_____

Towards a Consistent Model
Information Systems Curriculum

Mehdi Sagheb-Tehrani
Bemidji State University
College of Business, Technology and Communication
Bemidji, MN 56601
mtehrani@bemidjistateu.edu

Abstract

Many programs are closely following the curriculum guidelines of a widely recognized IS model. However, the decrease in enrollment in IS programs has motivated many institutions to be innovative in the design of their curricula in order to attract more students to their programs. Therefore it is important to study how to redesign the curriculum for survival in the current economic environment. An understanding of these programs will help us create a more consistent CIS/MIS curriculum that will be challenging and yet attractive to more students. Seventy one IS programs are evaluated in the Unites States. The main purpose is to compare these programs with 2009-IS model and show the differences that exist between these programs regarding core and elective courses credit hours. The results show a significant difference between institutions of higher education with respect to core and elective course credit hour offerings in their IS programs.

Keywords: Information Systems Curriculum, IS Model, Management Information Systems (MIS), Computer Information Systems (CIS), Information Technology (IT)

1. INTRODUCTION

Business managers are very convinced information systems (IS) are changing their business and must ensure that their organization develops and uses information systems to add real value. As the significance of information systems in the business world increases, so does the importance of the quality of our information system college graduates and information systems curriculum. Therefore, the proper education of information systems graduates is becoming more critical. Designing a consistent IS curriculum is a challenging yet necessary process for all educational institutions. Having different curricula offered by various colleges can lead to a chaos in IS education field. Moreover, we have not be able to meet the requirements of our society and our industry in particular. This is the reason that there are different IS models introduced over the past 20 years.

In addition, the technology skills shortage combined with low enrollments in IS related programs indicate a harsh picture for the future of the IT (Information Technology) industry. Many IS programs have experienced enrollment decline of about 70 percent. The cost of paying no attention to this phenomenon is severe indeed. Many CIS/IS/MIS programs have been eliminated or disbanded, and tenured faculty have been laid off (Koch, H, Slyk C.V, Watson, R., Wells, J, and Willson, R, 2010; Glass 2007). The perception of an increasing dependency on outsourcing and the "dot com" bust can contribute to declining enrollments. If enrollments continue to decline and if IS-related programs do not deliver graduates with the skills to succeed in the IT industry, the shortage will be worse than originally predicted (Aashim, L, Williams, S and Butler, E.S, 2009). We need to take action to improve enrollment. One main strategy is curriculum redesign.

_____

Designing and redesigning curriculum is a continuous process (Drinka and Yen, 2008). There have been many studies and curriculum proposals for IS programs in recent years. The authors believe that there are important differences between IS curriculum and IT curriculum. IT curriculum is more technology oriented than IS/CIS/MIS curriculum. One of the best IT curriculum is ACM/IEEE (ACM/IEEE-IT, 2008). The author believes that IT is the umbrella under which other groups or divisions fall (Lankford 2001). From a brief examination of IT curricula it appears that IT programs, like IS programs, are very different and typically multi-disciplinary (Woratschek and Lenox 2009). This study focuses on an IS curriculum model and not the IT curriculum model. In one of the earliest studies, Nunamaker (1981) proposed a conceptual model for information systems program. Nunamaker et al. (1982) presented the detailed recommendation to Association of Computing Machinery (ACM) curriculum committee.

In a field like IS that is quickly changing, it is important for institutions offering undergraduate programs in IS to periodically evaluate their curriculum and make necessary modifications to meet the demand and requirements of industry (Morello, 2005). In this study, the IS curriculum of institutions are compared to determine the differences between these curricular. The intention is to study and understand different curricula in IS and determine how a curriculum can be improved. This knowledge of what other institutions are offering should help us redesign our curriculum to stay competitive and attract more students to our IS programs.

2. RESEARCH METHOD, PROCESS, LIMITATION AND QUESTIONS

The primary purpose of this study is to design and adopt a CIS/IS/MIS curriculum that meets various skills required by our society. By doing this we may be able to overcome the low enrollment in this field. This study exerts to put in plain words the concept of IS/CIS/MIS curriculum by reviewing various CIS curricula and their relationships with ACM and AACSB. The research introduced draws upon social system theory in the functionalist sociology defined by Burrell and Morgan (1979). This study approaches the subject matter from an objectivist perspective. The proposed model presented is based on the "holistic view" school (Social System Theory). The methodology is based on a literature review, college's web sites and the author's experiences as an IS educator and an IS consultant in numerous universities and organizations.

