

A Comparative Analysis of Undergraduate Information Systems Curricula in Selected Business Schools

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Abstract

This paper provides an comparison of the undergraduate Information Systems (IS) curricula in five business schools (Manhattan College, Iona College, Baruch College, Pace University, and University of Georgia) in the USA. The IS programs in these schools are compared against a well-recognized model curriculum, IS 2002 developed by three leading Information systems associations. The comparison shows that some schools like Manhattan College place little more emphasis on the liberal arts aspect than the other institutions. The comparison also shows that all the institutions used in this study seem to provide similar corresponding courses while the larger institutions offer relatively more courses in their IS programs. Additional courses are typically more advanced courses in the same category. A significant omission observed is that none of the institutions offer a course in the project management category as recommended in the model curriculum IS 2002.

Keywords: information systems, education, business school, curriculum, undergraduate business program

1. INTRODUCTION

The Information Systems (IS) programs at many colleges provide education to equip the students with strong knowledge that will be necessary for entry-level positions in information systems field. This field of academic study exists under a variety of different names such as Management Information Systems (MIS) and Computer Information Systems (CIS).

A list of general characteristics expected from students entering the IS profession to possess are:

- A broad business and real world perspective.
- Strong analytical and critical thinking skills.
- Interpersonal communication and team skills and have strong ethical principles.
- Strong knowledge to design and implement information technology solutions that enhance organizational performance (Gorgone *et.al.* 2002).

Today, the Internet has become a major part of our daily life, personal and otherwise. The Internet along with user-friendly computing and communication devices now play key roles in the way the business is conducted. E-business has become an efficient way of doing business. The use of computer and communications systems – information systems – has become a “critical”

part of every business, small to large, and every field from accounting to manufacturing.

There are also changes in the way the business utilizes its employees. For example, the emphasis in teamwork, project management, workforce deployment (telecommuting), and outsourcing is increasing more than ever. Based on these and other sociological changes, the educators in the K-12 system have been updating their curricula by incorporating computing and communications related courses that have been taught at the college level. Today, it is not uncommon for high-school students taking courses such as “Information Processing,” Introduction to Computer Science (Java programming language), WEB Design, CAD Computer Design, and others (Program of Studies 2003).

These factors discussed above will have profound impact on the courses we teach in the IS program. Rapid advances in technology will impact the content of the existing courses as well as introduction of the new courses. The changes in the way the organizations use the employees will impact the emphasis that the existing courses place on teamwork and collaborative projects where not all employees may be in the same location. This may also result in introduction of new courses, for example on project management. The fact that the high school students are becoming more and more equipped with some initial knowledge of computing and

communications field, the college level curricula need to change to eliminate some introductory courses as well as updating the content of some of the existing courses by removing elementary units that may be covered in high schools already.

Therefore, it is important for the institutions to review their programs periodically to make sure that the school provides the best curriculum that meets the needs of its students while staying current as to subjects are concerned. This results in updating their curriculum, on an ongoing basis, with additional courses and appropriate updates of the existing courses. This may even result in elimination of some courses as well.

IS 2002 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems is a result of an ongoing joint effort by three leading associations involved in this field: Association for Computing Machinery (ACM), Association for Information Systems (AIS), and Association of Information Technology Professionals (AITP). IS 2002 is a well recognized and accepted model curriculum prepared by taking into account many influencing factors discussed above and therefore it should be used as a benchmark in evaluating any IS program. While IS 2002 is critical in this evaluation, it is also important, from the competitiveness point of view, to see what other institutions are offering.

This paper uses the above model curriculum to compare IS programs at four institutions: Manhattan College, Iona College, Baruch College, and Pace University, which are selected based on the region, size, and similarities. We also added another large institution (outside the region) with a reputable IS program, namely University of Georgia, to see whether there are significant differences. Our primary objective to conduct this study was to evaluate the IS program at Manhattan College to determine whether the curriculum needs to be updated.

The paper is organized as follows: After this introductory section, the paper provides a discussion of similar programs in various business schools that are selected for the study. Next, a comparative analysis is presented. Then, a specific set of recommendations for Manhattan College is described. Finally, the paper concludes with a summary.

2. EXISTING CURRICULA

This section presents a brief review of the IS curricula used in five business schools in the United States. First, the model curriculum provided in (Gorgone *et.al.* 2002) is presented briefly. We realize that the number of schools in this study is not large enough to reach more general conclusions. Nevertheless, the study provides a quick insight in terms of how IS 2002 benchmark

curriculum is being followed and what immediate modifications can be done to improve the IS program.

