Computer Information Systems Department: A Proposition Curriculum for CIS

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Abstract

The study of computer-related topics changes almost as rapidly as the technology it addresses. Various computer-based information systems exist in almost every contemporary organization. Like many subjects, the curriculum of computer information systems (CIS) development poses a certain dilemma. Which topic should come first? How are these systems developed? Each of these and many others issues is important to an understanding of the curriculum of CIS development. One good way to measure a CIS education is by comparing various curriculums of higher education institutions. In this paper a comparison will be shown between many universities' CIS curricula and a new curriculum will be devised based upon the review of some selected universities. In this paper, I have endeavored to put forward a proposed model of CIS curriculum. This is an initial step into the design of relevant CIS department in various universities.

Key words: Information Systems, Information Technology, Curriculum

1- INTRODUCTION

A good way to measure your CIS education is by comparing its curriculum to other institutes of higher education. In this paper a comparison will be shown between many universities' CIS curricula and a new curriculum will be devised based upon the review of some selected universities.

The schools that were reviewed are as following:

    1-Campbell University,
    2-Eastern Illinois University,
    3-Eastern Kentucky University,
    4-Hampton University,
    5-Arizona State University,
    6-Clemson University,
    7-University of Louisville,
    8-Winthrop University,
    9-University of Southern Indiana,
    10- Eastern Michigan University, and
    11-ACM/AIS/AITD model

Each of these schools was different and this was reflected in their CIS curricula. Some of the CIS majors are bachelor of business administration and some are bachelor of science. For BBA classes there is more emphasis on business while a BS emphasizes computer science. The primary objective of the computer information systems major is to provide graduates with knowledge, abilities, and attitudes to function effectively as an applications designer/project manager/ programmer /analyst, and with the educational

background and desire to pursue lifelong professional development. The CIS major is very versatile because of the business background. A further review of each university's CIS curriculum will give more insight (see table-1 for a summary).

2-CIS CURRICULUM

2.1 Campbell University: The first university that was reviewed is Campbell University (CU, 2007). This curriculum includes the business classes and computer information classes to earn a bachelor of business administration in computer information systems. The required business classes consist of Economics, Accounting, Marketing and Business Law. These courses provide a great foundation for business knowledge. The CIS related classes start out with Introduction to Computers and Internet Applications as a freshman. As a sophomore C++ Programming, Visual Basic Programming, and COBOL are required. The junior year consists of Systems Analysis and Design, Database Management, and Java Programming. During the last year of classes, Design Project and Research Topics or an Internship are required. Along with the required classes, 12 hours of CIS electives are required at the 300 level or above. As a result, the graduates discover many diverse opportunities. For example, about 40% of the majors go on to work in computer-related organizations. Another 30% take positions in non-computer-related organizations. The remainder work as consultants, pursue graduate degrees, research, or teach.

2.2 Eastern Illinois: Eastern Illinois University (EIU, 2007) offered a complex CIS program with many concentrations. The degree is a BBA and offers many business class requirements. The required business classes are Management and Organizational Behavior, Principles of Marketing, Management Information Systems, Business Financial Management, Operations Management, International Economics and Strategy and Policy. Along with the business core classes the CIS core classes are Problem Solving with Visual Basic, Information Systems Design and Development, Networking

Fundamentals and Database: Design and Management. This curriculum has a good core set of classes that are both business and CIS related. In this major one is able to select a concentration and take classes according to a concentration's curriculum. The concentrations are Client/Server Systems, Corporate Systems Development, Telecommunications Systems, and User Systems Management. For a concentration in Client/Server Systems, one must take Business Programming with C, Local Area Networks and Java Programming. Two electives are also required between Telecommunications Programming with Visual Basic, Decision Support Systems for the Management Sciences, Advanced Java Programming, or Internetworking. Corporate Systems Development classes include Business Programming in COBOL, Business Programming with C, and File Organization and Management Methods plus two electives of Java Programming, Decision Support Systems for the Management Sciences, and Advanced Java Programming, or Interactive Business Systems. Telecommunications Systems Concentration includes Local Area Networks, Telecommunications Programming with Visual Basic, Fundamentals of E-Commerce, and Internetworking. Only one elective is needed to complete the concentration. The last concentration is User Systems Management focusing on Advanced Microcomputer Applications and Development, Communication for CIS Professionals, and Management of User Systems. To complete successfully the concentration a programming elective must be taken either (COBOL or Visual Basic) then a CIS elective of Business Presentations and Document Design, Web Site Design and Development, Local Area Networks and Fundamentals of E-Commerce. Eastern Illinois University allows the student to specialize in a concentration of computer information systems.

