



Guidelines for Development of an Online Baccalaureate Degree in Information Systems

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ABSTRACT

Colleges and universities are entering the online education arena in increasing numbers. However, little information is available about what is needed to provide students with a quality information systems (IS) educational experience via the Internet. The web-based delivery of four-year IS programs is a recent innovation and little empirical evidence exists to suggest "best practices" in IS online education. This paper examines and synthesizes IS education criteria from two sources: the Computer Sciences Accreditation Commission which recently established criteria for accrediting programs in information systems, and the Regional Accrediting Commissions which issued guidelines for the evaluation of electronically offered degree and certificate programs. The result is a set of guidelines for the development of online baccalaureate programs in Information Systems that addresses both IS and online accreditation requirements.

INTRODUCTION

The current and projected nationwide shortage of information systems (IS) professionals is driving a renewed interest in IS education, as companies strive to hire new IS graduates and retrain existing employees. One solution to the growing demand for IS education is the use of the World Wide Web as an educational delivery mode. The proliferation of commercially available web-based training products is evidence of the potential of this educational delivery mode to address the needs of industry and the economy. Colleges and universities are entering the online education arena in increasing numbers, but what do we know about how to effectively deliver the IS degree online? What do we need to know to provide a quality IS educational experience via the Internet?

This paper addresses the questions posed above by presenting guidelines for the development of the online IS baccalaureate degree. The guidelines are developed through a synthesis of drafts from two relevant authorities on IS and online education: the Computer Sciences Accreditation Board (CSAB) of the Accrediting Board for Engineering and Technology (ABET); and the Council of Regional Accrediting Commissions (C-RAC) comprised of the eight United States regional accrediting bodies. The next section discusses the background and development of draft guidelines by both the CSAB and C-RAC and their current status. The synthesis of the draft guidelines from both accrediting entities creates the basis for a set of guidelines to direct the development of online baccalaureate programs in IS which are presented in the following section. The model is then discussed, along with its implications for effective web-based IS degree delivery. Future directions for research and practice are then presented followed by key conclusions.

BACKGROUND

The online delivery of four-year IS programs is a recent innovation. While many institutions offer a number of IS courses online, few offer an accredited IS baccalaureate degree online. As such, little empirical research exists that provides evidence for a set of "best practices" in IS online education. Much of the literature is anecdotal or based on limited case study. Given the lack of empirical research on effective web-based delivery of IS programs, the framework presented in the next section is principally derived from the key guidelines established for electronically offered degrees accepted by the Council of Regional Accrediting Commissions (initially drafted by the Western Cooperative for Educational Telecommunications/ Western Interstate Commission for Higher Education (WICHE), 1999); and from the criteria for accrediting programs in information systems developed and adopted by the Computer Sciences Accreditation Board (CSAB) of the Accrediting Board for Engineering and Technology (ABET). Since

accreditation of academic programs is highly desirable to most institutions and prospective students, the guidelines drafted by the C-RAC and the criteria drafted by the CSAB form a reasonable basis for the guidelines for the development of a web-based IS degree. Each of these criteria are discussed below.

The Computing Sciences Accreditation Board (CSAB) produced Version 5.2 of "Draft Criteria for Accrediting Programs in Information Systems" in August 2000 (CSAB, 2000). The criteria were adapted for information systems programs from the previously established accrediting criteria for programs in computer science. The key objectives of the criteria are:

"to assure an adequate foundation in business, general education, mathematics, social sciences, and information systems fundamentals, and to assure appropriate preparation in advanced information systems areas." (CSAB, p. 1).

Overall, an information systems program must be designed to provide a broad general education at the baccalaureate level and prepare students to function effectively in the information systems profession in order to be considered for CSAB accreditation. While the CSAB draft criteria do not specifically address distance education or online degree programs, these programs are eligible for evaluation and accreditation review.

The criteria address eight major categories: program objectives and assessments, students, faculty, curriculum, technology infrastructure, institutional support and financial resources, program facilities, and institutional facilities. These categories, summarized in Table 1, will be applied to CSAB evaluation of information systems programs beginning in 2001.

