Learning Track 5: Occupational and Career Outlook for Information Systems Majors 2010–2020

Total employment in the United States is expected to increase by about seven percent from 2010 to 2020. However, the 20.5 million jobs expected to be added by 2020 will not be evenly distributed across major industry and occupational groups. Changes in consumer demand, improvements in technology, the rise and fall of industries and entire sectors of the economy, and many other factors, will contribute to the changing employment structure of the U.S. economy. Industries and occupations associated with health care, personal care, social assistance, and construction are projected to be the fastest growing. Occupations which do not require a college degree (either two or four-year college degrees) will have the slowest growth in the 2010-2020 forecast period. Also, the labor force is aging, and the labor participation rate will decline, slowing the growth in the labor force.

Employment growth in IS/MIS jobs will be about 50% greater than average job growth in other fields.
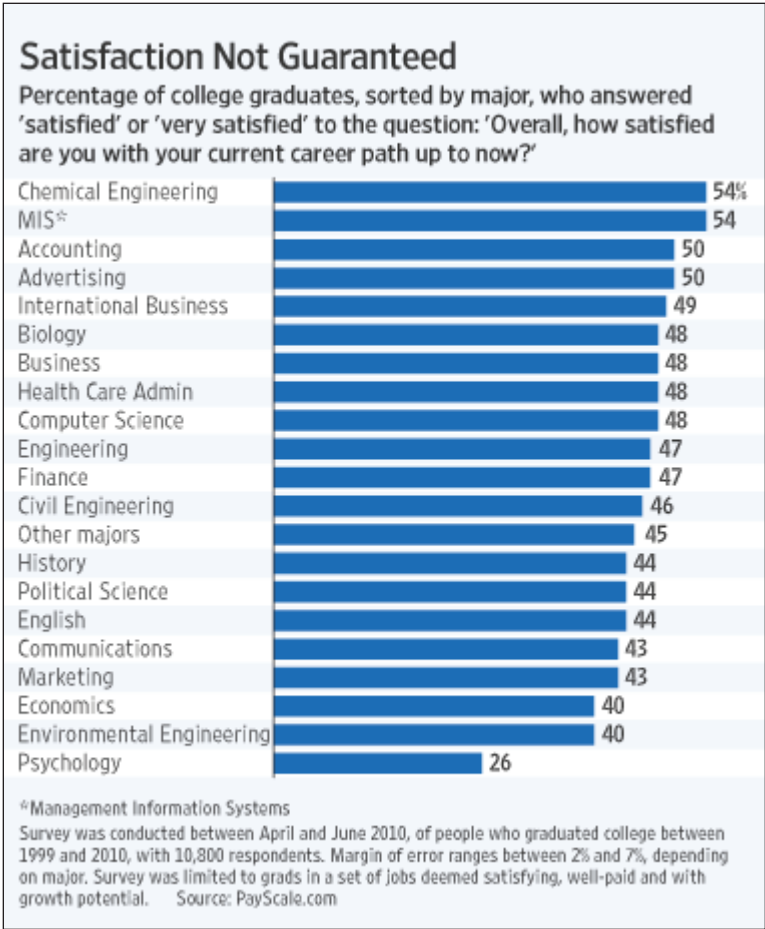
Career Satisfaction Among Information Systems Majors

A survey completed in 2010 found that IS majors were among the most satisfied with their career path since graduation when compared to other majors (Figure 1-1). In fact, MIS majors had the highest level of career path satisfaction. 54% of MIS graduates were "satisfied" or "very satisfied" with their career path since graduation. The survey, which was conducted by PayScale.com between April and June of 2010, only included respondents with jobs, but could also include people who went on to earn a graduate degree. It included 10,800 employees who got their bachelor's degrees between 1999 and 2010. The survey was done as part of the Wall Street Journal's Paths to Professions project, which looked at jobs that are satisfying, well-paid and have growth potential. The PayScale survey examined people in a set of jobs that included industries such as health care, finance, and government (Figure 1-1).

The differences among the top half college majors are not huge, but they are interesting and statistically significant. The average for all careers is 46%. It is likely that those college majors with less than "average" satisfaction reflect difficulties in finding jobs in a field for which they have trained, and when found, retaining jobs and having good job experiences. Psychology had the lowest level of satisfaction.