2.3 Eastern Kentucky University: The next university reviewed was Eastern Kentucky University (EKU, 2007). Like EIU, Eastern Kentucky University has a bachelor of business administration degree. This curriculum for this university is 128 hours for completion with a combination of CIS classes and business classes. The CIS required hours

total 27 while business hours total 33. The bulk of the hours for this curriculum comes from the general education classes that every student has to take. These classes total 45 hours plus 9-12 hours of non-business electives. Supporting classes for the CIS major include a 200 level math class, a sociology class, and two economic classes totaling 12 hours. Business classes needed to complete the BBA for CIS are Cost Accounting, Management Information Systems, Principles of Finance, Principles of Management, Principles of Marketing, Management Science and Business Policy totaling 21 hours. There are many choices for CIS classes needed. The core requirement classes are Introduction to Business Programming, Business Programming II, E-Business Technologies & Tools, Network and Telecommunications, Information Systems Analysis & Design, Database Management and Information Systems Implementation. Six hours of CIS related electives are needed which include Advanced Business Programming, Seminar in Computer Information Systems, Electronic Business Planning and Strategy, Project Management and Practice and Advanced Database Management. These electives allow students to take classes in the CIS field that could enhance their basic knowledge of a certain field.

2.4 Hampton University:

Hampton University (HAM, 2007) offered a CIS curriculum filled with business, computer science, and computer information systems classes to receive a bachelor of science in computer information systems. The BS in CIS totals 127 hours which is about the norm to complete the degree. Hampton University is the first university reviewed that is a bachelor of science and will give a good idea on the difference between at BS and a BBA. Just like all of the universities, the first classes taken are the general education classes. Computer Programming I is included in the freshman fall semester. In the spring semester Introduction to Computers and Computer Programming II are taken along with the general education classes. The sophomore fall semester includes the computer classes Computer Architecture and Organization I, Data Structures I and Discrete Structures while the spring semester's computer classes are Computer Architecture and

Organization II and Data Structures II. Database Management Systems, Information System in Organizations and Operating Systems I are the computer classes that need to be taken during the junior fall semester while the spring semester's computer classes being Organization and Programming languages, Systems Analysis and Design I and COBOL. The senior year finishes up the curriculum with Software Design and Development I, Data Communication, System Analysis and Design II, Software Design and Development II and Senior Seminar. The difference in this curriculum and the previous ones is that this curriculum contains many computer science courses. The only courses that were tagged as computer information systems courses were Information System in Organizations, Systems Analysis and Design I and System Analysis and Design II. Unlike a BBA curriculum in CIS, this is a BS curriculum and only contains classes related to business in finance, management, accounting, and economics. These classes are not as in depth as those of the BBA. The computer science classes taken are some great classes that students enrolled in a BBA of CIS would not be able to take unless they took them as electives and their school offered them. Hampton University offers a great curriculum to gain great knowledge in computer information systems.

2.5 Arizona State University:

After looking at a university with a bachelor of science for computer information systems, Arizona State University (ASU, 2007) awarded the bachelor of business administration. This BBA consists of 120 hours of computer information systems classes along with business classes that build on the required general education classes. Along with the usual general education classes ASU requires the student to take a business core curriculum. These classes consist of Accounting I and II; Legal, Ethical, and Regulatory Issues; Fundamentals of Finance; Organization Management and Leadership; Principles of Marketing; and Global Supply Operations. Two CIS courses are also part of ASU's core business curriculum. These two classes are introductory courses in Computer Applications and Information Technology and Intro to Information Systems. This is a good idea to make these classes part of the

business core classes because information technology is everywhere in the business world and for business majors it is important to have a little knowledge in the area. The requirements for the computer information classes are included in the BBA total hours. Unlike the Hampton University curriculum, ASU's CIS curriculum contains all computer information classes instead of computer science courses. The required major courses are Enterprise Process Analysis and Design, Object Oriented Modeling and Programming, Business Database Concepts, Electronic Commerce Strategy, Networks and Distributed Systems and System Design and Electronic Commerce. There is one class that is a major support class that is required and that class is C#.NET. This class is not a CIS class but a computer science class. A student can come away with a solid understanding of computer information systems after completing this curriculum.

