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Keywords: model curriculum, liberal arts, undergraduate information systems

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Toward a Model Curriculum for an Information Systems Degree in Liberal Arts Colleges

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ABSTRACT

This paper presents a rationale for a model curriculum for an IS major in liberal arts colleges, followed by the courses that would comprise such a curriculum, sample schedules and staffing requirements for those courses. The recommendations in IS2002 and CC2005 were used in constructing the curriculum.

Keywords: model curriculum, liberal arts, information systems

1. INTRODUCTION

The major computing societies (ACM, AIS, AITP and IEEE CS) have produced comprehensive model computing programs for undergraduate degrees. While these model curricula fit well in the mid-sized to large colleges and universities, they are too large, with respect to the number of classes, to fit within traditional liberal arts programs. For example, the IS 2002 model curriculum recommends ten IS courses, five business courses, and three mathematics courses, for a total of 18 courses for an IS major. Most liberal arts programs limit major courses to about ten, or no more than one-third of the total courses required for a degree. This paper proposes a model IS curriculum that fits the constraints of liberal arts colleges.

Twenty years ago, the liberal arts computer science (LACS) community recognized a disparity between the 1978 computer science model curriculum and liberal arts program requirements. In response, they produced a model curriculum for a liberal arts degree in computer science (Gibbs, 1986). LACS's latest revision to that model curriculum (LACS, 2004) is based on the 2001 version of the computer science model curriculum, CC2001 (ACM, 2001).

Although there are fewer IS programs than computer science programs in liberal arts institutions, those programs could benefit

from, and new ones be encouraged by, a model IS curriculum that fits within the limitations of their program requirements. This paper is a first attempt at defining such a model program. Like the work of LACS, the proposed model is based upon IS2002 recommendations and upon information found in the Computing Curricula 2005 Overview Report, CC2005 (ACM, 2005). It draws also from Dooley's (2004) description of his department's efforts in implementing CC2001 at a small college, from Rhodes and his colleagues (2001) who describe implementing an information technology program in a liberal arts setting, and from an implementation of an IS major at a liberal arts college (Howatt, 2005).

LACS views computer science in the liberal arts as described in this excerpt from their proposal (LACS, 2004):

Liberal arts programs in computer science generally emphasize multiple perspectives of problem solving (from computer science and other disciplines), theoretical results and their applications, breadth of study, and skills in communication. [...] Three general-purpose capabilities that are among those fundamental to a liberal arts education are the ability to organize and synthesize ideas, the ability to reason in a logical manner and solve problems, and the ability to communicate ideas to others.

[...] Rather than consider undergraduate programs as professional degrees, liberal arts programs embrace the premise that graduates working in areas related to their majors will find that their careers develop in unexpected ways -- often involving new areas of knowledge and application. Further, many are likely to change professions multiple times over their working lives.

As in the LACS recommendation, this IS proposal, LAIS, will sacrifice depth for breadth to present as wide a view as possible to prepare the IS graduate to enter the job market at most any area, and to learn the job-required specifics while on the job. The proposal will also emphasize effectiveness in speaking and writing, in group interaction and in looking at all aspects of a situation/problem, balancing the developer's viewpoint with that of the client and of the business. However, instead of emphasizing theoretical concepts as LACS does, this proposal will emphasize practical application of IS development methods.

2. DEFINING THE CURRICULUM

Course definition and topic selection for the LAIS curriculum will be based on the typical size limitations of a major in liberal arts colleges--about 10 courses (about 1/3 of the courses required for the degree). Although we could designate all ten IS2002 courses as LAIS courses, graduates of IS programs must understand the context in which IS will be used and must possess analytical skills not unique to IS. Therefore, the curriculum must include business calculus and statistics, as well as the "functional area" courses recommended by IS2002: accounting, economics and management. This leaves room for just five IS-specific courses in the LAIS curriculum. Note, however, that if any of the non-IS courses can be "double counted", e.g. economics as satisfying a social science requirement or business calculus as satisfying a quantitative methods requirement, then a specific implementation of this curriculum may be able to accommodate additional IS courses.