To obtain a complete list of AACSB schools the author visited The Association to Advance Collegiate Schools of Business website (AACSB). On the website the author was able to view all of the accredited schools in the world. For this research the author focused on those colleges in the United States. Complete lists was generated; then between 1-5 schools from each state were randomly selected, reducing to 104 schools from the original 471 schools for review. By the time of preparing this paper data were collected from 71 universities. The intention was to choose a diverse group of institutions regardless of size and reputation. Next was an online search conducted for institutions with IS programs. Schools were chosen if they had their IS curricular available completely online. The data on total number of credit hours (TCH), IS core course credit hours (ISCCH), business core course credit hours (BCRCH), general education core course credit hours (GECCH), and elective course credit hours (ECCH) were collected and analyzed. From the author's point of view, good research requires a sequence of well defined steps planned in advance. The following steps were included in this study: Generate research idea, review literature, select schools, review CIS curricula, collect data, analyze data and publish the study.

As with any research, this study has limitations. The authors believe that there are important differences between IS curriculum and IT (Information Technology) curriculum. IT curriculum is more technology oriented than IS/CIS/MIS curriculum. This study focuses on 2009-IS model (Fig.-1). The data were obtained from 71 different schools. All participating schools in the study were from USA. Another limitation is, this study only considered the schools which were accredited by AACSB. Moreover, there are many other factors that could be part of continued study, such as: considering schools from other accreditation bodies, number of students, internship programs, location of the schools, the name of the programs, job placement and so on. The author faced limitations based upon available resources in order to conduct the study. Further studies might identify additional factors related to the development of CIS curricula. This study as a whole attempts to answer the following research questions (RQ):

_____

RQ: Is there consistency in Information Systems programs offered by AACSB accredited institutions.

H1: There is no consistency in ISC credit hours of IS programs offered by AACSB accredited institutions.

H2: There is no consistency in Elective course credit hours of IS programs offered by AACSB accredited institutions.

_____

_____

3. LITERATURE REVIEW

Many researchers have studied undergraduate IS curricula over the years. For example, Davis et al., (1997); Longennecker and Feistein, (1991a); Longenecker and Feistein, (1991b); Longennecker et al., (1995); Cameron B, (2007), Janicki et al., (2007), Sagheb-Tehrani M, (2007), and Koohang et al.,(2010) studied IT curricula. Moreover, much time has been dedicated to developing model curricula for IS programs in business schools, yet there is no consistency in the department that oversees the degree or in the name of the major. Some common major titles are Management Information Systems (MIS), Information Systems (IS), Computer Information Systems (CIS), and Business Information Systems (BIS), (Shackelford, et al. 2006). Educators in this field want to make sure that all the programs continue to meet the requirements of their stakeholders (Pierson, J.K, Kruck, S, and Teer, F, 2009).

Curriculum degree programs guidelines for undergraduates in Information Systems (IS) known as an IS model have been developed by the Association for Computing Machinery (ACM) and the Association for Information Systems (AIS). The IS model is widely endorsed and accepted by many institutions. However, there may be noticeable differences between the IS curriculum at various institutions including those who are accredited by different accreditation bodies such as AACSB. The main purpose of this research is to examine the IS programs at different institutions to determine how closely they are following the guidelines of the IS model.

The Association for Computing Machinery (ACM) and Association for Information Systems (AIS) has proposed a model curriculum and guidelines for undergraduate degree programs in information systems (Topi H. et al, 2009). This model is focused only on IS education requirements. The core-also known as Information Systems Education Requirement (ISER) and elective course specifications of the latest model IS 2009 are provided in figure 1.

