Computer Information Systems Curriculum Development Trends

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Abstract

Computer Information Systems (CIS) has been one of the fastest growing disciplines during the last decade. Eight of the top ten fastest growing occupations (2000-2010) covered in the 2002-03 Occupational Outlook Handbook, involve computer applications. Development of CIS began after World War II as accounting managers started using computers for data processing. Academic CIS programs blossomed in the early1980's, and 1990's. Emerging from "hard-core" disciplines like Computer Science and Engineering Science, Computer Information Systems today has distinguished itself as a discipline supporting businesses and business administration. The related disciplines of this category are: CIS, MIS, CSIS, AIS, and ISYS.

Amidst these developments in the Computer Information Systems discipline, educators face the challenge of reviewing the existing curricula of the aforementioned related disciplines in colleges in an attempt to develop standards and deliver a quality education because the discipline is not unified. The mix of CIS programs also includes associate degree programs, accelerated bachelor's degree programs, and short certificate programs of assorted quality. Seven different professional organizations have endorsed the IS 2002 Undergraduate model, which is the latest official CIS model. This fall only one university program met the new rigorous national accreditation standards based on the IS'97 model.

This paper is an effort on the part of two college educators from North Dakota and Michigan to understand these ongoing trends with a view to identify the ingredients of a "quality computer information systems curriculum."

Introduction

This paper is an effort on the part of two college educators from North Dakota and Michigan to understand trends in computer information systems programs with a view to identify the ingredients of a "quality computer information systems curriculum."

The Information Systems Job Market and Academia

The fastest growing occupations during the previous few years have been computer related. Table 1 shows the fastest growing occupations according to the Occupational Outlook Handbook [1]. These are the occupations with the greatest rate of increase. Waitress, fast-food industry, janitor, etc. still have the greatest number of openings, but those generally don't require a college degree. Most of the computer related jobs require a bachelor's degree.

Table 1: Fastest growing occupations

Rank	Field	Educational Required
1	Computer software engineers, applications	Bachelor's degree
2	Computer support specialists	Associate degree
3	Computer software engineers, systems software	Bachelor's degree
4	Network and computer systems administrators	Bachelor's degree
5	Network systems and data comm. Analysts	Bachelor's degree
6	Desktop publishers	Postsecondary vocational award
7	Database administrators	Bachelor's degree
9	Computer systems analysts	Bachelor's degree
13	Medical records & health info. Technicians	Associate degree
14	Computer and information systems managers	Bachelor's or higher degree, plus work experience

Looking at the job market another way, outside of general business manager, teaching, and accounting, the occupations with the greatest number of openings in areas requiring a bachelor's degree are also computer related.

1 - Registered nurses
2 - Computer support specialists
3 - Computer software engineers, applications
4 - General and operations managers
5 - Postsecondary teachers
6 - Computer software engineers, systems software
7 - Computer systems analysts
8 - Elementary school teachers, except special education
9 - Network and computer systems administrators

Colleges have responded and there are now as many 4-year colleges with Computer Information Systems (CIS) major programs as English major programs. Table 2 is the result of an IPEDS COOL database search on any Public 4-year or above US College and then on all 9000 US colleges. (The pattern in 4-year non-profit private colleges is similar to public colleges. There are 117 four-year for-profit colleges with CIS programs.)

Table 2: Academic Major Programs

Program	4-year US Public Colleges	All US Colleges
Engineering	256	689
Mathematics	481	1290
English	484	1420
Education	510	1921
Computer and information science	499	2403

This should be a surprising result. There is the same number of English major and CIS programs at the bachelor's level, but there are many more CIS programs below the bachelor's level than there are English programs.   Since the computer jobs are supposed to require a four-year college degree, why are there so many non-four-year degree programs?

Before continuing on, let us look at the undergraduate programs offered by the University of Phoenix Online:

• Accounting
• Administration
• E-Business
• Management
• Marketing
• Information Technology
• Nursing and General Studies

Another for-profit university, Career Education Corporation, offers programs in:

• Visual communication and design technologies
• Information technology
• Business studies
• Culinary arts
• Healthcare

What these various disciplines have in common is that unlike traditional academic disciplines, such as chemistry, English, mathematics or mechanical engineering;

standards and curricula in these programs often vary dramatically and these can be cheap programs. The following is from a discussion group [2]:

"What you can normally expect to see is programming jobs requiring BSCS [i.e. computer science] degrees while non-programming IT jobs requiring a "computer" degree. In all cases, the stated job "requirement" is often flexible, which I expect is the case in the CS degree for a network admin job instance. Probablky [sic] a CIS [computer information systems] degree would be acceptable.