The Western Cooperative for Educational Telecommunications/Western Interstate Commission for Higher Education (WICHE), recognized for its substantial expertise in the field of distance learning, initially developed a draft of guidelines for electronically offered degree programs in 1999 with the purpose of reflecting current best practice in online program delivery (Academe, January-February 2001; WICHE, 1999). The eight regional accrediting commissions responsible for accrediting United States colleges and universities used the WICHE draft as the basis for developing "Guidelines for the Evaluation of Electronically Offered Degree and Certificate Programs" for accrediting degree programs offered electronically. The Council of Regional Accrediting Commissions (C-RAC), the organizational body for the eight commissions, undertook the development of the draft to respond to the on-going emergence of technologically mediated instruction offered at a distance (C-RAC, 1999). The guidelines focused on providing assistance to institutions in planning distance education activities, and on providing a self-assessment framework for institutions already involved in such endeavors (C-RAC, 1999).

The C-RAC guidelines address five separate components: institutional context and commitment, curriculum and instruction, faculty support, student support, and evaluation and assessment. The five components of the C-RAC guidelines are summarized in Table 1 and synthesized with the CSAB draft criteria in the next section.

ONLINE IS DEGREE GUIDELINES

The C-RAC guidelines show that well-established standards of institutional quality are applicable to electronically mediated distance learning environments. The CSAB draft criteria provide educational standards for high quality post-secondary education in information systems. The synthesis of CSAB draft criteria and C-RAC guidelines results in recommendations for online information systems programs across seven key categories: (1) institutional context, support, financial resources and facilities; (2) program objectives and assessments; (3) faculty; (4) curriculum; (5) program delivery; and (6) students. Each of these categories and their implications for online IS baccalaureate programs are discussed below.

(1) Institutional Context, Support, Financial Resources, and Facilities

The online IS program should be consistent with the role and mission of the institution. Specifically, offering the program to stu-

Table 1: Comparison of CSAB IS criteria and C-RAC guidelines

Category	CASB IS Criteria <i>Source:</i> "Draft Criteria for Accrediting Programs in Information Systems," Version 5.2, August 2000	C-RAC Guidelines <i>Source:</i> "Guidelines for the Evaluation of Electronically Offered Degree and Certificate Programs," September 2000
(1) Institutional Context, Support and Financial Resources	<ul style="list-style-type: none"> Sufficient support for faculty to enable program to attract/retain high-quality faculty capable of supporting the program's objectives Sufficient support/financial resources to allow faculty members to attend technical meetings to maintain competence as teachers and scholars Support and recognition of faculty scholarly activities Sufficient office support for faculty members Adequate time assigned for administration of the program Sufficient program resources and atmosphere to function effectively with the rest of the institution Sufficient resources to acquire/maintain adequate laboratory facilities Sufficient resources to support library and information retrieval facilities that meet the needs of the program Evidence of continuity of institutional support and financial resources 	<ul style="list-style-type: none"> Program is consistent with the institution's role and mission Notification/consultation with accrediting commission if program represents a major change to educational goals, intended student population, curriculum, modes/venue of instruction Institution budgets/policies reflect commitment to target students of electronically offered programs Articulation/transfer policies judge courses/programs on learning outcomes, not modes of delivery Assure consistent/coherent technical framework for students/faculty; minimize impact of technological change on students/faculty Technical support provided to students for all hardware, software, and delivery system required in a program Selection of technologies is based on appropriateness for the students and the curriculum Institution observes the legal and regulatory requirements of the jurisdictions in which it operates.
(2) Institutional Facilities	<ul style="list-style-type: none"> Library adequately staffed with professional librarians and support personnel Library technical collection includes up-to-date texts, reference works, and publications of professional and research organizations Systems for locating/obtaining electronic information available Classrooms adequately equipped for courses taught in them Faculty offices adequate to enable faculty members to meet their responsibilities 	

Table 1: (continued)