2.6 Clemson University:

Clemson University (CEL, 2007) was another school that offered a bachelor of science in computer information systems. This is another curriculum that consists of mostly computer science classes. The fact that this curriculum includes some business related classes gives it the information systems title. The freshman year includes Computer Science I and II which are taken with general education classes. During the sophomore year, students can take courses such as Algorithms and Data Structures in the fall semester. In the spring, one can take courses such as Tools/Technology for Software Development, Introduction to Machine Organization and Seminar in Professional Issues I. The junior year fall semester includes Introduction to Operating Systems, Introduction to Software Development and the spring semester includes Networks and Network Programming, and Systems Analysis and Design. During the senior year, the only two classes that are required are Database Management Systems and Seminar in Professional Issues II. Two more computer science classes are required but are the student's choice as long as the courses are 300 level or higher. One information systems class is required but the student must choose from a management 400 level class or a 400 level computer science class. In this curriculum a grade of C or better

must be earned in all of the computer science classes. On top of that, the student must earn a C or better in all prerequisite courses before enrolling in the next computer science course. The rules for this major are strict. Even though this major is a BS, it seems that it covers all the bases for a computer information systems degree.

2.7 University of Louisville:

The University of Louisville (LOU, 2007) offered a strong curriculum bachelor of business administration in computer information systems. This curriculum offers core business courses and core computer information systems courses. The major calls for 129 hours to be completed and requires a co-op class. Courses to be taken to complete the BBA at U of L start with general education subjects. Next are the business core classes. These classes offer a wide variety of subjects to set the students' background. These classes start out by taking Corporate Finance, Principles of Marketing, and Legal Environment of Business. Three more classes are needed to be taken to complete the business core, Legal Environment of Business, Operations Management, and a CIS 300 level class Computer Information Systems. These classes coupled along with the CIS core classes will give one a degree in computer information systems. The CIS classes required are Software Development I. II, and III. These are the programming classes. One can take Introduction to CIS and Operating Systems during the sophomore year. After those courses are completed, Database Design, Systems Analysis and Design and Business Data Communications round out the CIS 300 level courses needed. The required 400- level CIS courses need are Management of Information Systems, Careers in Information Systems and CIS Development Project. There is also a required CIS elective of three hours. The finishing course is a CID CO-op class for six hours. This co-operative education is a curriculum requirement for six months of full-time employment for the six hours credit. The class is graded on pass/fail but offers a great opportunity for students to get experience needed to start a successful career in computer information systems.

2.8 Winthrop University: Down in South Carolina at Winthrop University (WIN, 2007) there was bachelor of Science in computer information systems. The Computer Information Systems option of the Bachelor of Science in Business Administration is composed of 124 semester credit hours of coursework. The coursework encompasses University Requirements that are required of all Winthrop students, Business courses, Computer Science courses, math courses that support the computer information systems option, and electives. The curriculum starts with the University's required general education courses. First are the business administration requirements. These classes consist of Accounting I and II, Finance, Management, Marketing and Economics. The CIS portion of the curriculum consists of computer science classes in Software Engineering, Database, Computer Science, File Structures and a math class in Discrete Math. A computer science elective is required to complete degree. This curriculum seems like a basic Bachelors of Science in Computer Information Systems.

2.9 University of South Indiana: The University of Southern Indiana (USI, 2007) offered the opportunity to earn a bachelor of business administration in computer information systems. The CIS program at USI is designed to prepare individuals to develop and support information systems using computers in a business or organizational environment. The Association for Information Technology Professionals (AITP) model curriculum is used as the primary curriculum guide for this program. The curriculum calls for the usual general education classes and business courses. The CIS portions of classes that need to be taken are Introduction to Programming Logic, Management Information Systems, Data Communications, Systems Analysis and Design, Web Development and Applied Software Development Project. On top of that six hours of programming language is required. The student may choose from two classes in Object-Oriented Programming, C# and Visual Basic. Three hours of CIS electives are required in either Mark-up Language Programming, Introduction to E-Commerce, Using VBA, Managing Information Technology and Special Topics in CIS. All of these courses total 124 hours.

2.10 Eastern Michigan University: Eastern Michigan University (EMI, 2007) offered a bachelor of business administration in computer information systems. In this program students will learn everything they need to design, develop, and deploy a wide range of integrated, end-to-end business applications and services designed to help small, medium and large businesses become more connected with customers, employees, partners, and suppliers. Students will use products and technologies to build solutions that connect people to each other and to the business processes. They will learn about interoperability and will see roadmaps with products and technologies such as instant messaging, live communications, workflows, and portals. Students will learn how to integrate line of business applications and business processes, how to perform business-to-business communication, and how to develop comprehensive and reliable e-business solutions. Program requirements include classes in Web Application Development, Object-Oriented Application Development, Business Data Communication, Databases, IT Security and Infrastructure, Systems Analysis and Design, Project Management and Systems Integration. A three hour information system elective must be taken in Enterprise Resource Planning, Business Intelligence or System Software Administration. The general requirements for the bachelor of business administration degree include a minimum of 124 semester hours for graduation as stipulated in the undergraduate catalog.

