Changes in the Systems Analyst Skill Set: 2006 versus 2001

Wayne A. Haga
haga@mscd.edu

Gerard J. Morris
morrisgj@mscd.edu

Charles H. Mawhinney
mawhinnc@mscd.edu

Joseph S. Morrell
morrellj@mscd.edu
Computer Information Systems Department
Metropolitan State College of Denver
P.O. Box 175562, Campus Box 45
Denver, CO 80217-3362

ABSTRACT

This paper addresses the issue of what skills are necessary to be successful as an Information System Analyst. An empirical study was performed to investigate the skill set requirements for the systems analysis position in the current job market and compare those requirements with those reported in a previously published paper. It is important to address these issues to be better able to advise students in an information systems program and to better package the curriculum content. This study found evidence of changing roles and responsibilities and requisite skills compared to those previously reported.

Keywords: systems analyst, job skills, curriculum

1. INTRODUCTION

An early textbook on information systems by Forkner & McLeod (1973), defined a systems analyst in the following way:

> Systems analysis is the study of complete business systems, or parts of business systems and the application of the information gained from that study to the design, documentation, and implementation of new and/or improved systems. The person who performs this systems analysis, design, and implementation activity is known as the Systems Analyst.

Compare that description with one provided in a recent systems analysis and design textbook by Whitten and Bentley (2007) which defines a systems analyst as "a specialist who studies the problems and needs of an organization to determine how people, data, processes, and information technology can best accomplish improvements for the business" (p. 11). On the surface there is little difference in the two descriptions. However, as recently as fifteen years ago, two jobs characterized the industry – 1) systems analyst, and 2) computer programmer. Systems analysts decided what sort of technology particular situations needed while programmers provided the computer with appropriate instructions to carry out specific tasks. The subsequent growth of information technology (IT) has led to a diversification of roles. This has caused some confusion, par-

ticularly where two jobs have had similar sounding names, such as systems designer and systems analyst, or when two employers have given the same job different names. The industry has grown very quickly and new job titles appear frequently. This paper researches the system analyst position in detail and will delineate the roles and responsibilities and attendant skills and knowledge of the systems analyst, and will show how the position has changed over the past few decades.

The job market for information technology workers has grown rapidly during the past three and a half decades. Cale, et al (1991), reported on actual and projected programmer and analyst positions for the period 1972 to 2000. They indicated 250,000 actual jobs in 1972 and 1,395,000 projected jobs in 2000. More recently, Smolkina (2001) utilized secondary data sources to assess the future of the systems analyst job. She indicated that employment of systems analysts was projected to rank in the top twenty in the number of new jobs and was expected to increase over one hundred per cent over the next twenty years. In that study it was revealed that employment in computer and data processing services grew by more than 900,000 jobs from 1988 to 1998. In 1998, there were about 1.6 million wage and salary jobs, and an additional 216,000 self-employed workers, making it one of the largest industries in the economy. Since the late 1980s, employment had grown most rapidly in the computer programming services and prepackaged software segments of the industry. From 1988 to 1998, about 245,000 jobs were created in programming services and another 166,000 in prepackaged software. The study further revealed that the computer and data processing services industry grew dramatically during that period and employment was expected to grow about 117 percent by the year 2008, making this the fastest growing industry in the U.S. economy. However, that study occurred just as the IT employment bubble burst. The IT meltdown that occurred in 2001 was inevitable. The coincidence of safe passage through the Y2K gateway and the speculative over-investment in e-commerce technology that caused the bursting of the dot-com bubble resulted in massive IT layoffs throughout the IT industry as well as in user industries. This was further exacerbated by the rapid buildup of the offshoring of some IT services and the "post 9/11 recession". Gincel (2005) was one of many who forecast doom for the IT profession. He reported on the Gartner Group's forecast that by 2010 large and mid-size firms will have cut the size of their IT departments by one-third the level they had in 2000. Gartner also predicted that by 2010 ten to fifteen percent of IT professionals would drop out of the IT profession. John Mahoney, chief of research for IT services at Gartner further predicted the end of programming as a viable profession. Mahoney stated "If you can put it in a set of rules that can be copied, it will go offshore". Eckie (2005) reported that economists Martin Bailey and Robert Lawrence estimated the software and business process jobs lost to India from 2000-2003 at 274,000. They argued that a job shift of this size is small when you consider that 2.1 million service jobs were created every year in the 1990s, and that most of the jobs lost were on the low-end. However, the purveyors of doom-and-gloom would appear to have been wrong. Reports in the last year have indicated that domestic IT employment is currently at all time high levels, surpassing the dot-com heyday. Typical of such reports is one by Olsson (2007) stating "The job market is ripe for recent college graduates in the computer industry. The overall unemployment rate for the computer industry at the end of the last quarter was 2.1 percent, even lower than it was during the peak of the dot-com boom."