Association for Computing Machinery (ACM), Association for Information Systems (AIS), and Association of Information Technology Professionals (AITP) have all proposed a model curriculum and guidelines for undergraduate degree programs in information systems (Gorgone J.T., et al, 2002). The main distinction is the total number of credits offered by the models. The 2002 model is focused more on IS education requirements (Sagheb-Tehrani 2007). The 2002 model offers eleven core courses while the 2009 model offers thirteen courses. The 2009 model has made a distinction between the "Core" courses" and "Elective" courses (Figure 1). The 2009 model has less emphasis on programming courses. Some believe that this could help increase the enrollment in IS as many students are driven away from IS programs because of programming requirements.

It is common for institutions to have different names for their computing programs such as Information Systems, Computer Information Systems, Information Technology Management, Business Information Systems, and Management Information Systems. In addition, some of the IS programs are Bachelor of Business Administration (BBA) and some are Bachelor of Science (BS). BBA programs emphasize more business courses while BS programs emphasize technology and programming. The primary objective of the IS program is to provide graduates with knowledge, abilities, and attitudes to function effectively as an applications designer/project manager/ programmer /analyst, with the educational background and desire to pursue lifelong professional development. The IS program is very versatile because of the business requirements.

4. ANALYSIS AND T-TESTING

The IS programs at the **71 institutions** all located in USA were examined and analyzed. A summary of findings is shown in Table-1 and details of each program by institution are provided below. The factors evaluated include the general trend of total credit hours offered by different institutions, Business Education Requirements, Information Systems Education Requirements, General Education Requirements, and Elective Requirements.

In Table-1.1, column two provides the name of institution. Column three (**STNA**) shows name of state in USA. Column four (**TCH**) shows the total credit hours required from each university in order to graduate from the program. Last column shows the accreditation of the program by AACSB. In Table-1.2, column one provides the name of institution, column two (**TCH**) as in Table-1.1 column three (**BCRCH**) represents the total credit hours requirement for business courses. Column four (**%**) shows the percentage

_____

_____

of business courses requirement credit hours. Column five (**ISCCH**) gives the total credit hours requirement for IS courses. Column six (**%**) represents the percentage of ISC requirement credit hours. Column seven (**GECCH**) provides the total credit hours requirement for general education core. Column eight (**%**) represents the percentage of general education requirement credit hours. Column nine (**ECCH**) shows the total elective requirement credit hours. Column ten (**%**) provides the percentage of elective requirement credit hours.

Table-2 provides descriptive statistics on the total credit hours, core courses, and elective courses of all the institutions examined in this study along with the core and elective courses of institutions with AACSB accreditation.

Testing H1 (two tail test)

Just to restate our hypothesis-1 (H1) of the study "There is no consistency in ISC credit hours of IS programs offered by AACSB accredited institutions". Using the following formula:

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

$$-1.99 \leq \frac{\bar{x} - \mu}{s / \sqrt{n}} \leq +1.99$$

One gains t = 4.82 after inserting all the values (x = 29, μ = 21, S = 14, α = 0.05, n =71 and t value is 1.994) in the above mentioned formula. As the value of t = 4.82 lies in the region to right 1.99, then H0 is rejected at the 0.05 significant level in favor of H1, i.e., the data support H1. So, one can conclude that there is a significant difference in the Information Systems Courses Requirements (ISC) program in those listed universities.

Testing H2

Just to restate our hypothesis-2 (H2) of the study "There is no consistency in Elective courses credit hours of IS programs offered by AACSB accredited institutions". One gains t = -8.40 after inserting all the values (x = 11, μ = 21, S = 10, α = 0.05, n =71 and t value is -1.994) in the above mentioned formula. As the value of t = -8.40 lies in the region to left 1.99, then H0 is rejected at the 0.05 significant level in favor of H2 i.e., the data support H2. So, one can conclude that there is no consistency in

elective courses credit hours of IS programs offered by AACSB accredited institutions.

Therefore the research questions of this study are answered that there is a lack of consistency in core and elective courses credit hours among the accredited institutions of higher education offering the IS program.