IS 2002 Recommended Curriculum - Benchmark

IS 2002 is a continuation of an earlier joint effort known as IS '97 (Couger 1997) in providing a model IS curriculum. IS 2002 is a comprehensive report that provides detailed discussions on the needs of the various constituencies of the field: students, business, faculty, etc., and identifies a set of well-defined requirements for such a program, and finally defines a set of 10 model courses. It should be noted that these courses do not necessarily correspond to individual college courses but rather they are guidelines from which one or more college courses can be developed. Detailed descriptions of these model courses/guidelines can be found in (Gorgone *et.al.* 2002).

CIS Curriculum At Manhattan College

Established in 1853, Manhattan College is an independent Catholic institution providing the traditional liberal arts and sciences and professional and technical education in a single organization. Located in Riverdale, NY, the College has a student body of approximately 3,000 students: 2,600 undergraduates and 400 graduate students. The School of Business offers the majors in accounting, computer information systems, economics, finance, global business studies, management, and marketing (Manhattan 2004).

The Computer Information Systems (CIS) program is part of the School of Business at Manhattan College. Students in the School of Business can choose the CIS as their major or double major with another major field. (The business curriculum provides seven major fields of study.) A student who opts to major in two areas of concentration should utilize the business and free electives in such a way as to satisfy the requirements for the second major which consists of fifteen credits. Liberal arts electives cannot be used to satisfy the requirements of any business major or minor (School 2004).

Students in the School of Business can also choose the CIS as their minor to their major field. This program consists of 9 credits. All major and minor credits must be taken at Manhattan College. A minimum grade of C is necessary to receive major or minor credit. Also all 300 and 400 level Business courses must be taken at Manhattan College (School 2004).

All the programs including the CIS in the School of Business consist of liberal arts courses and business courses. The program in liberal arts (which comprises over one-half of the total curriculum) includes courses in the areas of humanities, mathematics, sciences, and social sciences. The business program includes core courses in accounting and mathematics economics, law, management, marketing and behavioral sciences, which

are required of all students and the study of a major field (School 2004).

To be more precise, a total of 120 credits is required for graduation:

- The Liberal Arts requirements: 63 credits
- Business Core Program for all Students: 30 credits
- CIS Program: 27 credits
 - Required: 15 credits from CIS program
 - Elective: 12 credits from CIS and Business

Details of these courses are given in (School 2004).

IDTM Curriculum At Iona College

Founded in 1940, Iona is a college in the tradition of the Christian Brothers. Located in New Rochelle NY, Iona College has over 4,500 students attending undergraduate and graduate programs in the School of Arts & Science or the Hagan School of Business (Iona 2004). The Hagan School of Business offers Bachelor of Business Administration (BBA) degree programs in seven majors: Accounting, Business Administration, Finance, International Business, Management, Information & Decision Technology Management, and Marketing (Hagan 2004).

The Department of Information and Decision Technology Management (IDTM) is part of the Hagan School of Business. Students who choose to major in IDTM must complete seven of the courses (all are 3 credits) offered by the Department. The Hagan School of Business students can select IDTM as Minor concentration as well. Students minoring in IDTM are required to complete 12 credits in IDTM (Undergraduate 2004).

All students in the Hagan School of Business must fulfill the college core requirements and business core requirements. College course requirements include courses in Humanities, Social Sciences, Science and Technology, and Natural and Symbolic Language. Business core requirements include courses in Financial Accounting, Managerial Accounting, The Legal Environment of Business, The Law of Agency, Business Organizations, Commercial Paper, and Sales, Statistics, Management Information Systems, Management, Production and Operations Management, Finance, Marketing, and Business Policy (Hagan 2004).

Each degree program requires 126 credits consisting of the following:

- College Core: 54 credits
- Business Core: 36 credits
- Major courses and business electives 36 credits
 - Required: 21 credits from the IDTM program
 - Elective: 15 credits from Business and IDTM

Details of these courses are given in (Undergraduate 2004).

CIS Curriculum at Baruch College

Baruch College, founded in 1847, is part of the City University of New York (CUNY). It is located in Manhattan, New York. Undergraduate and graduate programs are offered through its three schools: the Zicklin School of Business, the Weissman School of Arts and Sciences, and the School of Public Affairs. Total enrollment is over 15,000, including nearly 2,500 graduate students (Baruch 2004).