The majority of workers in computer and data processing services are managers, professional specialists (such as computer systems analysts, engineers, and scientists), and technicians, such as computer programmers. Together, these occupational groups have traditionally accounted for 70 percent of the jobs in the industry, reflecting the emphasis on high-level skills and creativity. The focus of this paper is on the systems analyst position and how the expected skills, knowledge, education, and experience for this position have changed over the years. Numerous studies on this topic have been conducted. Several of them will be summarized here.

Trauth, et al (1993), conducted a study of business IS managers in New England. They

concluded that there was an "expectation gap" between industry needs and academic preparation.

Todd, et al (1995), tracked the evolution of IS job skills from 1970 to 1990 using content analysis of IS job advertisements in four newspapers (two in the United States and two in Canada). They found that during that twenty year period the greatest transition in specified job requirements was for the systems analyst position. Contrary to their expectations, they found that the frequency and proportion of technical knowledge requirements increased dramatically while the relative frequency of business and systems knowledge requirements decreased slightly.

Athey, et al (1995), investigated the changes in IS job requirements during the period 1989 to 1993 using Sunday newspaper want ads in eight major cities in the United States. Unfortunately they did not do a break-out by job type (programmer, systems analyst, systems management, etc.), but they did document the transition from COBOL to C/C++ as the preferred development language and rise in popularity of the Unix operating system. They also noted that the use of specific technologies varied from one region to another.

Mawhinney, et al (1994), surveyed 192 Denver area businesses in 1993. They found that the most common entry level IT positions were in applications programming, operations, and maintenance programming, all being mentioned by 40 percent or more of the respondents. Systems analysis was seventh on the list with only 20 percent of the respondents mentioning it. The knowledge areas in which these companies expected the highest levels of competence were problem solving, implementation and testing, and professionalism. Lesser levels of competence were expected in specific technical skills like database, programming languages, and telecommunications.
Mawhinney, et al (2006), surveyed 208 Denver area businesses in 2005 and found that significantly more IT workers had been hired than had been laid off during the previous year. In assessing employee attributes used in hiring and layoff decisions, they found that companies tended to use the same attributes for both decisions. They found that "soft skills" (competent communication skills and evidence of team qualities) were the more important than "hard skills" (proficiency in an area of specialty and work experience in the field) which were in turn more important than education (education level and certifications).

Morrell, et al (2001), used position listings at America's Job Bank to delineate and summarize the requisite skills for the systems analyst position. The authors concluded that there was optimistic future for the systems analyst, that the role of systems analyst was still vigorous, and that there was a variety of skills and talents necessary for competition in the job market. They summarized the role of the systems analyst as follows: Systems analysts are involved in analyzing and solving business, scientific, or engineering data processing problems and design new flows of information. Systems analysts tie together hardware and software to give an organization the maximum benefit from its investment in machines, personnel, and business processes. To do this, they may design entirely new systems or add a single new software application to harness more of the computer's power. They use data modeling, structured analysis, information engineering, and other methods. Systems analysts prepare models for programmers to follow for proper coding of machines and also perform cost-benefit analyses for management to evaluate the system. They ensure that the system performs to its specifications and test it thoroughly.