5. CONCLUSION

The Information Systems (IS) discipline faces greater challenges now than at any time; the main challenge is low enrollment. The college curriculum in Information Systems (IS) is revisited and often changed in institutions of higher education to reflect the changes in the field. It is important to make necessary changes to the IS curriculum to make programs challenging and to better prepare graduates for today's job market. Examining the seventy one institutions' IS curricula shows differences in each program (Tables 1.1, 1.2). It is also shown statistically that these programs differ based on core and elective courses credit hours offered regardless of AACSB accreditation. A curriculum is suggested in Figure-2 based on studying these seventy one IS programs and 2009-IS model.

This curriculum consists of business classes and computer information system classes. The degree would be a bachelor of business administration in computer information systems or management information systems. The business courses would be Accounting, Corporate Finance, Micro Economics, Macro Economics, Business Law, Principles of Marketing, and Business Communication. Computer information systems classes would be programming language. Database Management, Systems Analysis and Design, Management Information Systems, Project Management, Networks Management, E-Business, Information Security, IT Management. An Implementation / Internship course will complete the required CIS courses. The 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 at the completion of the program. Twelve hours of CIS electives will be required to complete the degree. These classes may be an extra programming course, Operating Systems, Computer forensics, Oracle DB, Advance networking management or Advance Webpage Development. Thus, about 30 percent of courses should focus on general college core

_____

requirements, 23 percent on BBA core requirements, 39 percent on major specific requirements and about 8 percent open electives (See Figure 2).The findings of the study supported Hypothesis-1 (H1). This can help programs to move towards designing a more consistent CIS curriculum. The result of this study is useful for schools in designing or redesigning their CIS programs. More detailed research would be required to obtain a better understanding of the deviation uncovered in this paper.

The primary purpose of this study is to show the existence of differences in the IS curricula of different institution of higher education accredited by AACSB. The findings show lack of consistency in core and elective courses credit hours offered by various institutions offering IS degree programs. This inconsistency exists regardless of the claim for following the IS model curriculum and receiving AACSB accreditation. More institutions should be investigated in different regions with additional criteria such as size, differing accreditation bodies, and reputation. To further validate the differences between the IS programs, more IS curricula in other countries should also be examined. Future studies should identify additional factors related to the value of IS curricula. The focus should also be geared toward the AACSB accredited institutions and be compared to non accredited institutions. Further studies can focus on other factors mentioned above such as size of the schools and location of the schools.

ACKNOWLEDGEMENT

6. REFERENCES

Aashim, L, Williams, S and Butler, E.S, (2009). "Knowledge And Skill Requirements For It Graduates", Journal of Computer Information Systems, Spring 2009, pp.48-53.

ACM/IEEE - IT 2008. (2008). *Information technology undergraduate curriculum model*. Association for Computing Machinery. Retrieved October 18, 2009 from http://www.acm.org/education/curricula/ACM/IEEE - IT2008%20Curriculum.pdf

AACSB, http://www.aacsb.edu/

ACBSP, www.acbsp.org

Burrell G, Morgan G (1979),"Social Paradigms and Organization Analysis", Heinemann, U.S.A.

Cameron B.H, (2007), "Enterprise Systems Education: New Direction and Challenges for the Future" in Proceeding of Information Systems Education Conference (ISECON) 2007, V24, §3513, Pittsburgh, USA.

Davis, G.B, Gorgone, J.T., Couger, D.J., Feinstein, D.L., and H.E., Longennecker, (1997), "Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems," A Joint Report from ACM/AIS/AITP Task Force.

Drinka, D., & Yen, M. Y. (2008). Controlling curriculum redesign with a process improvement model. *Journal of Information Systems Education*, *19*(3), 331-342.

Glass, R.L. (2007) "Through a Glass, Darkly*: IS: Doom and Gloom Forecasts?" *Information Systems Management* (24)4, pp. 393–394.

Gorgone J.T., Davis , G.B, Valacich, J.S., Topi, H, Feinstein, L.D, & Loggeneker, H.E,(2002), "IS 2002 Model Curriculum And Guidelines For Undergraduate Degree Programs In Information Systems". http://www.acm.org/education/curric_vols/is2002.pdf?searchterm=gorgone+J.T

HAM, (2007), http://www.hamptonu.edu/academics/schools/science/comp_sci/cis_curriculum.htm

Janicki T.N, Lenox T, Logan R, Woratscheck C, (2007), "Information Systems/Technology Employer Needs Survey: Analysis by Curriculum Topic, "in Proceeding of Information Systems Education Conference (ISECON) 2007, V24, §2312, Pittsburgh, USA.