Another factor is pay. MIS is ranked 15th out of 114 occupations in terms of median starting pay ($50,900) and mid-career median pay ($90,300) (Payscale.com, 2010).

FIGURE 1-1 MIS Scores Highest in Career Path Satisfaction

Satisfaction Not Guaranteed

Percentage of college graduates, sorted by major, who answered 'satisfied' or 'very satisfied' to the question: 'Overall, how satisfied are you with your current career path up to now?'

Major	Percentage
Chemical Engineering	54%
MIS*	54
Accounting	50
Advertising	50
International Business	49
Biology	48
Business	48
Health Care Admin	48
Computer Science	48
Engineering	47
Finance	47
Civil Engineering	46
Other majors	45
History	44
Political Science	44
English	44
Communications	43
Marketing	43
Economics	40
Environmental Engineering	40
Psychology	26

*Management Information Systems
Survey was conducted between April and June 2010, of people who graduated college between 1999 and 2010, with 10,800 respondents. Margin of error ranges between 2% and 7%, depending on major. Survey was limited to grads in a set of jobs deemed satisfying, well-paid and with growth potential.   Source: PayScale.com

MIS Job Projections to 2020

If MIS college graduates today are among the most satisfied, and if this is in part related to employment prospects and job satisfaction after graduation, then the future for the various IS/MIS careers is quite positive because jobs in MIS will continue to expand over the next eight years at a healthy rate. IS employment in the United States will grow by about 800,000 jobs in the forecast period to 2020.

Figure 1-2 below presents data from the Occupational Outlook Handbook (Bureau of Labor Statistics, 2013) for the period 2010-2020. This table collapses a variety of MIS occupational titles into nine occupational categories: computer and information scientists, database administrators, information systems managers, security analysts/Web developers, network and system administrators, systems analysts, computer support specialists, and software developers/programmers. Figure 1-3 describes the percentage change and salary range in these occupations over the forecast period.

FIGURE 1-2   Job Outlook for Selected IS Occupations 2010-2020
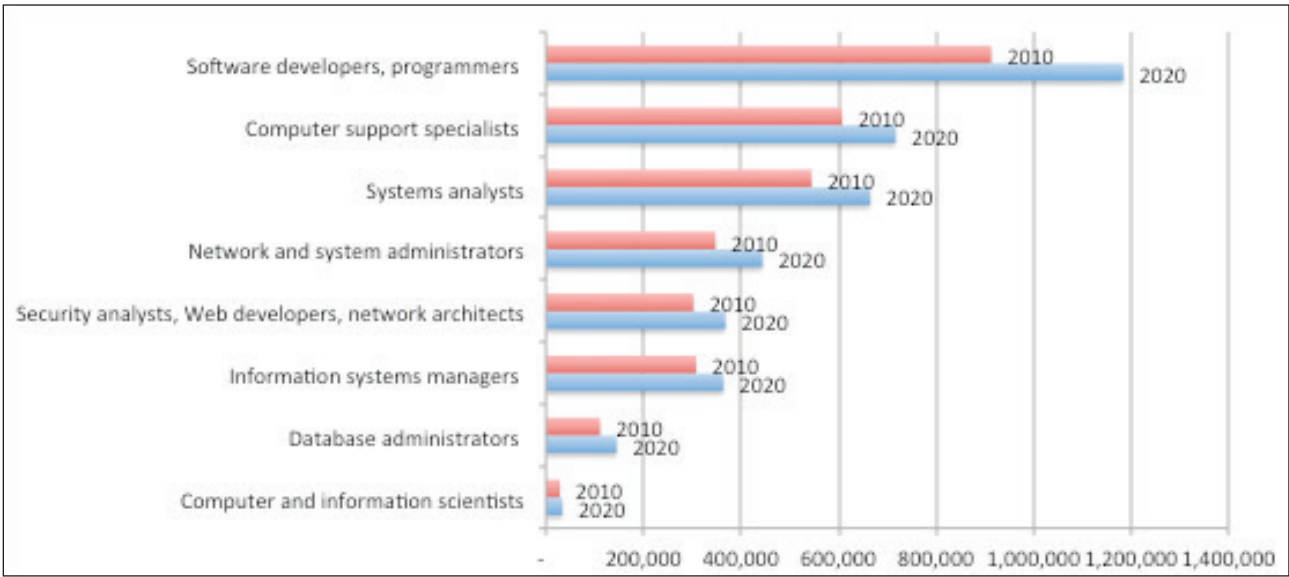
Source: Bureau of Labor Statistics, 2013. Table by author.