2.11 ACM/AIS/AITD: Association for Computing Machinery (ACM), Association for Information Systems (AIS) and Association of Information Technology Professionals (AITP) has proposed a model curriculum and guidelines for undergraduate degree programs in information systems [11]. This model is focused only on CIS education requirements. The model puts forward eleven courses on CIS (see figure 1).

P. Prerequisite
IS 2002.P0 Personal Productivity with IS
Technology
A. Information Systems Fundamentals
IS 2002.1 Fundamentals of Information
Systems
IS 2002.2 Electronic Business Strategy,
Architecture and Design
B. Information Systems Theory and Practice
IS 2002.3 Information Systems Theory and
Practice
C. Information Technology
IS 2002.4 Information Technology Hardware
and Software
IS 2002.5 Programming, Data, File and
Object Structures
IS 2002.6 Networks and
Telecommunications
D. Information Systems Development
IS 2002.7 Analysis and Logical Design
IS 2002.8 Physical Design and
Implementation with DBMS
IS 2002.9 Physical Design and
Implementation in Emerging Environments
Deployment and Management Processes
E. Information Systems
IS 2002.10 Project Management and
Practice

Figure1. IS Curriculum Presentation Areas
and Courses, source [11], p.18.

Table-1 which summarizes the above
mentioned curricula by various universities.
Table-1 comprised of eleven columns and
rows. Column one provides the name of
institution. Column two shows the total
credit hours required from each university in
order to graduate from the program. Column
three represents the total credit hours
requirement for business education core.
Column four shows the percentage of
business education requirement credit hours.
Column five gives the total credit hours
requirement for CIS core. Column six
represents the percentage of CIS
requirement credit hours. Column seven
provide the total credit hours requirement
for general education core. Column eight
represents the percentage of general
education requirement credit hours. Column
nine shows the total elective requirement
credit hours. Column ten provides the
percentage of elective requirement credit
hours. Last column shows the accreditation
of the program by AACSB.

3. CONCLUSION

After reviewing these universities' curricula it
has been decided to put forward a suggested
CIS curriculum. Each school showed that its
programs are unique but strong (see table 1
for a summary).   The curriculum would
consist of business classes and computer
information system classes.   The degree
would   be   a   bachelor   of   business
administration   in   computer   information
systems.   The business courses would be
Accounting   I and II, Corporate Finance,
Micro Economics, Macro Economics, Business
Law I, Business Law II, Principles of
Marketing,   and   Business   Communication.
Computer information systems classes would
be three courses in the students' choice of
programming language of Visual Basic, Java,
COBOL,   C++   and   HTML.   Database
Management, Systems Analysis and Design,
Computer   Information   Systems   in
Management,   Project   Management,
Networks   Management,   E-Business,
Information Assurance, Information Security
Management and an Implementation course
will complete the required CIS courses. This
implementation course / internship would be
along the lines of a design project where the
student uses everything that he/she has
learned and put it into one project. This will
give the student experience and maybe a
job opportunity in the long run.   Twelve
hours of CIS electives will need to be taken
to complete the degree.   These classes may
be an extra programming course, Operating
Systems,   Oracle   DB   or   Webpage
Development. Thus, about 35% of courses
should   focus   on   general   college   core
requirements,   23%   on   BBA   core
requirements,   34%   on   major   specific
requirements and about 8% open electives
(See fig.2).

All of reviewing schools have great curricula
that any student can benefit from to have a
better knowledge of computer information
systems.   The above curriculum is a
compromise of many of the curricula. Most
of the curricula offer the same courses but
are under different names.   Some of the
schools   offered   the   ability   to   pick   a
concentration and take classes specifically
for that concentration. A student may apply
and tries to learn all he/she can, any of
these curriculums can give one a great
knowledge of computer information systems.