Koch, H, Slyk C.V, Watson, R., Wells, J, and Willson, R, (2010), "Best Practices for Increasing IS Enrollment: A Program Perspective ", CAIS, Vol.,26, Article 22.DD.477-492.

Koohang, A & Riley, L & Smith, T and Floyd, K. (2010), Design of an Information Technology Undergraduate Program to

_____

Produce IT Versatilists, *Journal of Information Technology Education* **,** Vol 9, pp.99-114.

Lankford, E. M. (2001) "Teaching IT: A Survey of Terminal Degrees, Hiring and Promotion for Information Technology Professor."Information Systems Education (ISECON2001). Cincinnati, OH, November 2001.

Longenecker, H.E, and D.L Feinstein, (1991a)" A Comprehensive Survey of USA and Canadian Undergraduate Programs in Information Systems," Journal of Information System Education, Volume 3, No.1, Spring 1991, pp.8-13.

Longenecker, H.E, and D.L Feinstein, (1991b)" IS90:The DPMA Model Curriculum For Information Systems for 4 Year Undergraduates," Park Ridge, Illinois, Data Processing Management Association, 1991.

Logenecker, H.E, Feinstein, D.L., Couger, D.J., Davis, G.B, and J.T. Gorgone, (1995) " Information Systems 95: A summary of Collaborative IS Curriculum Specification of the joint DPMA, ACM, AIS Task Force, " Journal of Information Systems Education, Volume 6, No. 4, 1995, pp.174-187.

Morello. D. (2005). *The IT Professional Outlook: Where Will We Go From Here?* Gartner, Inc.

Nunamaker, J.F, (1981) "Educational programs in information systems, "Communications of the ACM, Volume 24, No. 3, March, 1981, pp.124-133.

Nunamaker, J.F, Couger, D.J, and G.B. Davis, (1982) "Information systems curriculum recommendations for the 80s: Undergraduate and graduate programs," Communications of ACM, Volume 25, No.11, November, 1982, pp.781-805.

Pierson, J.K, Kruck, S, and Teer, F, (2009). "Trends In Names Of Undergraduate Computer-Related Majors In AACSB-Accredited Schools Of Business In The USA", Journal of Computer Information Systems, Winter 2008-9, pp.26-33.

Sagheb-Tehrani, M, (2007) "Computer Information Systems Department: A Proposition Curriculum for CIS", in Pr
proceeding of Information Systems Education Conference (ISECON) 2007, V24, §1542, Pittsburgh, USA.

Shackelford, R., ed. (2006) "Computing Curricula 2005: The Overview Report," *ACM SIGCSE Bulletin,* (38:1), pp. 456-457.

Topi H, Valacich J.S, Kaiser K, Nunamaker J.F, Sipior J. C, Vreede GJ de, Wright R.T, (2009) " Curriculum Degree Programs Guidelines for Undergraduate in Information Systems : Association for Computing Machinery (ACM) , Association for Information Systems (AIS) " , http://cis.bentley.edu/htopi/IS2009_05192009.pdf

Woratschek, C. R., and Lenox, T. L. (2009). Defining CS, IS, and IT: Are we there yet? *Information Systems Education Journal, 7*(59), 1-30.