Compensation of IS Personnel

IS occupation salaries are generally far above the average compensation for employees in the United States (about $45,000 annually) (Figure 1-3).

FIGURE 1-3   Percentage Change and Salary Range in Selected IS Occupations, 2010-2020

	%Change	Median Salary
Computer and information scientists	19%	$100,660
Database administrators	31%	$73,490
Information systems managers	18%	$115,780
Security analysts, Web developers, netw		

Source: Bureau of Labor Statistics, 2013. Table by author.

The top five occupational titles in terms of salary are: information system managers with a median salary of $116,000; computer and information scientists, $100,660; software developers and programmers, $90,500, systems analysts, $77,740; security analysts and Web developers, $75,660. About 518,000 new jobs will develop in these areas by 2020. The largest number of jobs created will be software developers/programmers (about 270,000). Students of MIS with a managerial interest will find significant opportunities in project management, system management, and liaison roles with other corporate managers in marketing and sales, production, general administration, and finance. Students

with an interest in database, data mining, networks and software development will also find significant opportunities.

Fastest Growing IS Occupations

All IS occupations show a far higher rate of growth than the average for all occupations (about 7%). The fastest growing occupations are database administrators (31%) followed by software developers/programmers (30%), network/system administrators (28%). The other IS occupations are growing in the 15%-20% growth range in this ten-year period (Figure 1-4). Computer support specialists will grow by 18%, adding about 110,000 new jobs. Computer support specialists provide technical assistance and advice to company employees, and customers, as well as provide training materials. These are excellent entry-level jobs for recent graduates, and offer many opportunities for advancement to higher paying IS jobs in the future, as well as promotions to corporate divisions and departments like marketing, logistics, and finance. Software developers and programmers, and network occupations tend to be more technically oriented, whereas systems analysts jobs tend to be more management oriented. Systems analysts provide a crucial link between business managers and systems staff by helping managers to define information requirements, system design, and implementation. Both of these occupations require good technical, interpersonal, and problem solving skills. Systems analysts require, in addition, excellent writing and presentation skills.

FIGURE 1-4

|	2020	2010	New Jobs
Computer and information scientists	33,500	28,200	5,300
Database administrators	144,700	110,800	33,900
Information systems managers	363,700	307,900	55,800
Security analysts, Web developers, netw	368,000	302,300	65,700
Network and systems administrators	443,800	347,200	96,600
Systems analysts,	664,800	544,400	120,400
Computer support specialists	717,100	607,100	110,000
Software developers, programmers	1,184,000	913,100	270,900

Technical vs. Managerial IT Jobs

One question business students often ask is "How much technology do I need to know to get a good job?" Unfortunately, there is no single answer for this question. From a career perspective, what is better: start out with a strong technology background, and then build on those skills and experiences, seek out additional educational credentials, and seek a higher paying management position? Or, is it better to focus on the management skills while in school, apply for management-oriented IS jobs, and learn a smattering of technology along the way?

Figure 1.5 groups the various IS occupations into two groups: managerial and technical. Managerial occupations include information systems managers, systems analysts, network and system administrators, and database administrators. Technical occupations include software developers and programmers, computer support specialists, and security analysts/Web developers. From what we have said so far, it's clear that the technical jobs are more numerous to begin with and are generating slightly more jobs than the managerial occupations, and that the managerial occupations pay more than the technical occupations on average. Figure 1.5 illustrates that technical IS jobs are more numerous and are growing a bit faster.