The question now becomes: "How do we select and organize from the material recommended in IS2002 to fit into LAIS's five courses?"

Since the LAIS model emphasizes breadth, the material recommended for IS 2002.1, Fundamentals of Information Systems, should certainly be included. The amount of material to be covered will necessarily make this a complete course in itself. And, that many business programs require all of their majors to take an IS overview course as a part of the business core, motivates us to make this a complete course.

A second significant recommendation of IS2002 is having students work on large projects, as in the "physical design" courses IS 2002.8 and 2002.9, and in the Project Management and Practice course IS 2002.10. To ensure that LAIS majors also gain practical experience on a large project, these three courses can be condensed into a single project, or capstone, course, wherein students apply the topics they learn in the lower-level courses while they learn new topics relevant to large projects.

Given these "endpoint" courses, we now need to define the three courses that will "connect" them. Turning to CC2005 for additional guidance, we see that it defines the performance capabilities of graduates of an IS program as "information systems specialists should be able to analyze information requirements and business processes and be able [to] specify and design systems that are aligned with organizational goals". Also in CC2005, Table 3.3, "Relative performance capabilities of computing graduates by discipline", shows the highest expectations of IS graduates to be in the areas of IS development (analysis, design, and maintenance being the highest, with implementation just one step lower); database design, implementation, and maintenance; and systems development through integration.

Because CC2005 emphasizes analysis and design, and because that subject covers many topics, the curriculum will need one course to adequately cover that material, providing the IS majors a solid grounding in analysis and design methods. It would be up to the individual programs to decide which methods in analysis and design to stress, a decision that could be based on the needs of their graduates' employers.

Because databases are a fundamental component of ISes, and because CC2005 stresses database in the desired perform-

ance capabilities, database topics could be made a significant component of the second connecting course. And, even though database topics could easily fill a complete course, our desire for breadth in the curriculum motivates us to present just fundamental, with respect to IS, database topics, and to fill the remainder of the course with system implementation material. This seems reasonable because system implementation will necessarily include database implementation.

Finally, coverage of management topics and material on specific types of IS applications, such as e-commerce and internal business systems (ERP, SCM, CRM, etc.), could satisfy a large part of the remaining performance expectations. These topics, then, would form the basis for the third connecting course.

To summarize, the LAIS proposed curriculum will contain the following required IS courses:

- IS-1. Fundamentals of IS
- IS-2. Analysis and Design of IS
- IS-3. IS and Database Implementation
- IS-4. IS Applications and Management
- IS-5. IS Capstone

IS-1, the typical introductory information systems course, introduces IS concepts, where and how IS supports the enterprise, IS hardware, software and telecommunications, IS applications supporting functions such as supply chain management, enterprise resource planning, customer relationship management, etc., e-commerce concepts, and the ethical/social aspects of IS use.

IS-2 presents the methods used to identify and document the requirements for an information system, and the techniques that can be used to transform the requirements into an IS design.

IS-3 describes the methods of implementing information systems, to include building a system from scratch (programming and GUI development, hardware selections, database development), identifying and selecting off-the-shelf packages to integrate to form a single solution, and identifying and selecting a single system as the solution.

IS-4 describes in depth the various applications for supporting the business, with an emphasis on e-commerce, as well as aspects of managing the development and operation of IS.

IS-5 has the students build a reasonably large system using the techniques learned in IS-1 thru IS-4. Ideally, the course would be spread over a full academic year and the project would be for a real customer. The students would work in teams to develop appropriate process and product documents and would provide their customers with periodic progress-review presentations, thus applying communication and interpersonal skills.

3. COMPARING LAIS TO IS2002

The following table shows the course learning unit goals (LUGs), as defined in Appendix 6 of IS2002, which would be satisfied, at least partially, by each of the five courses. (Due to space considerations, that Appendix is not replicated in this paper.)