_____

_____

APPENDIX

NO	University Name	ST NA	TCH	AA-CSB
1	University of South Alabama	AL	123	Yes
2	Arkansas Tech University	AR	124	Yes
3	Arizona State University	AZ	120	Yes
4	University of Colorado-Denver	CO	120	Yes
5	Georgetown University	DIC	120	Yes
6	Florida Atlantic University	FL	120	Yes
7	Florida International University	FL	120	Yes
8	Emory University	GA	138	Yes
9	Kennesaw State University	GA	123	Yes
10	University of Hawaii at Monoa	HI	124	Yes
11	Drake University	IA	124	Yes
12	Iowa State University	IA	122	Yes
13	Boise State University	ID	129	Yes
14	Idaho State University	ID	128	Yes
15	Loyola University Chicago	IL	128	Yes
16	University of Illinois at Springfield	IL	120	Yes
17	Purdue University	IN	124	Yes
18	University of Notre Dame	IN	126	Yes
19	Kansas State University	KS	126	Yes
20	Pittsburg State University	KS	124	Yes
21	Eastern Kentucky University	KY	128	Yes
22	Morehead State University	KY	128	Yes
23	Grambling State University	LA	125	Yes
24	Nicholls State University	LA	122	Yes
25	Southern University and A&M College	LA	142	Yes
26	University of Louisville	LA	124	Yes
27	Bentley University	MA	122	Yes
28	Howard University	MA	123	Yes
29	Morgan State University	MD	127	Yes
30	Towson University	MD	120	Yes
31	University of Maine	ME	122	Yes
32	Central Michigan University	MI	124	Yes
33	Grand Valley State University	MI	134	Yes
34	Oakland University	MI	128	Yes
35	Minnesota State University Mankato	MN	127	Yes
36	Minnesota State University Moorhead	MN	115	Yes
37	University of Minnesota	MN	120	Yes
38	University of Minnesota Duluth	MN	120	Yes

_____

39	University of Missouri	MO	120	Yes	
40	Jackson State University	MS	120	Yes	
41	Mississippi State University	MS	124	Yes	
42	The University of Mississippi	MS	126	Yes	
43	The University of Montana	MT	120	Yes	
44	East Carolina University	NC	120	Yes	
45	Midwest: University of North Dakota	ND	128	Yes	
46	University of Nebraska, Kearney	NE	125	Yes	
47	University of Nebraska, Omaha	NE	125	Yes	
48	University of New Hampshire	NH	128	Yes	
49	Montclair State University	NJ	123	Yes	
50	Rider University	NJ	120	Yes	
51	New Mexico State University	NM	128	Yes	
52	The University of New Mexico	NM	128	Yes	
53	University of Nevada, Las Vegas	NV	124	Yes	
54	University of Nevada, Reno	NV	128	Yes	
55	Clarkson University	NY	120	Yes	
56	Cornell University	NY	124	Yes	
57	New York University	NY	128	Yes	
58	Saint Louis University	PA	120	Yes	
59	Clemson University	SC	122	Yes	
60	East Tennessee State University	TN	124	Yes	
61	Middle Tennessee State University	TN	120	Yes	
62	University of Houston-Clear Lake	TX	120	Yes	
63	Brigham Young University	UT	123	Yes	
64	University of Utah	UT	120	Yes	
65	James Madison University	VA	120	Yes	
66	Norfolk State University	VA	121	Yes	
67	University of Vermont	VT	122	Yes	
68	Washington State University	WA	120	Yes	
69	Marquette University	WI	128	Yes	
70	University of Wisconsin-Eau Claire	WI	120	Yes	
71	University of Wisconsin-La Crosse	WI	120	Yes	
72	ACM-AIS		42	NA	
	ST-NA= State Name				
	CH= Credit Hours				
	T CH= Total Credit Hours				
	GEC CH= General Education Courses				
	BCR CH= Business Courses Required				
	ISC CH= Information Systems Courses				
	EC CH= Electives Courses				