(3) Program Objectives and Assessment	<ul style="list-style-type: none"> Educational objectives are documented and consistent with the mission of the institution Objectives include expected outcomes for graduating students Process exists for periodic review of program/courses Program assessment results used to identify/implement program improvement Results of program review/actions taken must be documented 	<ul style="list-style-type: none"> As part of institution's overall assessment, student performance is compared to intended learning outcomes in each course and at program completion; assessment results of student achievement are documented. Examinations are administered in circumstances that include firm student identification Security of personal information is assured and security procedures are documented Overall program effectiveness includes measures such as: <ul style="list-style-type: none"> Match between student learning and intended outcomes Extent to which student intent is met Student retention rates Student satisfaction, measured by periodic surveys Faculty satisfaction, measured by periodic surveys Extent to which access is provided to students not previously served Extent to which library/learning resources are used appropriately by students Student competence in fundamental communication, comprehension, and analysis skills Cost effectiveness of program to students, compared to campus-based alternatives Program and results are reflected in the institution's ongoing self-evaluation process Institutional evaluation of the program takes place in the context of the regular evaluation of all academic programs
(4) Faculty	<ul style="list-style-type: none"> Interests, qualifications, and scholarly contributions of the faculty members are sufficient to teach/plan/modify courses and curriculum Faculty members are current and active in the discipline Majority of faculty hold terminal degrees; some must be in IS or closely related field Faculty members have level of competence that would normally be obtained through graduate work in IS 	<ul style="list-style-type: none"> Institution and participating faculty develop policies/agreements on workload, compensation, ownership of intellectual property resulting from the program, implications of program participation for faculty professional evaluation processes Institution provides ongoing program of appropriate technical, design, and production support for participating faculty members Institution provides orientation/training on technologies/pedagogy to those responsible for program development and those working directly with students

dents at a distance should contribute to the institution's fulfillment of its stated mission. By ensuring consistency with institutional mission, commitment to the targeted students of the online IS program should be reflected in institution budgets and policies. In particular, sufficient institutional support for faculty should be available to enable the program to attract and retain high quality faculty capable of supporting the program's objectives. Program faculty should receive financial support to attend technical meetings to maintain currency in the field and in teaching, as well as recognition for scholarly activities and sufficient office support. Online IS programs should receive adequate program resources to function effectively with the rest of the institution, acquire and maintain adequate laboratory facilities, and support library and information retrieval needs of the program. The institution should also show on-going institutional support and financial resource commitments for the program.

The technological context and infrastructure provided for the online IS program by the institution is extremely important, and supersedes the institutional facility requirements of on-campus programs.

Table 1: (continued)

(5) Curriculum	<ul style="list-style-type: none"> Curriculum combines professional requirements with general education requirements and electives to prepare students for a professional career in IS Curriculum covers basic and advanced topics in IS as well as an emphasis on the IS environment Curricula consistent with widely recognized models and standards Specific requirements: <ul style="list-style-type: none"> At least 30 semester-hours in IS topics At least 15 semester-hours in an IS environment, such as business At least 9 semester-hours in quantitative analysis beyond pre-calculus, including statistics and calculus or discrete mathematics At least 30 semester-hours of study in general education Oral and written communications skills, and collaborative skills must be developed and applied in the program Sufficient coverage of global, economic, social and ethical implications of computing 	<ul style="list-style-type: none"> Program of study results in collegiate level learning outcomes appropriate to the degree Program is coherent and complete leading to undergraduate degrees that include general education requirements Academically qualified persons participate fully in the decisions concerning program curricula and program oversight. Institution includes all courses necessary to complete the program If some program components are supplied by consortial partners or outsourced, the institution must establish criteria for their selection and means to monitor/evaluate their work Program design reflects the importance of appropriate interaction between instructor and students, and among students
(6) Program Delivery	<ul style="list-style-type: none"> Enough full-time faculty members with primary commitment to th program to provide continuity and stability Full-time faculty must oversee all course work Full-time faculty must cover most of the total classroom instruction Full-time faculty must remain current in the discipline Full-time faculty have sufficient time for scholarly activities and professional development Advising duties are recognized part of faculty members' workloads 	
(7) Technology Infrastructure	<ul style="list-style-type: none"> Each student must have adequate/reasonable access to systems needed for each course Documentation for hardware/software must be readily accessible to faculty and students Faculty members must have access to adequate computing resources for class preparation and scholarly activities Adequate support personnel to install and maintain computing resources Instructional assistance provided 	

Selection of technologies to support the online IS program must be based on the appropriateness of the technologies for the students and the curriculum. A consistent, coherent technical framework for students and faculty will minimize the impact of technological change on these parties. In addition, technical support must be provided to all students for all hardware, software, and the delivery system required for completion of the online IS program.