Course	Learning Unit Goals
IS-1	1, 4, 5, 6, 7, 9, 13.1, 13.4, 13.7, 13.8, 13.9, 13.12, 13.15, 17, 24, 27, 31, 32, 33, 36, 37, 38, 62, 63, 65, 119, 200, 201, 202, 203, 205, 206, 208
IS-2	13.10, 28, 62, 64, 72, 74, 75, 78
IS-3	2, 13.6, 13.10-13.13, 43, 45, 47, 48, 50, 51, 52, 53, 56, 58, 62, 68, 81, 90, 91, 92, 95, 96, 98, 100, 101, 103, 117
IS-4	17, 26, 27, 29, 38, 39, 68, 112, 113, 114, 116, 119, 123, 125, 200, 201, 202, 204, 208
IS-5	60, 80, 85, 87, 94, 100, 105-107, 109, 110

Because IS-1 is an overview course, it touches on the most LUGs. Time constraints will require that the coverage of these topics be shallow. IS-2 appears to satisfy far fewer goals than the other courses, but many of its LUGs cover substantial material (for instance, LUG 74 states "to show how to collect and structure information in the development of requirements and specifications" a topic about which whole textbooks have been written). Throughout the five courses, students will exercise writing and speaking

skills and will discuss ethical/legal/social implications of the topics they cover. Personal productivity software can be introduced where applicable, and covered only in as much depth as needed.

The selection of the LUGs for each course was based on personal knowledge and experiences in computing systems development. If we assume that an employer's expectations of a graduate of an LAIS program would differ from those of a graduate of an IS2002 program, then the selected LUGs and the depth to which we cover them are reasonable. Regardless, they should be viewed as just an initial proposal upon which to base discussions that would lead to a final selection.

4. IMPLEMENTING LAIS

One implementation of this curriculum over a student's four academic years could be:

Year	Fall	Spring
1	calculus	IS-1; statistics
2	IS-2; economics	IS-3; accounting
3	management	IS-4
4	IS-5, 1st half	IS-5, 2nd half

It places mathematics, sometimes viewed as one of the major hurdles in an IS program, first to begin honing the students' analytical skills. The IS courses are then fairly evenly distributed over the remaining semesters, and are mixed with the functional area (business) courses so students will understand the context within which IS operates.

But, because many liberal arts students do not choose a major until their sophomore years, the LAIS program of study could also be compressed to accommodate this:

Year	Fall	Spring
1		
2		IS-1; calculus
3	IS-2; statistics; economics	IS-3; IS-4; management
4	IS-5, 1st half; accounting	IS-5, 2nd half

The courses are presented in roughly the same order, but in a much more compressed fashion to allow LAIS majors to graduate within four years.

5. STAFFING THE PROGRAM

Liberal arts colleges typically employ fewer faculty members for their academic programs. This necessarily constrains the number of sections of courses that can be offered each semester. But, if we assume that the mathematics and business courses are taught by non-IS faculty, then just two LAIS faculty members, each teaching three courses per semester, can accommodate a reasonable number of sections. If multiple sections of IS-1 must be offered each semester because it is a requirement for all business majors, then one example of section offerings for an academic year might be:

Fall Semester	Spring Semester
IS-1	IS-1
IS-1	IS-1
IS-2	IS-3
IS-5, first half	IS-4
elective	IS-5, second half
elective	elective

The "electives" could be additional sections of IS-1, if needed, or true IS elective courses. One could argue that just 1.5 FTE faculty would actually be needed, but to guarantee coverage, we feel the minimum should be two.

6. CONCLUSION

In the previous sections, we have presented a rationale for a "liberal arts information systems" version of IS2002, a recommendation for the courses that would comprise such a curriculum, and possible program-of-study schedules and a teaching schedule. The proposed program covers those topics that support CC2005-emphasized learning outcomes for IS majors, albeit with less depth, but almost as much breadth, as IS2002. The sample course schedules show that the curriculum will allow students to complete the program in four years. The sample teaching loads show that the required courses can be taught by just two faculty members. This proposal is offered as a starting point for discussions leading to a final recommendation for an LAIS program by the IS community.

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