Let me offer one anecdotal reason why a CIS degree might *not* be acceptable for a network admin job. One of the primary problems with a CIS degree is that these programs are sometimes complete jokes. Here's the required curriculum for a regionally accredited BSIS degree from … "

The bracketed comments have been added to the original posting. The comment was posted in February of 2001. The university referenced is a regionally accredited US university and as of March 2, 2003, there have been no major changes to the program.

Origin of Information Systems

Many others have commented about the problems in defining "information systems" [3]. The conclusions of a paper by Prakash Saraswat states [4], "A glaring deficiency of paradigmatic thinking in the information systems discipline is raising questions about its raison d'être in academic circles and these views are being expressed in many colleges of business administration with increasing stridency. A confusion seems to be prevailing about the boundaries, sources, structure and fundamental basis of information systems as a field of studies. Although the eclectic nature of the discipline is widely recognized, the sources of its tradition remain obscure. This paper summarizes the important philosophical ideas that have contributed to the development of modern systems thinking as applied to the design and development of computer based information systems. The richness and diversity of philosophical thought from natural sciences and other academic areas can be successfully used to explore the intellectual roots of information systems and make the practice more effective. The interdisciplinary perspective of this paper enhances the boundaries of information systems research and imparts greater relevance to the proliferating tools and techniques of information systems trade. As a suggestion for further research, the intriguing ideas of Marcus Vitruvius can be studied in detail and their application to information systems design can be investigated."

"IS" is a fairly new field, relative to physics, mathematics, English, etc. The content that IS thinks of as its own, is found in many different other fields, such as computer science, office management, library science, engineering, education, technology, and communications. Indeed, almost any discipline contains "information systems." IS departments are often housed in the college of business, but are also commonly found in computer science, liberal arts, mathematics or engineering. Some of the various names for academic IS programs are the following:

- Information Systems - IS
- Management Information Systems - MIS
- Computer Information Systems - CIS
- Information Management - IM
- Business Information Systems - BIS
- Informatics
- Information Resources Management - IRM
- Information Technology - IT
- Information Technology Systems - ITS
- Information Technology Resources Management
- Accounting Information Systems - AIS
- Information Science
- Information and Quantitative Science

If we go back to the era before World War II, there were no individuals who claimed to be part of the modern "IS" profession. So what were the precursor occupations the evolved into IS?

One area was electrical engineering and physics, i.e. the people who originally built computers. IEEE-Computer Society is one of the largest computer organizations today. Another area is computer science and mathematics, i.e. the people who originally programmed computers. ACM is another one of the largest computer organizations today. Both of these organizations essentially began with the invention of the electronic computer. In 1961, IEEE-Computer Society and ACM together created AFIPS (now FOCUS). FOCUS represents the United States with the International Federation of Information Processing. IEEE-CS and ACM are also part of ABET, which handles computer science accreditation. ABET has recently added IS accreditation.

Another precursor to the IS profession involves data processing for business and accounting purposes. While ACM and IEEE have traditional connections with the physical science, data processing people have traditional connections with schools of business. In the late 1940's, the National Machine Accountants Association was created by accounting machine operators and managers. It became the Data Processing Management Association (DPMA) in 1951 and the Association of Information Technology Professionals (AITP) in 1996. "AIS" or the Association for Information Systems was created in 1994 and is a new similar organization. IACIS was formed in 1960 as the Society for Automation in Business Education.

The occupation of efficiency expert is still another precursor occupation to "IS." Scientific management was created to apply scientific methods to modern industrial production and assembly line work. Here we have the applications of physical science methods and of social science methods to business. Systems analysis and industrial engineering grew out of this line.

The profession of secretary has developed into office systems and now into end-user computing. In this case, "CIS" or "computer and information systems" is not well

differentiated from "computer applications", especially at the two-year and below level. This is probably the main reason for the large number of less-than-4-year college programs. The Office Systems Research Association (OSRA) has developed a national model Office Information Systems (OIS) curriculum or Organizational and End-user Information Systems (OEIS) curriculum. The introduction to the OEIS model curriculum states [5], "A dedicated team of information systems academics and practitioners have worked together to address the need for collegiate preparation of individuals who have skills related to being an information systems developer, troubleshooter, change agent, trainer, systems evaluator, and savvy business person. The Office Systems Research Association announces the publication of its four-year model curriculum entitled *Organizational and End-user Information Systems.*"

The Data Administration Managers Association (DAMA) and the Information Resource Management Association (IRMA) are two more associations which have produced model "IS" curriculum guidelines. Their model focuses less on the technical computer skills and more on the managerial aspects of IS, such as effective verbal and written communication, leadership, and delegation of authority.