FIGURE 1.5   Technical vs. Managerial IT Job Growth 2010–2020
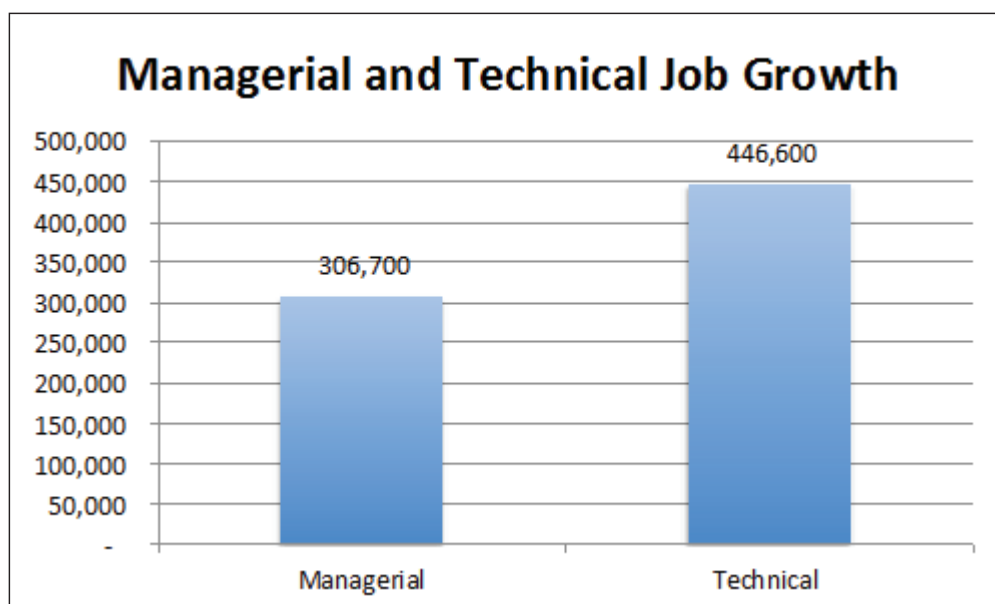
Note: Technical jobs: software developers/programmers, computer support specialists, security analysts/Web developers. Managerial jobs: information systems managers, systems analysts, network and system administrators, and database administrators.

In the history of the MIS profession there are a variety of successful career paths. Some senior IS managers started out in narrow technical jobs and worked their way up to becoming managers and even CIOs (Chief Information Officers). In contrast, there are some CIOs who have very little technology background but a great deal of experience as project managers, dealing with other senior managers, and managing at the Vice-president and C-level (senior management) in other divisions of the company. However, this latter case is rare. Chances are in the first interview students have with potential IS/MIS employers, the question of technical competence will come up. Therefore, it is wise for recent college graduates seeking employment in the IS/MIS field to have a good to strong technical background.

One career strategy is to focus on developing technical skills while in school and then use those skills to obtain an entry-level job. Return to school, or learn on the job, managerial skills to participate in

the higher earnings of this group. Another strategy is to focus on technical skills for an entry level job, then build on those skills staying within the technical track to attain higher paying technical positions.

The optimal career strategy is arguably a mix of strong technical skills with an equally strong set of inter-personal, collaboration, and management skills. If you can't get along with colleagues, have poor project management skills, and are poorly organized in your work, chances are good your technical skills alone may not be enough for a successful career.

The Impact of an Aging Labor Force on IS Careers

The demand for IS and MIS employees will actually be much higher in the next decade and beyond than discussed above because of the aging population and labor force in the United States.

The U.S. civilian population, including individuals aged 16 and older, is expected to increase by 25.2 million to a total of 325 million from 2010 to 2020 (about 8%). The labor force is expected to increase at about the same rate from 157 million in 2010 to 167 million in 2020, an increase of .8% a year, down from greater than 1% in previous decades. Labor force growth is slowing.

As the baby boomers continue to age, the 55 and older age group is projected to increase by 29.7 percent, more than any other age group. Meanwhile, the 45 to 54 age group is expected to decrease by 7.6 percent, reflecting the slower birth rate following the baby-boom generation. The 35 to 44 age group is anticipated to experience little change, with a growth rate of 0.2 percent, while the population aged 16 to 24 will grow at only .3 percent over the projection period. According to the U.S. Census Bureau, the number of people aged 55 and older will increase to 30% by 2020, while the number of younger workers will grow only 5%. By 2030, with the last of the baby boom generation turning age 66, an unprecedented 20% of the population will be over age 65. The share of the youth labor force, workers aged 16 to 24, is expected to decrease from 14.3 percent in 2010 to 12.7 percent by 2020. The primary working-age group, those between 25 and 54 years old, is projected to decline from 67.7 percent of the labor force in 2008 to 63.5 percent by 2018. Workers aged 55 years and older, by contrast, are anticipated to leap from 18.1 percent to 23.9 percent of the labor force during the same period. As baby boomers grow older, so does the U.S. workforce.