The Zicklin School of Business is one of the largest in the U.S. and offers undergraduate, graduate, and doctoral programs. The School includes the Department of Accountancy and the Departments of Economics and Finance, Law, Management, Marketing, and Statistics and CIS. It offers majors in accounting, CIS, economics, finance, management, marketing, operations research, and statistical analysis (Zicklin 2004).

In Zicklin, half of the credits required for the BBA degree are in the arts, sciences and general education. Business core requirements include courses in accounting, management, IS, law, finance, operations management, marketing, and business policy.

To get a BBA degree majoring in CIS, 130 credits are required:

- Liberal Arts Requirements: 63-65 Credits
- Business Base: 30 Credits
- CIS Major: 33-35 credits
 - Required: 24 Credits
 - Free Electives: 9-11 Credits

Details of these courses are given in (Zicklin 2004).

IS Curriculum At Pace University

Founded in 1906 by the Pace brothers as a business school, Pace University is now an independent University located in New York City. Pace offers to its more than 13,000 students academic and professional programs at the graduate and undergraduate levels (Luben 2004).

Students may select programs leading to the bachelor of business administration degree (BBA) in accounting, economics, finance, IS, management, and marketing (Pace 2004). All BBA students are required to follow the University Core Curriculum that requires 60 credits in the arts and sciences, BBA students must also complete the Business Core Curriculum.

A total of 128 credits is required for a BBA degree in Information Systems:

- University core: 60 credits
- Business core: 33 credits

- Major Program: 35 credits
 - Required: 23 credits from the IS program
 - Free Electives: 12 credits

Details of these courses are given in (Pace 2004).

MIS Curriculum at University Of Georgia

Founded in 1785, the University of Georgia (UGA), located in Athens, Georgia, has about 32,000 students. It offers baccalaureate, master, and doctoral programs in the business and in many other areas (University 2004).

The MIS program is part of the Terry College of Business, which is one of 13 schools and colleges at the UGA. The Terry College has about 5,500 students with undergraduate and graduate programs (Terry 2004) in accounting, marketing, banking and finance, management, economics, MIS, International Business, real estate, risk management and insurance.

All the undergraduate students in the Terry College must complete half of their credits in the core curriculum, which include courses in English, Math, Humanities/Fine Arts, Science, Mathematics, and Technology, and Social Sciences, as well as course in accounting, economics, law, and MIS for those who are majoring in MIS. In addition, the MIS program includes more course work in accounting, economics, legal studies, mathematics, statistics, computer programming, finance, marketing, production and management.

The total number of hours (credits) required to graduate is 120:

- Core Curriculum: 60 hours
- CIS Major Requirements 60 hours

- Required Courses - 33 hours
 - o Five courses from the MIS department, plus advanced courses in business
 - o Three courses from the electives in the MIS department
- Major Electives - 3 hours
 - o One course from the business school advanced curriculum
- General Electives - 24 hours
 - o Five courses in Arts and Sciences
 - o One business course outside major
 - o Two business courses outside department

Details of these courses are given in (Terry 2004).

3. COMPARISON OF IS CURRICULA

First, a brief comparison of the institutions as a whole is provided, then the credit requirements to be fulfilled to graduate, is discussed. Finally, a comparison of the specific courses offered in each of these institutions against the benchmark curriculum IS 2002 is presented.

Among the regional institutions, Manhattan College and Iona College have a similar size while Baruch and Pace have much larger student bodies. University of Georgia has the highest number of students. As far as the Business programs are concerned, Manhattan College and Iona have similar student bodies while the rest has larger student populations in the business schools.

Table 1 provides a comparison of the course requirements to graduate with a business major from these institutions.

Table 1. Comparison of Course Requirements (credits)

	MC	IONA	BARUCH	PACE	GEORGIA*
General Core	63	54	65	60	60
Business Core	30	36	35	33	
M/IS Core	27	36	30	35	60
Required	15	21	24	23	36
Elective	12	15	11	12	24
Total	120	126	130	128	120

* Business Core courses in the MIS program at Georgia are integrated into the General Core as well as MIS core courses.

While Manhattan College, the smallest among them, and University of Georgia, the largest, require 120 credits to graduate, the rest of them requires up to 130 credits. Almost all of them require that half of these credits be taken in a general core that includes mostly liberal arts and science course. The business core and IS programs almost equally divide the remaining half of the credits.

Lastly, a comparison of the specific courses offered in the IS programs at these five institutions are provided as shown in Table 2. The table also includes a column to show the courses specified in IS 2002, the model curriculum.