Also within the institutional context, articulation and transfer policies must judge courses and programs on learning outcomes and not on modes of delivery to ensure that students receive the greatest benefit from the online IS program. And finally, the institution must observe the legal and regulatory requirements of the jurisdictions in which it operates.

(2) Program Objectives and Assessment

Educational objectives and expected outcomes for graduating IS students must be specified and documented for online IS programs. The

Table 1: (continued)

(8) Students	<ul style="list-style-type: none"> Courses offered with sufficient frequency to all students to complete program in reasonable amount of time Effective interaction between teaching faculty and students is ensured by program structure Advising on program completion, course selection, and career opportunities made available to all students Standards and procedures are established to ensure that graduates meet the program requirements 	<ul style="list-style-type: none"> Institution has commitment to continuation of the program for a period sufficient to enable all admitted students to complete the degree in the publicized timeframe Prior to admission of student to electronically delivered program, student is qualified via prior education or equivalent experience, and institution provides information to student on: <ul style="list-style-type: none"> Required access to technologies used in the program Technical competence required in the program Estimated or average program costs and associated payment and refund programs Curriculum design and timeframe in which courses are offered Library and other learning services available Full array of other support services available from the institution Arrangements for interaction with the faculty and fellow students Nature and potential challenges of learning in the program's technology-based environment Estimated time for program completion Appropriate services must be available for students of electronically offered programs Institution recognizes the importance of a "sense of community" to students' success
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online IS program and its results must be reflected in the institution's ongoing self-evaluation process, and institutional evaluation of the program must take place in the context of regular evaluation of all academic programs. A clear process must exist for the periodic review of the online IS program and its related courses. In addition, the results of program reviews must be used to identify and implement program improvements, and the review and actions taken must be documented.

A variety of effectiveness measures should be incorporated in the assessment of online IS programs, including: match between student learning and intended outcomes; extent to which student intent is met; student retention rates; student satisfaction; faculty satisfaction; extent to which access to the online IS program reaches previously unserved students; extent to which library/information resources are used appropriately by students; student competence in fundamental communication, comprehension, and analysis skills; and cost effectiveness of the program to students compared to campus-based alternatives.

In the online program environment, it is also important that the security of personal information is assured and that security procedures are documented. Also, when examinations are administered via electronically mediated distance formats, circumstances must include accurate student identification measures.

(3) Faculty

Faculty face a number of issues when moving from traditional classroom-based delivery to online IS course delivery. In online IS programs, the institution and participating faculty must develop policies and agreements on workload, compensation, ownership of intellectual property resulting from the program, and implications of program participation for faculty professional evaluation processes. The institution must also provide an on-going program of technical design and production support for online IS faculty members. Training in technologies and pedagogies appropriate for online course delivery is also essential for those developing courses and working directly with students online.

Faculty members' participating in the online IS program should demonstrate interests, qualifications, and scholarly contributions sufficient to teach, plan and modify online IS courses and the curriculum. In addition, the majority of faculty in the program must hold terminal degrees, some of which must be in IS or a closely related field. In short, faculty members must have a level of competence that would normally be obtained through graduate work in IS. All faculty members are expected to remain current and active in the discipline.

(4) Curriculum

The CSAB draft criteria establish curricular guidelines for programs in IS (CSAB, 2000). The focus of the recommended curriculum is on combining professional, general education, and elective requirements to prepare graduates for a professional IS career. The specific curriculum requirements include:

- At least 30 semester hours of IS topics
- At least 15 semester hours in an IS environment, such as business
- At least 9 semester hours in quantitative analysis beyond pre-calculus, including statistics and calculus or discrete mathematics
- At least 30 semester hours of study in general education

In addition, the online IS program must assist students in the development of oral and written communication skills, and collaborative skills. It must also provide sufficient coverage of global, economic, social, and ethical implications of computing.

The curriculum requirements specified by the CSAB draft criteria have serious implications for the online IS program. It is not sufficient for the IS major courses to be offered online. Online offerings must be extended to general education, mathematics, statistics, and business or some other appropriate environment if the online IS baccalaureate degree will be available to students. Ideally the institution has made a commitment to providing online baccalaureate degrees and the online IS program will have a variety of courses from which to choose.