Just as it is difficult to teach chemistry without chemicals or botany without plant specimens, the development of academic IS programs has been dependent on the availability of hardware and software. We might consider the first wave to be the introduction of mainframe computing. This was mainly limited to research universities. The second wave of the mid-1980's allowed any college to teach computer courses using microcomputers. The third wave has been miniaturization of computers, the Internet and the World Wide Web. College enrollments have grown dramatically and then fallen with each successive wave. If past trends hold true, we should expect computer enrollments across the United States to be falling at this time. Indeed this seems to be the case. [6]

In summary so far, "IS" has developed from a variety of different precursor fields, all of which can legitimately lay claim to the discipline. There are a variety of different curricula [7, 8] relating to these various fields. Amidst these developments in the Computer Information Systems discipline, educators face the challenge of reviewing the existing curricula of the aforementioned related disciplines in colleges in an attempt to develop standards and deliver a quality education because the discipline is not unified. The mix of CIS programs also includes associate degree programs, accelerated bachelor's degree programs, and short certificate programs of assorted quality.

These problems have reached the point that the Association for Information Systems [9] is establishing a Blue Ribbon Panel to define the nature of the IS discipline and to determine the content of the core courses in IS.

Valley City State University and Ferris State University

The model adopted at Valley City State University and at Ferris State University is in its most recent form called IS 2002. This curriculum developed out of work done by ACM and AITP going back to the early 1970's.

Seven different professional organizations have endorsed the IS 2002 Undergraduate model, which is the latest official CIS model. This fall only one university program met the new rigorous national accreditation standards based on the IS'97 model. IS 2002 is the second collaborative curriculum effort among ACM, AIS and AITP. It is also a part of the Computing Curricula 2001 project, which is a joint work of the IEEE Computer Society and the Association for Computing Machinery (ACM). This model has been endorsed by Decision Sciences Institute (DSI), the International Association for Computer Information Systems (IACIS), the International Academy for Information Management (IAIM), the Society for Information Management (SIM), AITP Special Interest Group for Education (EDSIG), ACM Special Interest Group on Management Information Systems (SIGMIS), and INFORMS Information Systems Society (INFORMS-IS).

These organizations updated the model curriculum for three reasons. (1) Although the creators of the previous model were aware of the Web and Internet when the report was produced, developments were too late to include these in the process. (2) Many students were learning basic computer skills in high school. (3) Although many CIS programs are housed in the School of Business and can receive accreditation through AACSB, there was a growing desire to have a set of guidelines suitable for accreditation through AACSB or through a process similar to computer science. Pace University [10] in New York is the first university to receive IS accreditation through the Computing Accreditation Commission (CAC) of ABET.

In the IS 2002 model, "The overarching objective for IS professionals is to enable organizations to utilize information technology to achieve their strategic objectives with a customer service orientation." "IS" is at the intersection of business and organizational focus, analytical and critical thinking, technology, and interpersonal communications and teams.

"Information Systems" mean different things to different people. A comparison of CIS programs offered by different colleges and universities demonstrates this fact. The CIS programs at VCSU and FSU are no exceptions, showing that there is a great need for adopting standards in CIS curricula development. The CIS curricula of the respective universities that provided the basis of this study are available at websites given below:
http://www.vcsu.nodak.edu/asp/programsofstudy/major-minorlist.asp?id=7
http://www.ferris.edu/HTMLS/colleges/business/cis.htm.

Conclusions:

Computer Information Systems programs offered by 4 year-degree-granting colleges and universities range from office management and end-user computing to database management on the one hand and training computer users to producing computer programmers and developers on the other. While gaining accreditation for CIS programs is of high priority for some institutions, increasing enrollment has become the sole objective of offering CIS programs in other institutions. College-bound students, who are

caught up in the middle of this highly volatile discipline, still find it attractive, marketable, risky and confusing.

Faced with CIS curricula development, college professors and administrators encounter enormous challenges not only in understanding and identifying what Computer Information Systems is all about, but also in evaluating the quality of CIS programs offered in different colleges and universities. While guidelines provided by model curricula would facilitate such an understanding and offer tools for review and assessment of existing CIS programs, the availability of human and other resources including computer hardware, software and infrastructures that are required to sustain these programs, would ultimately determine their quality and viability in academic institutions.

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