DIC= District of Columbia			
UN =University name			
NA=Not Applicable			

Table 1.1: IS undergraduate TCH by various universities in USA

UN NO	TCH	BCR CH	%	ISC CH	%	GEC CH	%	EC CH	%
1	123	46	37%	15	12%	53	43%	9	7%
2	124	40	32%	41	33%	37	30%	6	5%
3	120	31	26%	21	18%	60	50%	8	7%
4	120	42	35%	18	15%	52	43%	8	7%
5	120	36	30%	48	40%	24	20%	12	10%
6	120	54	45%	21	18%	36	30%	9	8%
7	120	54	45%	30	25%	36	30%	0	0%
8	138	30	22%	33	24%	64	46%	11	8%
9	123	18	15%	15	12%	42	34%	48	39%
10	124	24	19%	21	17%	54	44%	25	20%
11	124	42	34%	21	17%	52	42%	9	7%
12	122	50	41%	21	17%	30	25%	21	17%
13	129	36	28%	37	29%	35	27%	21	16%
14	128	43	34%	18	14%	37	29%	30	23%
15	128	42	33%	15	12%	45	35%	26	20%
16	120	21	18%	30	25%	42	35%	27	23%
17	124	57	46%	12	10%	48	39%	7	6%
18	126	49	39%	9	7%	39	31%	29	23%
19	126	24	19%	24	19%	63	50%	15	12%
20	124	36	29%	27	22%	58	47%	3	2%
21	128	43	34%	42	33%	30	23%	3	2%
22	128	43	34%	18	14%	58	45%	9	7%
23	125	36	29%	36	29%	53	42%	7	6%
24	122	36	30%	39	32%	42	34%	5	4%
25	142	15	11%	68	48%	59	42%	6	4%
26	124	18	15%	42	34%	70	56%	0	0%
27	122	24	20%	24	20%	46	38%	28	23%
28	123	44	36%	27	22%	36	29%	16	13%
29	127	48	38%	33	26%	46	36%	6	5%
30	120	12	10%	52	43%	56	47%	9	8%
31	122	0	0%	53	43%	69	57%	0	0%
32	124	45	36%	33	27%	42	34%	4	3%
33	134	45	34%	58	43%	31	23%	0	0%

34	128	38	30%	27	21%	41	32%	28	22%
35	127	31	24%	36	28%	44	35%	16	13%
36	115	32	28%	34	30%	40	35%	9	8%
37	120	20	17%	74	62%	46	38%	0	0%
38	120	18	15%	21	18%	40	33%	0	0%
39	120	48	40%	36	30%	60	50%	0	0%
40	120	48	40%	36	30%	36	30%	0	0%
41	124	32	26%	18	15%	58	47%	16	13%
42	126	12	10%	24	19%	60	48%	3	2%
43	120	51	43%	24	20%	60	50%	39	33%
44	120	42	35%	18	15%	42	35%	18	15%
45	128	49	38%	23	0.18	42	33%	14	11%
46	125	36	29%	21	17%	45	36%	13	10%
47	125	30	24%	47	38%	48	38%	0	0%
48	128	32	25%	16	13%	80	63%	0	0%
49	123	33	27%	21	17%	69	56%	0	0%
50	120	24	20%	18	15%	77	64%	14	12%
51	128	62	48%	27	21%	39	30%	0	0%
52	128	51	40%	15	12%	60	47%	2	2%
53	124	44	35%	27	22%	47	38%	6	5%
54	128	24	19%	27	21%	33	26%	15	12%
55	120	33	28%	27	23%	42	35%	18	15%
56	124	18	15%	30	24%	62	50%	6	5%
57	128	48	38%	12	9%	68	53%	0	0%
58	120	18	15%	18	15%	84	70%	0	0%
59	122	24	20%	47	39%	47	39%	4	3%
60	124	22	18%	55	44%	41	33%	6	5%
61	120	24	20%	24	20%	44	37%	6	5%
62	120	48	40%	24	20%	42	35%	6	5%
63	123	42	34%	24	20%	39	32%	18	15%
64	120	45	38%	30	25%	27	23%	18	15%
65	120	39	33%	28	23%	41	34%	12	10%
66	121	51	42%	21	17%	40	33%	9	7%
67	122	36	30%	24	20%	36	30%	26	21%
68	120	42	35%	9	8%	0	0%	12	10%
69	128	36	28%	34	27%	52	41%	6	5%
70	120	60	50%	54	45%	8	7%	6	5%
71	120	28	23%	36	30%	56	47%	0	0%
72	42	NA	NA	21	50%	NA	NA	21	50%

_____

Table 1.2: IS undergraduate curriculum by various universities in USA

Function	TCH	Function	BCR	Function	ISC	Function	GEC	Function	EC
Mean	124	Mean	36	Mean	29	Mean	47	Mean	11
Median	123	Median	36	Median	27	Median	45	Median	8
Mode	120	Mode	36	Mode	21	Mode	42	Mode	0
SD	4	SD	13	SD	14	SD	15	SD	10
Range	27	Range	62	Range	65	Range	84	Range	48
Min	115	Min	0	Min	9	Min	0	Min	0
Max	142	Max	62	Max	74	Max	84	Max	48
Sum	8793	Sum	2555	Sum	2089	Sum	3341	Sum	763
Count	71	Count	71	Count	71	Count	71	Count	71