Table 2 shows that the larger institutions offer relatively more courses in their IS programs. Pace has the largest

number of IS courses to offer. Despite this largest number of courses available, it is interesting to notice that Pace does not offer courses in the e-business and IS theory and practices (i.e., decision support systems) categories, which are recommended as required in the model curriculum. The larger programs simply offer more than one courses in several categories. Additional courses are typically more advanced courses in the same category.

All schools have similar prerequisite for their programs. However, Table 2 reveals that there appears to be significant variance in the required vs. elective designations. Two exceptions to this are the courses aligned with IS 2002.1 and IS 2002.5, which are either required or prerequisite by all the curricula including the benchmark. Table 2 also reveals that almost all institutions make IS 2002.6, IS 2002.7, and IS 2002.8 as required courses where the benchmark curriculum recommends them as electives. On the other hand, the benchmark curriculum makes IS 2002.2 and IS 2002.4 required courses whereas majority of schools do not even offer them.

In the following, a comparison of the courses offered by these institutions against the courses recommended by the benchmark curriculum is provided.

The first category, personal productivity with IS technologies, contains courses that are typically prerequisite for the IS majors. Credits from these courses are not available for IS majors. Almost all institutions offer various courses or more informal study programs to prepare the students to fulfill this prerequisite, non-credit, requirement for the IS majors. All five institutions offer at least one course in the area of Management Information Systems, IS-2002.1.

In the area of e-business, Manhattan College seems to be the only institution offering a specific course similar to the one recommended by the model curriculum. The courses offered on this subject by Iona and Baruch seem to be not quite following the model curriculum. Furthermore, two of the larger institutions, Pace and Georgia do not have an e-business course listed in their curriculum.

IS-2002.3 is the category that deals with basically decision support systems and expert systems. All institutions, except Pace, have a course in their curriculum on this category. Although, the model

curriculum emphasizes both theoretical and practical aspects of the systems, the courses offered in these institutions seem to emphasize the practical aspects more.

The Information Technology (hardware and software) model course, IS 2002.4 has corresponding specific courses only at Baruch and Pace. The other institutions do not offer courses that match scope of this category. Lack of appropriate faculty to teach this course could be a reason for this omission.

In the programming area, IS-2002.5, Baruch and Pace offer more courses. Their curriculum includes, on this area, not only separate courses on different programming languages such as C, C++, COBOL, Assembly Language, but also separate course on data structures. Manhattan and Iona offer only Visual Basic as the programming language. Only Baruch and Pace offer courses on the COBOL programming language, an older language that has been used for business applications.

IS 2002.6 refers to the area of networking, and all the institutions offer courses in this category. While the course offered by Iona emphasizes the management aspects, the other institutions provide a wider coverage on networking. Baruch, Pace, and Georgia offer more (two) courses, while Manhattan and Iona offer one course in this category: Baruch offers an advanced course on networking, Pace and Georgia offer a course on network management as well.

Each of the five institutions offers a course on the analysis and design of information systems, the area guided by IS 2002.7. They seem to be similar in content. In the IS 2002.8 area, the Database management systems category, all the institutions offer one or more courses as well.

IS 2002.9 deals with the design and implementation of systems in the new emerging environments. It seems that, except Manhattan College, all the other institutions offer one or more courses. (Baruch offers 2 and Georgia offers 3 courses in this category.) Keep in mind that this is a new emphasis in the model curriculum to prepare the students in the areas of system implementation and maintenance. Also a new emphasis is the project management, the IS 2002.10 category.