In a nutshell, the U.S. population and the labor force are getting older over the foreseeable future, and slowing in growth. Three decades ago the median age of the labor force was 35 years. Today, the median age is estimated to be 41 and by 2030, the median age is expected to be 48. Retirement age had been falling since the turn of the Century (from 74 years down to 62 years), but going forward to 2018, more elderly workers will remain in the labor force and average age at retirement is expected to increase to 67 (for a variety of reasons including better health, extension of the legal age of "full retire-ment" by the Social Security Administration, and economic necessity).

So far we have been using projections for new openings in the IS field. These projections did not account for replacement positions for those retiring. The number of replacement positions is not known for the specific IS field, but overall in the labor force, about 25% of today's labor force will

retire in the years 2010-2020. Using this ratio and applying it to the IS field suggests actual job growth with be 25% higher than suggested by looking just at "new positions." This means the IS field will actually add about 1.25 million new jobs in the period 2010-2020.

Industry Effects: Choosing The Right Sector

While employment prospects for IS/MIS majors look very good, it certainly will help if students focus on those sectors and industries that are likely to expand. The shift in the U.S. economy away from goods-producing in favor of service-providing is expected to continue. Service-providing industries are anticipated to generate approximately 14.5 million new wage and salary jobs. As with goods-producing industries, growth among service-providing industries will vary (Figure 1-6).

FIGURE 1-6   Numeric Change in Wage and Salary Employment in Service-Providing Industries, 2010–2020 (Projected)
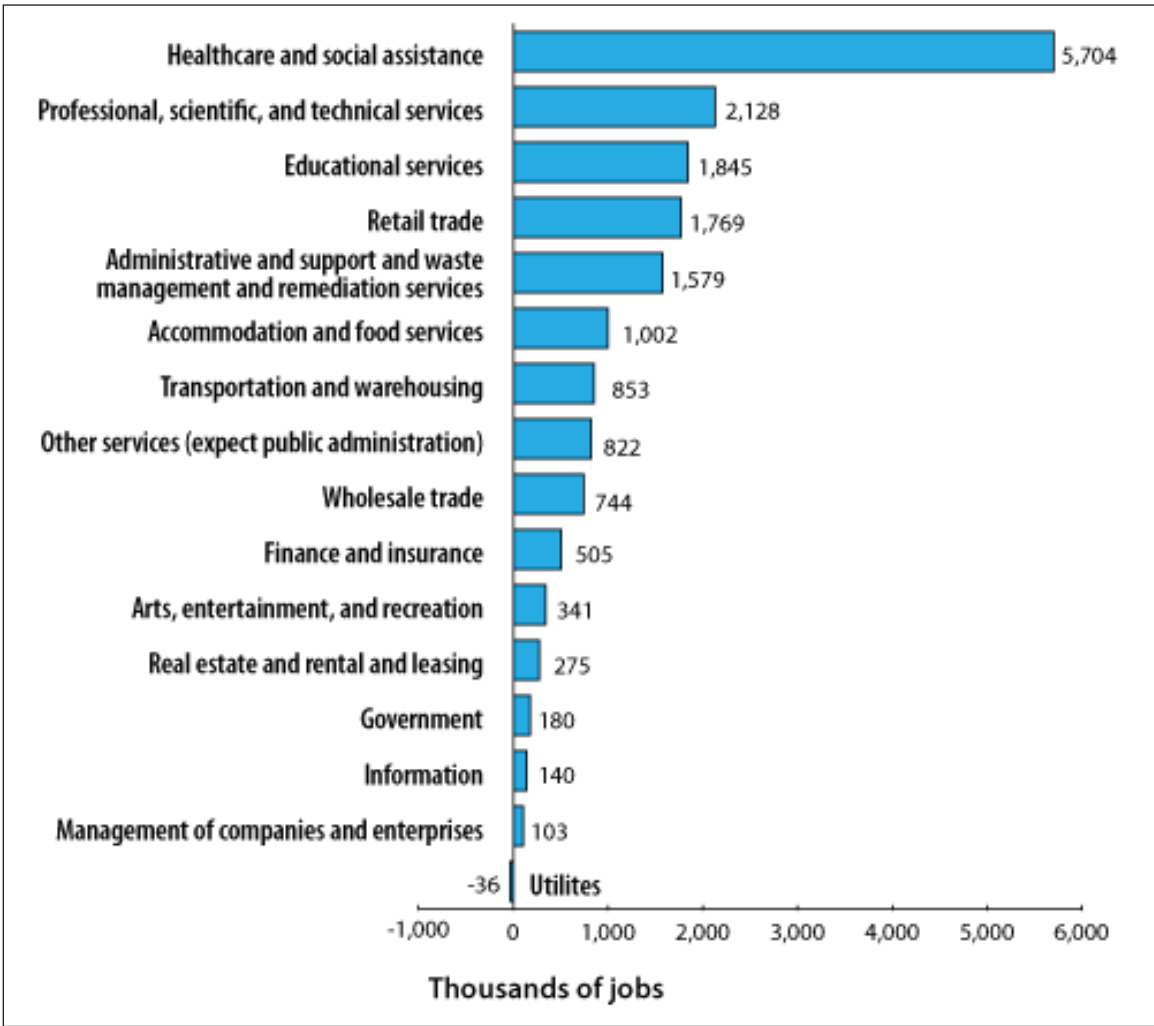
Source: BLS National Employment Matrix