Table-2: Descriptive Statistics for Credit Hours (CH)

Core Courses or IS Courses
IS 2009.1 Fundamentals of Information Systems
IS 2009.2 Data and Information Management
IS 2009.3 Enterprise Architecture
IS 2009.4 IS Project Management
IS 2009.5 IT Infrastructure
IS 2009.6 Systems Analysis and Design
IS 2009.7 IS Strategy, Management and Acquisition

Elective Courses
Application Development
Business Process Management
Enterprise Systems
Fundamentals of Human-Computer Interaction
IT Audit and Controls
IT Innovation
IT Security and Risk Management
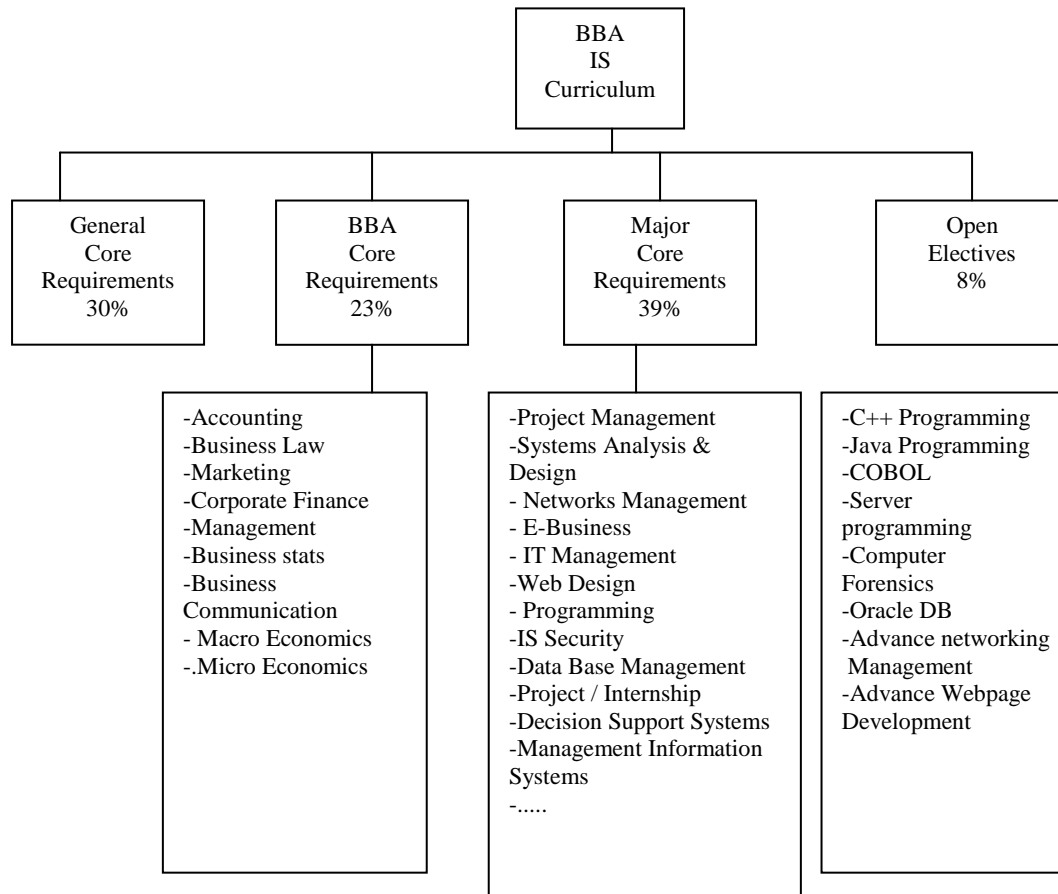
_____

_____

Figure 1: IS model, source (Topi H. et. al, 2009)

Figure 2: Proposed IS curriculum

_____