(5) Program Delivery

Program delivery refers to the involvement of full-time faculty with the online IS program. A sufficient number of full-time faculty members with primary commitment to the IS program must exist to provide continuity and stability to the program. Full-time faculty must oversee all course work, cover most of the online instruction, remain current in the discipline, and have sufficient time for scholarly activities and professional development. Advising duties must also be a recognized part of the faculty members' workloads.

(6) Students

The online IS program must offer courses with sufficient frequency and continuity to ensure that students can complete the degree in a reasonable amount of time. Prior to admission of the student to the online IS program, the student must be determined to be qualified via prior education or equivalent experience to participate in the program. The student must also be provided information on: required access to technologies used in the program; technical competence required to participate in the program; estimated program costs and associated payment and refund programs; curriculum design and timeframe in which courses are offered; availability of library and other learning services; availability of full array of support services available at the institution; arrangements for interaction with the faculty and fellow students; nature and potential challenges of learning in the program's technology based environment; and estimated time for program completion.

The institution must also make appropriate services available to online students, such as advising on program completion, course selection, and career opportunities. The institution must also recognize the importance of a "sense of community" to students' success, and ensure effective interaction between teaching faculty and students throughout the program. Finally, standards and procedures must be established to ensure that graduates meet program requirements.

DISCUSSION

In synthesizing the IS degree criteria and the electronically offered program accreditation guidelines, several distinct differences between traditional classroom IS education and online IS programs emerged.

First, institutional facilities obviously become less important for off-campus students enrolled in the online IS program. Instead, the technological context provided by the institution is of major importance. It is this technological context that will mediate the student's connection to the program and directly affect student interaction with the course, instructor, and fellow students. Technological context must be suitable, reliable, flexible, and easily adaptable for students and for faculty.

Second, interactions between online IS students and faculty, and among IS students must be more directly facilitated. Little facilitation is necessary for students in a face-to-face classroom environment. To nurture the potential benefits from faculty-student and student-student interaction, more deliberate, planned actions must be taken in the online IS program. These actions may involve scheduling chat rooms, interactive chat appointments, or facilitating small group projects and communication.

Third, student assessment as a part of overall program assessment is difficult. When examinations, assignments, and other evaluative activities are part of the online course, action must be taken to ensure the student enrolled in the class is the student completing the activity. This is not as easily accomplished as it is in typical classroom interactions.

Finally, faculty in online IS programs face unique challenges. Not all faculty will be effective teaching in online IS programs. Special training in online techniques and pedagogy is necessary to ensure that all participating faculty have the skills necessary to develop and facilitate online learning experiences.

FUTURE DIRECTIONS

Online IS baccalaureate programs are in their infancy. The guidelines provided here are based on current knowledge of effective IS education and effective electronically offered degree programs. As more 4-year IS degree programs go online, research opportunities will be created. Some of the key research questions of interest to institutions, faculty, students, and prospective employers of graduates include:

Do online IS program students perform at the same level as students in traditional IS classroom programs?

Do online IS program students show higher levels of satisfaction with their educational experience than traditional IS program students?

Are online IS graduates as well-prepared for the IS profession as graduates of traditional IS classroom programs?

Are employers as satisfied with graduates of online IS programs as they are with graduates of traditional IS programs?

Do online IS program graduates achieve the same success as graduates of traditional programs?

Are online IS degree programs as effective as traditional classroom programs?

The most pressing need is to empirically determine a set of "best practices" for the online IS degree program, rather than extrapolating these best practices from prior experiences in distance learning.

CONCLUSION

Online IS baccalaureate programs are an emerging educational experience. Established institutional standards for high quality educa-

tional delivery apply to electronically mediated learning experiences as well as to more traditional classroom models. Prior experience in distance learning also provides guidance for the development of online IS programs. By synthesizing approaches from the institutional guidelines as delineated by the CSAB draft criteria and the distance learning best practices identified by the C-RAC, this paper develops a set of worthwhile guidelines for the development of online IS baccalaureate degree programs. As more programs are developed and implemented, additional research must be conducted to empirically determine the efficacy of online IS programs.

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