication, information sharing and collaboration on the Web. Examples include social-networking sites, video-sharing sites, wikis and blogs.

Resources

News You Should Use

IT is a dynamic field. Technology changes quickly, yesterday's solution can be today's bottleneck, advanced end users lead to more complex security issues. To succeed, you have to keep up.

Among other things, that means staying up-to-date on developments in business, economics and the world in general. That's no small task in today's media-crazed environment, especially if you want to focus your career in specialized areas like many of those covered in this book, such as security, data management or business intelligence.

This list is meant as a starting point, a collection of information resources you can use to keep abreast of what's going on in business and general news around the world. In addition to these, each technology sector offers a variety of trade Web sites and publications that focus on narrow areas of expertise.

General and Business News

The Boston Globe (www.bostonglobe.com)
Like many metro dailies, the Globe offers a technology news section with business information about enterprise-level companies like EMC, Hewlett-Packard, Oracle, Microsoft, etc. It also includes tech-consumer news.

Bloomberg (www.bloomberg.com)
Offers daily stock market data on all public technology firms, as well as national and international news.

BusinessWeek (www.businessweek.com)
Has a special section devoted to in-depth technology coverage, which includes a CEO Tech Guide, tech columnists, computers, electronics, entertainment, Internet, investing, reviews, software and telecom.

The Chicago Tribune (www.chicagotribune.com)
Offers a technology blog as well as general technology news.

CNN (www.cnn.com)
Provides a range of technology news, both national and international, from consumer tech to stories on major businesses.

The Financial Times (www.ft.com)
Read by executives around the globe, "the FT" has a tech blog as well as general technology news.

Fortune (www.fortune.com)
This magazine's Brainstorm Tech section offers edgy stories with both a business and cultural focus. It also has a range of columnists devoted to technology.

The Los Angeles Times (www.latimes.com)
Its technology section is fashioned more like a blog than a straight news service, but is worth reading.

The New York Times (www.nytimes.com)
In addition to global business coverage, the Times publishes a section devoted to technology news, as well as a separate tech blog.

Reuters (www.reuters.com)
A global news service that offers both technology news and green business news.

USNews and World Report (www.usnews.com)
Its money and business section also delivers career information.

The Wall Street Journal (www.wsj.com)
Includes a technology section devoted to industry news, as well as information on careers and small business.

Washington Post (www.washingtonpost.com)
Offers in-depth technology coverage with an emphasis on government projects and initiatives.

Technology Industry News

All Things Digital (WSJ) (www.allthingsd.com)
An in-depth tech site from The Wall Street Journal with articles that strike a nice balance between tech culture, business and general consumer news.

Bits (NY Times) (bits.blogs.nytimes.com)
Focuses on technology, innovation, business and society.

ChannelWeb (www.channelweb.com)
Delivers news for Value Added Resellers (VARs) as well as articles on storage, networking, security, managed services, hardware and software.

CIO (www.cio.com)
Focused on tech executives, the site does a good job of offering high-level stories that include articles about managing IT workers.

CNet (www.cnet.com)
One of the earliest tech Web sites, CNet delivers general stories as well as news in narrow categories such as desktops, cell phones and car tech.

Data Center Knowledge (www.datacenterknowledge.com)
Devoted to all things related to the data center, a go-to source for news and information on operations-related issues.

eWeek (www.eWeek.com)
Formerly PCWeek, the site offers general tech news.

InformationWeek (www.informationweek.com)
If you're looking for in-depth news about the tech industry at large, this is the place to visit.

ComputerWorld (www.computerworld.com)
Offers some of the best articles and news for tech workers, as well as general tech news.

Internet.com (www.internet.com)
A good source for information on tech products.

IT Jungle (www.itjungle.com)
Offers breaking tech news as well as coverage of tech products.

Linux Journal (www.linuxjournal.com)
If you want to know anything about Linux, this is the place to read it.

MacWorld (www.macworld.com)
The title speaks for itself.