Table 2. Comparison of Specific IS Courses

IS 2002	MC	IONA	BARUCH	PACE	GEORGIA
<i>IS 2002.P0 - Personal Productivity w IS Tech.</i>	*	*	<i>CIS 1000 CIS 1357 CIS 3367 CIS 4367</i>	CIS 101	MIST 5700 MIST 5710
IS 2002.1 – Information Systems	CIS-210	BUS 300	<i>CIS 2200</i>	IS 241 IS 341	<i>MIST 2090</i>
IS 2002.2 – E-Business Arch. & Des.	CIS 316	<i>IDT 355 **</i>	CIS 4150 **		
IS 2002.3 – IS Theory & Practice	CIS-424	<i>IDT 420</i>	CIS 4610		MIST 5620 MIST 5680
IS 2002.4 – IT HW & SW			CIS 4650	IS 112 IS 414 IS 416	
IS 2002.5 – Prog., Data, File, Objects	CIS-301 CIS-302	<i>IDT 320</i>	CIS 3100 CIS 3200 CIS 4100 CIS 4200 CIS 4201	IS 222 IS 223 IS 323 IS 328 IS 381	MIST 4600
IS 2002.6 – Networks & Telecom	CIS-326	<i>IDT 430</i>	CIS 3500 CIS 4500	IS 351 IS 451	MIST 5640 MIST 5670
IS 2002.7 – Analysis & Logical Design	CIS-431	<i>IDT 310</i>	CIS 4800	IS 243	MIST 4620
IS 2002.8 – Design & Impl of DBMS	CIS-310 CIS-312	<i>IDT 335</i>	CIS 4300 CIS 4400	IS 481 IS 483 IS 481	MIST 4610
IS 2002.9 – Design & Implementation in Emerging Environment		<i>IDT 425</i>	CIS 5800	IS 441	MIST 5630 MIST 5660 MIST 5770
IS 2002.10 – Project Management					
Others		IDT 301 IDT 302 <i>IDT 440</i>	CIS 4350 CIS 4630	IS 343 IS 431	MIST 5720
Special Topics in IS			CIS 4670	IS 396	MIST 5600
Ind. Studies	CIS-470	<i>IDT 461- 463</i>	CIS 5000	IS 490 IS 499	
Internship		<i>IDT 465</i>	CIS 5900	IS 495	MIST 4800
Total number of IS courses offered	10	15	22	25	16

Legend:Courses in **bold**: Required course*Courses in italic only*: PrerequisiteCourses in *italic* and **bold**: 7 of these courses are required

Other courses: elective.

* Students are expected to be proficient with basics of computers and popular programs

** These courses meet only parts of the model curriculum scope in their respective areas.

As shown in Table 2, none of the institutions have a course offered in their IS curriculum in this area. It is possible that other departments (e.g., management) may offer similar courses. In addition, four institutions offer additional courses that do not match the ones in IS 2002. For example, Iona and Baruch offer “Audit and Control of Information Systems”. Other additional courses that

are offered are: “Applied Statistical Analysis” (Iona), “Applied Optimization Methods” (Iona), “Multimedia: Theory and Applications” (Baruch), “Information Center Approach: Tools, Techniques & Applications” (Pace), “Applied Artificial Intelligence” (Pace), and “Collaborative Work Systems” (Georgia). Finally all

institutions offer credits for independent studies and internships.

4. RECOMMENDATIONS

The primary objective to conduct this study was to evaluate the IS program at Manhattan College to determine whether the curriculum needs to be updated. The study concludes that the IS program at Manhattan College is competitive with similar institutions examined in this study. Furthermore, the CIS curriculum at Manhattan College includes courses that match most of the categories recommended in the benchmark curriculum, IS 2002. However, addition of some new courses and modifications of some of the existing courses, as shown in Table 3, will make the CIS program more competitive and more aligned with IS 2002.

The course on the Computer Hardware and Software (CIS 305) should be reinstated. It is true that most students have some kind of knowledge and “commercial” information about the basics of the computer. However a course dealing with the fundamentals of the computer systems including the operating systems such as Unix and Linux in more depth is essential for the CIS students to follow other information systems courses.

One or more programming language courses need to be offered. More and more e-commerce and business applications use newer, object oriented, languages such as Java and C++. The existing CIS 302 could be restructured to include these new languages. This need could be also accomplished by allowing the CIS majors to take courses from other departments (i.e., Computer Science and Computer Engineering).

CIS 326 (Networks) provides a wide coverage of the networking field. This may be overwhelming for students. To ease the burden, CIS 326 could be scaled down and another course (CIS 426) in network management and network design could be offered.

Another new course (CIS 440) dealing with the security aspects of the IT systems, e-Business, and networks should be offered. The issue of “cyber security” has become critically important in business and this course will help the students prepare in this area.

A new course (CIS 450) dealing with the implementations of information systems along the content of 2002.9 is recommended.

Management of information systems development projects will be one of the common tasks that many CIS graduates will perform in the industry. Therefore a new course (CIS 460) on Project Management of IS systems development is recommended (similar to IS 2002.10).