In the current study, the authors will attempt to determine the current status of the title "Systems Analyst" and to define the current skills, knowledge, educational, and experience requirements associated with the systems analyst job title. This study will use the same data source and analysis methodology as the Morrell, et al (2001) study so that direct comparisons can be made.

2. METHODOLOGY

In order to determine the skills required for the systems analyst, a search for jobs with "Systems Analyst" was performed at America's Job Bank (http://www.jobsearch.org/). This site facilitates searching for jobs listed at all 50 of the state government job service organizations. In the Morrell, et al (2001) study, a sample of 904 job advertisements

was selected. After elimination of duplicates and jobs that listed only generic skills, the final sample size was 585. All jobs were listed with the agencies during the months of May and June 2001. For the current study, a search was again performed at America's Job Bank, using the same keywords. All jobs selected were listed in October and November 2006. A smaller sample of 390 job advertisements was selected this time. After elimination of duplicates and jobs that listed only generic skills, the final sample size was 255.

As in the Morrell, et al (2001) study, the search for "Systems Analyst" revealed a wide variety of job titles and a disconcerting tale of the employers' expectations for the systems analyst position. A few examples of job titles include:

- computer systems hardware analyst
- business systems analyst
- business systems analyst programmer
- database systems analyst
- lead systems analyst
- sap systems analyst
- senior earned value management system analyst
- senior mainframe application developer/system analyst
- senior systems analyst
- system analyst - unix
- uml and systems analyst
- warehouse management systems analyst
- manufacturing systems analyst
- supply systems analyst
- systems analyst – mainframe
- software systems analyst

Job descriptions/requirements for the 390 jobs were examined. Forty-five of the jobs were duplicate listings and were eliminated. Of the remaining 345 jobs, ninety of the positions listed either no requirements or only a list of generic skills such as:

- strong technical skills
- strong problem solving skills
- strong writing skills
- strong communication skills
- project management skills
- teamwork skills
- leadership
- familiarity with the SDLC
- troubleshooting skills

Of the remaining 255 positions, the position descriptions were analyzed using a keyword search routine that used the keywords reported by Morrell, et al (2001), and the technical skills required/requested were noted and tallied. A subset of 100 of the position descriptions was verified manually, and several new keywords were added to the list, and automated analysis performed again.

3. ANALYSIS AND RESULTS

The results of the analysis are shown in the following tables. In all cases a sample size of 255 was used. The percentage figures shown in parentheses are those reported by Morrell, et al (2001), and the "Change" column shows the differences in percentages between 2001 and 2001 for the item.

TABLE 1. PROGRAMMING LANGUAGES

Programming Language	n	%	Change
Visual BASIC	24	9% (11%)	-18%
C/C++	14	5% (11%)	-55%
COBOL	20	8% (10%)	-20%
Java	23	9% (9%)	0%
.net	22	9% (---)	new
C#	10	4% (---)	new
CICS	12	5% (4%)	+25%
RPG	7	3% (3%)	0%
SAS	0	2% (0%)	-100%
FORTRAN	0	2% (0%)	-100%
Assembler Language	0	1% (0%)	-100%
Natural	1	1% (0%)	---

Table 1 summarizes the program language skills required for systems analysts listed in the job bank. There was a notable shift away from more traditional procedural languages (FORTRAN, assembler, Natural, C/C++) and toward the newer .net environment. Java use appeared to be stable during this period.

Table 2 summarizes the database skills required for systems analysts listed in the job bank. There was a general increase in this area with more requests for general database design/modeling skills. SQL and PL/SQL requests increased by 20%. The systems that decreased dramatically in the last five

years were Powerbuilder and Sybase. This was offset by Microsoft SQL Server requests increasing by 100%. The newer area, data mining and data warehousing, showed a 100% increase as one would expect.