NetworkWorld (www.networkworld.com)
A site devoted to all things related to networks.

PCWorld (www.pcworld.com)
Heavy focus on laptops and desktops.

SC Magazine (www.scmagazineus.com)
Detailed coverage of security tools and trends.

Seattle PI (www.seattlepi.com/business/)
IT news and coverage of local tech companies – like Microsoft.

Search Security (www.searchsecurity.com)
Part of the TechTarget network of Web sites, it delves deep into security-related issues.

SiliconValley.com (www.siliconvalley.com)
Silicon Valley's "local news" Web site is a good place to keep track of goings-on at industry-leading companies big and small, not to mention the firms and banks that finance them.

TechCrunch (www.techcrunch.com)
A tech blog heavy on opinion and attitude.

Techmeme (www.techmeme.com)
Compiles information from a number of tech blogs into a single resource.

TechRepublic (www.techrepublic.com)
General tech articles, quirky stories for IT professionals, and an active online community.

Telecommunications Online (www.telecoms-mag.com)
News on the telecommunications industry, nationally and internationally.

VentureBeat (www.venturebeat.com)
Wide coverage of venture-backed companies, their products, services and funding.

Wall Street & Technology (www.wallstreetandtech.com)
Coverage of IT as it's applied to the financial industry.

Organizations

CompTIA (www.comptia.org)
A not-for-profit association that represents the computing industry on public policy issues and offers vendor-neutral certification exams.

Data Management Association (www.dama.org)
A vendor-independent association of technical and business professionals dedicated to advancing concepts and practices around data resource management and enterprise information.

IEEE (www.ieee.org)
The world's leading professional association for the advancement of technology. Originally "the Institute of Electrical and Electronics Engineers," today the organization's scope has expanded into many related fields.

International Institute of Business Analysis (www.theiiba.org)
An independent professional association serving the growing field of business analysis.

Linux Online (www.linux.org)
A community-supported Web site, it seeks to "inform the public about every company, project and group that uses the Linux operating system and to report on the hard work of countless developers, programmers and individuals who strive every day to improve on the Linux offerings."

SNIA (www.snia.org)
Made up of some 400 member companies spanning the global storage market.

Project Management Institute (www.pmi.org)
An association for project managers, it has more than 500,000 members and credential holders in over 170 countries.

Society for Technical Communication (www.stc.org)
Its 14,000 members include technical writers and editors, content developers, documentation specialists, technical illustrators, instructional designers, academics, information architects, usability and human factors professionals, visual designers, Web designers and developers, and translators.

Software and Information Industry Association (www.siia.net)
The principal trade association for the software and digital content industry.

Telecommunications Industry Association
(www.tiaonline.org)
A membership-based organization for all things related to telecommunications.

Many Paths to Success

Information Technology is a broad field, with all sorts of opportunities for employment. There are countless IT jobs, from support to development to management. In nearly 30 years of covering the business, including 15 as editor-in-chief of *PC Magazine*, I've seen the evolution of a number of successful career paths.

Some people gravitate toward product development, where the task is to create products for others to use. Often, successful developers stay in this kind of role for many years, increasing their knowledge and responsibilities. Others start in development but then move toward management as a product manager to chief technology officer, often running a team of developers. Still others apply technology solutions in support of other business goals, typically within an IT department in a big company, eventually striving toward a chief information officer role. Finally, some people make their living doing consulting, providing services to other companies, or selling IT products.

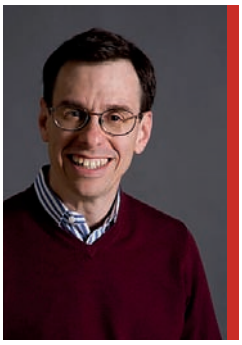
No matter what the role, the most successful IT professionals I've met combine technical skills, communications skills, and a sincere interest in their business and their customers.

How can you get ahead?