Table 3 Recommended new CIS Curriculum for Manhattan College

ID	Course Title	Comments
CIS-210	Introduction to Management Information Systems	Required Course
CIS-301	Introduction to Programming for Business Applications	Required Courses
CIS 305	Computer Hardware and Software**	
CIS-310	Database Concepts and Programming	
CIS 316	E-Commerce Technologies**	
CIS-326	Networks, Telecomm and Global Communications**	
CIS-431	Analysis and Design of Information Systems	
CIS-302	Advanced Programming for Business Applications **	
CIS-312	Advanced Database Concepts and Programming	Elective Courses
CIS-424	Decision Support Systems and Expert Systems	
CIS 426	Network Design and Management*	
CIS 440	Applied Security for Computers, e-Business, and Networks*	
CIS 450	Building Information Systems*	
CIS 460	Project Management*	
CIS-470	CIS Tutorial/Independent Study	
CIS 480	CIS Seminars on Advanced CIS Topics*	

* New courses

** Content Change

5. CONCLUSIONS

The analysis shows that all the institutions used in this study seem to provide similar courses while the institutions with larger student bodies and faculty, namely Baruch College, Pace University, and University of Georgia, offer more courses in their IS programs. This is perhaps due the fact that they have more resources: faculty, classroom, etc. Overall, it is clear the IS curricula in the selected institutions include courses that match most of the categories recommended in the model curriculum, IS 2002. However, they could be improved further by adding several specific courses in certain areas especially in the project development and management areas. This area is especially important for the prospective graduates who will be placed in various projects with various assignments and expected to perform as a member of a project team. It was observed that none of the institutions have a course offered in the project management area in their IS curricula. One reason for this could be that there is a lack of experienced and/or interested IS faculty to teach this type of course.

Even though, the schools selected for this study have similar courses, there appears to be significant variance among the schools in the required vs. elective designations as compared to the benchmark curriculum: There is a general agreement (by the schools and the benchmark) that the Introduction to Information Systems and Programming courses are required. However, the schools differ from the benchmark curriculum on (Networks, Analysis and Design), and DBMS courses making them required where the benchmark curriculum recommends them as elective. On the other hand, the benchmark curriculum makes E-Business and IT Hardware Software courses required whereas a majority of schools do not even offer them. Does this mean that IS 2002 missed the importance of networking and DBMS? Also do the schools think that E-business and IT hardware and software course are not that important? The objectives of the programs, to keep a balance in the number of required vs. elective courses, and also the need to update the model curriculum could be among the answers to the above questions.

The study concludes that the IS program at Manhattan College is competitive and includes courses that match most of the categories recommended in the benchmark curriculum, IS 2002. However, the addition of the following courses will make the CIS program will be even more competitive and more aligned with the benchmark curriculum: Computer Hardware and Software, Network Management, Applied Security for Computers, e-Business, and Networks, Building Information Systems, and Project Management.

REFERENCES

- Baruch College Web Site, 2004,
<http://cisnet.baruch.cuny.edu/undergrd.html>
- Couger, J. Daniel, Gordon B. Davis, David L. Feinstein, John T. Gorgone, and Herbert E. Longenecker, Jr. 1997. "IS'.97: Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems, *Data Base*, Vol. 26 No. 1, pp. I-94.
- Gorgone, John T., et.al., 2002, *IS 2002, Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems*, Association for Computing Machinery (ACM), Association for Information Systems (AIS), Association of Information Technology Professionals (AITP)
- Hagan School of Business Web Site, 2004, Iona College, <http://www.iona.edu/academic/hagan/>
- Iona College Web Site, 2004, <http://www.iona.edu>
- Luben School of Business Web Site, 2004, PACE University <http://www.pace.edu/lubin>
- Manhattan College Web Site, 2004,
www.manhattan.edu
- Pace University Information Systems Web Site, 2004
<http://www.pace.edu/lubin/undergraduate/bbainfo.html>
- Program of Studies, 2003, Holmdel High School, New Jersey.
- School of Business Web Site, 2004, Manhattan College:
<http://www.manhattan.edu/catalog/business.html>
- Terry College of Business Web Site, 2004, University of Georgia, <http://www.terry.uga.edu/about>
- Undergraduate Catalog, 2004, Baccalaureate Programs, Iona College, 2001-2003
<http://www.iona.edu/academic/catalogs/Undergrad2001-02.PDF.pdf>
- Undergraduate Catalog, 2003, Pace University,
http://appserv.pace.edu/emplibrary/Pace_2002-04.pdf
- University of Georgia Web Site, 2004,
<http://www.uga.edu/>
- Zicklin Business School Web Site, 2004, Baruch College,
<http://zicklin.baruch.cuny.edu/undergrd.html>