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University Name	Total CH	BER CH	%	CISER CH	%	GER CH	%	Electives CH	%	AACSB Accreditation
Southern Indiana	124	31	25	30	24	53	43	10	8	X
Louisville	129	53	41	42	33	28	22	6	4	X
Winthrop	124	33	27	27	22	52	42	12	9	X
Clemson	122	24	20	47	38.5	47	38.5	4	3	X
Campbell	128	36	28	42	33	44	34	6	5	NA
Arizona State	120	31	26	21	17	60	50	8	7	X
Eastern Michigan	124	36	29	30	24	47	38	11	9	X
Hampton	129	27	21	57	44	45	35	0	0	NA
Eastern Kentucky	128	33	26	36	28	43	33	16	13	X
Eastern Illinois	120	36	30	36	30	40	33	8	7	X
ACM – AIS-AITD	NA	NA	NA	33[1]	NA	NA	NA	NA	NA	------

AIS= Association for Information Systems   ACM= Association for Computing Machinery
AITD= Association of Information Technology Professional
BER= Business Education Requirements
CH= Credit Hour   CIS= Computer Information Systems
CISER= Computer Information Systems Education Requirements
GER= General Education Requirements

Table 1: CIS undergraduate curriculum by various universities in USA

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[1] The model curriculum (Gorgone J.T et al., 2002) list eleven courses. I assumed three credit hour for each course.

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                              ┌──────────────┐
                              │ BBA          │
                              │ CIS          │
                              │ Curriculum   │
                              └──────────────┘
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| General Core Requirements 35% | BBA Core Requirements 23% | Major Core Requirements 34% | Open Electives 8% |

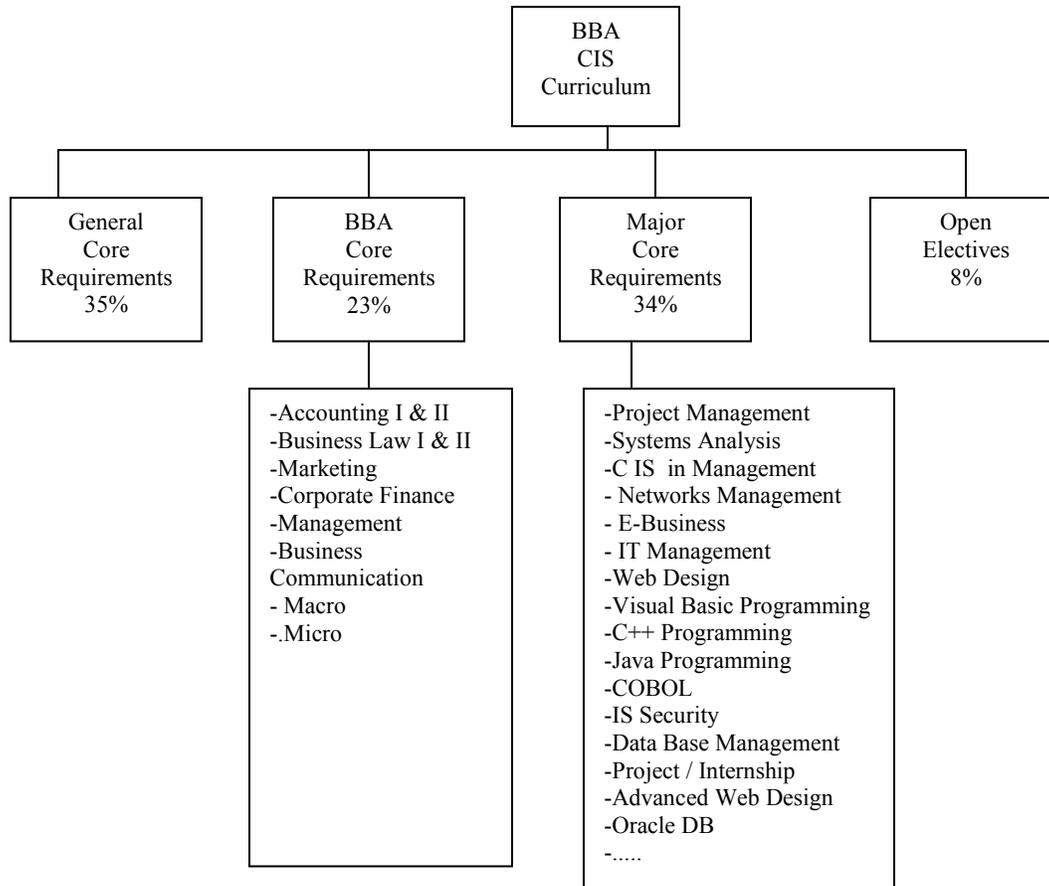| -Accounting I & II
-Business Law I & II
-Marketing
-Corporate Finance
-Management
-Business Communication
- Macro
-.Micro | -Project Management
-Systems Analysis
-C IS in Management
- Networks Management
- E-Business
- IT Management
-Web Design
-Visual Basic Programming
-C++ Programming
-Java Programming
-COBOL
-IS Security
-Data Base Management
-Project / Internship
-Advanced Web Design
-Oracle DB
-..... |

Fig. 2: Proposed CIS curriculum