Go Deep. You're better off knowing some specific areas of technology very well than just having a broad general knowledge, particularly early in your career. This often helps you move up through the ranks. But to be a successful CTO or CIO, you'll need to have a good broad knowledge of all of the IT issues that impact your firm.

Keep Learning. No matter what technologies you know now, there will be new ones coming in the near future. Your job will change, and you'll need to change with it. That has always been the case, and the rate of change certainly isn't slowing. The best way to grow in your career is to learn how to apply what you've done before to new situations and new technologies.

Volunteer to Do More. This is a great way to pick up new skills. Do more on the job, take classes, or follow the open source communities online. If you're worried about getting left behind, pick an open source project to contribute to. Mentor a younger colleague, or use some new form of technology to help a charitable organization. These are great ways to learn something new and maybe even make a name for yourself.



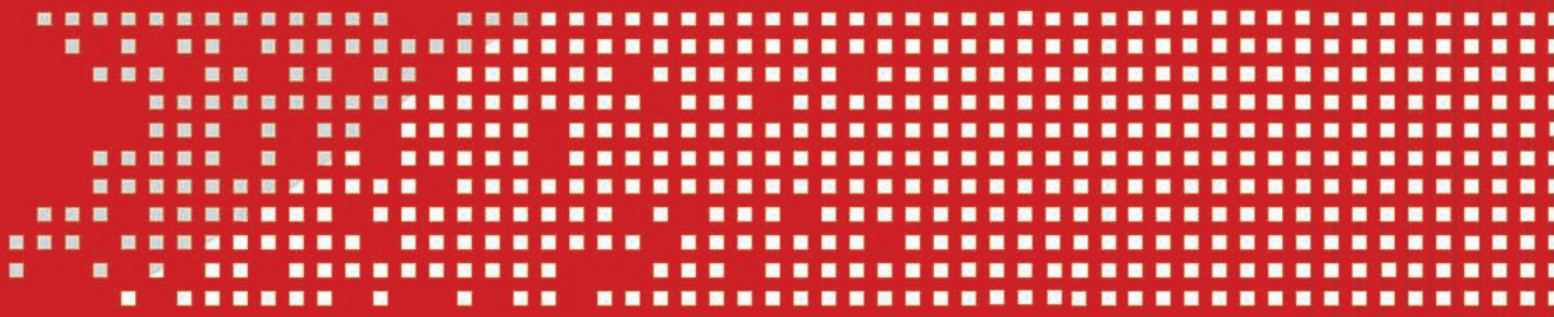
Michael J. Miller
Senior Vice President, Technology Strategy
Ziff Brothers Investments

Understand the Business. Some businesses are based on IT, but most simply use IT to support the business's goals. You must understand what the company's business is about, and what the end customers are really looking for. If you're in a back-office IT job, a good way to understand more about the business is to "ride along" with someone in a more customer-facing job. If you're moving into management, a basic understanding of business principles is essential. You want to be able to discuss the business issues with managers in other departments. You don't need to have an MBA, but you should understand the basics of a P&L statement.

Communicate Effectively. Being able to write and speak well will help you move up in any organization. You need to be able to explain what you are doing, why you are doing it, and what you have accomplished. If things go wrong (as they often do), tell your managers as soon as you can, and, if possible, be prepared to suggest a fix. But remember: Communicating well goes both ways. For many people, that means "Talk less. Listen more."

Remember that communications these days often happens outside of your formal job. Everything you do online is effectively part of your application when you go after a new job. Thus, your social networking pages become important – whether these are on your blog, Facebook, LinkedIn, Twitter, or whatever comes next. At the very least, they shouldn't be offensive. In the best case, they should demonstrate something very positive about you and your talents. A blog on some specific technical topic is a great way to differentiate yourself from the crowd.

I'm a big believer in loving what you do and doing what you love. Even if you're not currently in a great situation, strive to find something in it that is interesting or exciting as you make your plans to move on to the next great challenge.



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