Choosing the right industry for employment is like choosing the right asset class in an investment portfolio. The best opportunities for IS employment both in terms of percentage growth and overall numbers of new jobs can be found healthcare, professional and scientific services, and educational services. In general, employment in the manufacturing sector is not expected to grow as fast as service sector employment although there are local exceptions. In the recession of 2008-2010, and the slow-growth period of 2011-2013 that followed, manufacturing sector growth is larger than service sector growth. And in some regions where manufacturing plays a large role in the local economy, such as Ohio, Michigan, and Indiana, IS employment opportunities will be larger in manufacturing than services. Pay attention to local markets.

The Impact of Outsourcing on IS/MIS Employment: A Riddle

In the last decade, tens of thousands of IS/MIS jobs in the United States have been outsourced to India, as well as other countries. The three leading Indian outsourcing firms (Wipro, InfoSys, and Tata) are growing at about 10% annually, and currently employ about 300,000 IS/IT workers in India, most of whom are working on outsourced projects from the United States, and Europe. Large American global technology firms like Cisco, Microsoft, and IBM have made significant investments in India. IBM has created seven centers in India, and employs over 150,000 Indian workers in 2012. Microsoft has over 5000 employees in India working on products at all stages of the lifecycle from research and development, to support services. Cisco has 7,000 employees in India. Accenture, one of the world's largest IT and business consulting firms which has a large and growing practice called "business process outsourcing" and "management outsourcing," has over 74,000 employees in India working diligently to encourage firms around the world to outsource to India, or other low-wage countries. At the same time, large outsourcing firms like Wipro and Tata send over 100,000 IS workers to the U.S. every year.

There are many reasons that outsourcing to India and other areas has grown so rapidly. Labor costs in India are 10%-20% of labor costs in the U.S. A $60,000 a year programmer in the United States can be employed in India in 2013 for about $8,000-$10,000, and that programmer will live comfortably. Second, the Internet has made it possible and inexpensive to coordinate and manage far flung teams of employees. Third, Indian infrastructure has improved to the point where it can support global business operations (although there are exceptions). Fourth, India and China with 1 billion+ populations and nearly 8% annual GDP growth rates represent significant investment opportunities for American and other global firms. Most investments in China are not made for their outsourcing potential, but for the chance to participate in the growth of China's domestic and export markets. In their own right, India and China are the economies which will grow twice as fast as the U.S. economy in the next decade assuming existing trends continue.