TABLE 2. DATABASE SKILLS[1]

Skill	n	%	Change
Oracle	53	21% (21%)	0%
SQL & PL/SQL	61	24% (20%)	+20%
Database [2]	44	18% (16%)	+13%
DB2	19	8% (6%)	+33%
SQL Server	29	12 % (6%)	+100%
Powerbuilder	1	0% (2%)	-100%
Sysbase	0	0% (2%)	-100%
Data Mining/ Data Warehousing	10	4% (2%)	+100%
Informix	2	1% (1%)	0%
Delphi	0	0% (1%)	-100%

[1]MS Access was included with MS Office skills shown in Table 4.
[2]General Database design/modeling skills requested.

TABLE 3. OPERATING SYSTEM SKILLS

Skill	n	%	Change
UNIX/LINUX	37	15% (17%)	-12%
Win NT	1	0% (14%)	-100%
Win 95/98/2000	3	1% (6%)	-83%
AS400/OS400	5	2% (6%)	-67%
Mainframe[1]	18	7% (4%)	+75%
JCL	8	3% (4%)	-25%
Novell	0	0% (3%)	-100%
Sun Solaris	5	2% (2%)	0%
DOS	0	0 (1%)	-100%
MAC OS	0	0 (1%)	-100%

[1]General experience with mainframe OS requested.

Table 3 summarizes the operating system skills required for systems analysts listed in the job bank. Despite a decrease of 12%, Unix/Linux skills were still the most frequently requested. Requests for mainframe skills increased by 75% while older systems like DOS and Windows NT decreased by 100% each, as one would expect. Novell also continued its slide toward obscurity.

TABLE 4. OTHER MISCELLANEOUS SKILLS

Skill	n	%	Change
MS Office	56	22% (21%)	+5%
Internet/Intranet Development[1]	101	40% (18%)	+122%
Networking / Telecom[2]	16	6% (11%)	-45%
SAP	20	8% (9%)	-11%
Accounting (payroll, etc)	25	10% (8%)	+25%
Peoplesoft	15	6% (3%)	+100%
Tech Support / Help Desk	9	4% (3%)	+33%
ERP	22	9% (2%)	350%
Lotus Notes	3	1% (2%)	-50%
uml	22	9% (---)	new
Crystal Reports	12	5% (---)	new
Visio	10	4% (---)	new

[1]Includes HTML, XML, Javascript, Vbscript, Perl, Cold Fusion, MS Frontpage, etc.
[2]Networking certifications were frequently requested.

Table 4 summarizes other miscellaneous skills required for systems analysts listed in the job bank. The big gains here were made by Internet/Intranet development technologies, Peoplesoft, and general ERP. There was a dramatic decrease in requests for networking/telecommunication skills. One would expect these skills to be provided anyway by the networking group in IT so a decrease is reasonable.

4. SUMMARY AND CONCLUSION

The systems analyst position is one that is still difficult to define as evidenced by the plethora of job titles and the hodgepodge of skills needed to perform the role. These skills cut across the programming, database, internet technologies, and operating systems areas. The biggest gain was seen in the internet/intranet development technologies. This is of course expected given the strength of e-commerce in today's world. A surprise was the presence of COBOL, CIS, and RPG still in the list. Despite a decline, there was still a demand for these languages. While some skill areas are now more in demand than five years ago, there is still a wide range of skills desired in the market place.

This paper has focused on the technical skills that employers are currently seeking through new employees. "Softer' skills such as communication skills and ability to work in teams were not included in this analysis simply to maintain consistency with the previous study that was used for the basis of comparison. Such skills as well as systems analysis, design, and development skills were certainly mentioned frequently in the advertisements, and their range and frequency should be documented for future comparisons.

Academicians should take note of the findings described herein and consider whether their programs are consistent with the apparent changing needs of employers. Employers should take note of the wide variety of skills they are expecting and realize that it is unreasonable to expect academic programs to be able to provide such a broad background in an undergraduate student, and should consider whether it might be more appropriate to hire personnel who have strong conceptual backgrounds in database, programming, etc., and then themselves provide for training in a specific language or application.

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