All of this outsourcing would seem to paint a dim picture for IS/MIS careers in the United States. One would expect thousands of IS/MIS workers out of a job, and investment in systems shrinking. Oddly,

after a decade of significant outsourcing, unemployment among American IS/MIS workers is half that of the labor force average of 7.6 % in 2013, and is lower than unemployment among all college graduates and professionals of similar educational levels (about 3.7%). The estimated unemployment rate among IS/IT/MIS workers is less than 3.2%. Whatever the impacts of outsourcing, it clearly has not led to widespread unemployment among U.S. IS workers. Why not?

Oddly, despite all the outsourcing of IT work, investment by U.S. businesses in information technology and systems has expanded in the last decade at an extraordinary rate of about 5% annually (more than twice the rate of growth of the economy as a whole). Investment in information technology, systems, hardware, software and telecommunications equipment was $540 billion in 2012, 52% of all capital investment in the U.S., and up from $366 billion in 1998 (Bureau of Economic Analysis, 2013). Employment levels in the IS/MIS careers and occupations have also expanded in the U.S. over the last decade at about 5% annually.

How is it possible that IS/MIS outsourcing can be proceeding at a very rapid rate, and growth in IS/MIS careers and investments is expanding? The answers are speculative. One possible answer is that outsourcing has largely involved lower level, technical programming and engineering jobs and not higher level, high value-added jobs. As more lower level jobs are outsourced, more higher value jobs replace them. Moreover the demand in the U.S. for technical programming jobs has exceeded the supply, leaving plenty of work for local U.S. technical personnel. Some jobs like technical support specialist cannot be easily outsourced. Higher level management jobs are much less likely to be outsourced because of the need for face-to-face interaction with suppliers, customers, and employees. Sales and marketing are difficult to outsource.

Another possible explanation is that the growth of outsourcing has potentially lowered the costs of system development in the U.S., making systems less expensive to build, and therefore encouraging U.S. firms to invest more in IT/IS and systems in general. The cost of technology has also fallen significantly (in terms of cost/millions of instructions per second). These developments are the equivalent of lowering the price of capital (in this case IT capital). And high levels of IS investment in the U.S. have only encouraged more outsourcing (as well as domestic employment). One result is a virtuous circle: outsourcing leads to lower system development costs, which leads to more investments in systems, which leads to higher demands for skilled IS/MIS labor, some of which will be outsourced. There are of course brakes and limits on the outsourcing process which are beyond the scope of this paper.

Summary: Employment Career Prospects for IS/MIS Majors to 2020

- Recent college graduates report high levels of satisfaction in their IS/MIS careers.
- US IT/IS jobs will grow at 5-6% over the period, about 1.5 times the GDP growth and considerably faster than the overall growth in the labor force.

- Compensation for IS/MIS graduates is above average compensation for college graduates and is likely to remain so for the forecast period.
- Unemployment among IS/IT/MIS workers is extremely low
- The fastest growing IS/MIS jobs are database administrators, software developers/programmers, and network system administrators.
- The highest paid IS/MIS jobs are information systems managers, computer and information scientists, software developers.
- Technical vs. managerial jobs. Technical jobs show large percentage and absolute growth, but managerial jobs pay more, and are far less likely to be outsourced.
- Both technical and managerial knowledge and skills are valued in the marketplace.
- It helps to choose the right economic sector when preparing for the job market. Healthcare, professional and educational services show the highest sector growth rates over the next ten years.
- Outsourcing has had a significant impact on IS/MIS employment and investment in the United States although not in the ways commonly believed. Outsourcing has not led to massive unemployment or under investment in U.S. IT infrastructure. On the contrary, outsourcing may have led to more systems development and more employment than otherwise might have occurred.
- Technical jobs which can become routinized and commoditized suffer the greatest risk of outsourcing to low wage countries.
- Managerial jobs, and those technical jobs which require hands-on, judgmental, creative, and design skills are much less likely to be outsourced.
- Future growth in the U.S. IT/IS sector will be driven by falling capital costs in IT/IS sector, more powerful hardware and software, and relatively stable IS/IT wage rates in the United States. Wages rates in India and China are rapidly increasing, shifting business calculations on where to locate work.