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Computing Curricula Disputes: How Accreditation Documents and Curriculum Guidelines Might Help

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The paper reviews the model curricula guidelines on the computing fields and identifies alternatives to solve curricula disputes between academic areas. It also reviews how accreditation documents might help to facilitate discussions.

HISTORY OF MODEL CURRICULUM PROPOSALS

There is a long history of model curriculum guidelines and proposals in the computing fields. A curriculum for Computer Science was first outlined in 1968 by the Association for Computing Machinery (ACM), and revised ten years later. These curricula developments and reviews helped define the field of Computer Science (CS), and served as guidelines for program planning. A joint task force of the Institute of Electrical and Electronic Engineers Computer Society (IEEE-CS) and ACM revised the curriculum in 1991, and defined nine subject areas, and three major processes as focal points of subject matter for the discipline. The document was significantly revised recently and named Computing Curricula 2001, Computer Science Volume [IEEE-CS; ACM, 2001]. It defines a body of knowledge, identifies a core, and publishes a set of learning objectives that can be applied for the assessment of students' progress. It also contains detailed curriculum recommendations for undergraduate programs in computer science. That report also called for additional discipline-specific volumes for each of computer engineering, information systems, and software engineering. These volumes (or their drafts) were published in 2004 [IEEE-CS; ACM/CE, 2004] [ACM; AIS; IEEE-CS, 2004] [IEEE-CS; ACM/SE, 2004].

The curriculum development process has not stopped. A new approach to the design of the computing curriculum for a Bachelor of Arts degree [Davis, 2004] relies extensively on problem-based instruction and computer graphics to teach key concepts in computer science. The novelty arises from the magnitude and origin of the problems that are integrated into the curriculum and the breadth of the impact on studies areas.

Curriculum development in the Information Systems (IS) area began in the early 1970s [Couger, 1973]. Later both ACM [ACM Curriculum Committee, 1981] and the Data Processing Management Association [DPMA, 1986] published versions of IS model curricula in the 1980s. In 1990, the Association of Information Technology Professionals (AITP, formerly DPMA) sponsored a model curriculum for Information Systems [DPMA, 1990]. A major revision of curriculum structure, covered areas, technologies, and topics was presented in the IS'97 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems document, which has been widely accepted in the academic and in the professional fields, and has become the basis for accreditation of undergraduate programs in Information Systems. The IS'97 document was the result of a collaborative effort between ACM, AITP and the Association for Information Systems (AIS). As described in the document, "The architecture of the information systems curriculum at the highest level consists of five curriculum presentation areas: IS fundamentals; information systems theory and practice; information technology; information systems development; and information systems deployment and management processes" [ACM; AIS; AITP, 1997]. The IS 2002 model curriculum document has defined the architecture of the curriculum, identified the core in the body of knowledge, and laid out the context and relationship to other computing fields. "It draws heavily on past efforts, primarily IS'97, and is the second collaborative effort by ACM, AIS, and AITP. Information Systems, as an academic field, encompasses two broad areas: (1) acquisition, deployment, and management of information technology resources and services (the information systems function); and (2) development and evolution of technology infrastructures and systems for use in organizational processes (systems development)" [ACM; AIS; AITP, 2002].

Another approach to IS model curriculum development is illustrated by ISCC '99, the Information Systems-Centric Curriculum. In their proposal which was a joint effort between individuals in industry and academia the authors suggest that "… computing has a common core. This core material is usually taught in a different order and with differing emphasis in various disciplines within computing. This core material is also basic to ISCC. Further, many elements taught in computer science and in information systems are likewise essential in ISCC. Indeed, ISCC depends on knowledge units typically considered to be in the domain of MIS" [Lidtke; Stokes; Haines, 1999].

Another organization proposing curriculum guidelines for IS programs is the Information Resources Management Association (IRMA). IRMA offers more detailed guidelines for information resource management as they feel that the IS'97 is too generic and does not address the specific needs of the professional area. The proposed model curriculum "… prepares students to understand the concepts of information resources management and technologies, methods, and management procedures to collect, analyze and disseminate information throughout organizations in order to remain competitive in the global business world" [Cohen, 2000].

CURRICULUM DISPUTE

Economic trends, increasing Information Technology (IT) jobless rate, development outsourcing, and possible job considerations have lead to lower enrollments in computer technology related disciplines. These trends are especially troubling in the computer science field. Most schools have experienced 30-40% decline in the number of majors since the tech-bubble burst. Some leading universities (MIT, Carnegie-Mellon, Stanford, etc.) have no trouble filling their classes, but they also have fewer applicants. Deans also acknowledged that the number of applications, enrollment, and job offer expectations were artificially high. Information systems fields have also been negatively impacted by these trends, but not to such extent. Some fields like help desk, customer support, application customization etc. were dramatically downsized, but areas like system administration, LAN management, information systems security, business IS services, systems analysis and design,

project management, etc., can not be outsourced, and that has kept the IS programs rolling.

The struggle for survival, the chase for FTEs, and the overlapping content inherent within the computer science and information systems programs, have resulted in conflicts among faculty from these areas. The main issues are: who should teach what, whether course duplication (even with different emphasis and perspective) is allowed or not, what are the curriculum areas/domains for the Information Systems and Computer Science programs. Curriculum proposals deliver definitions that might help programs to identify themselves. "The context for Information Systems is an organization and its systems. In contrast, the context for Computer Science is algorithmic processes for information processing and associated technical and technology issues… An Information Systems academic unit is typically strong in preparing students for the organizational environment… On the other hand, a Computer Science program sometimes reverses the comparative position of an IS unit. It is typically strong in teaching technology and related algorithmic processes, but organizational functions and systems may not be an area of emphasis for them." [ACM; AIS; AITP, 2002] The discussions are (mainly) about professional content, but an underlying fear is job security.

Some schools use the model curriculum guidelines and accreditation documents to their advantage, and discover and create new programs to cover additional computing areas, and fill the classrooms. "Ultimately, the committees devoted to developing these curricula seek to define the areas of CS, SE, IS, and IT more crisply – their scope, their relationship to the other major and minor degree programs... We're forced to take a look at our field and point out the differences between it and other areas, so that we can better inform the public, our students, and the faculties interested in working in these areas." [Gorgone, 2003]

Possible Solutions

Computing Curricula 2004, the latest effort in defining different computing disciplines, identifying emphasized areas, and establishing relationships to other professions, presents thorough and detailed explanations that might help the industry but even more for academia to identify degrees, and lay out the path for future program and curricula developments.

With all the considerations in research and curriculum development there are at least three ways to solve existing curriculum disputes:

1. Merge all the computing programs under one school (e.g., School of Information Sciences) so that all the disciplines are managed within the same academic unit. This movement is not really new, but gained momentum lately. As Peter Denning, chair of the ACM education board expressed it "An important movement is taking shape on college campuses. This is the movement to organize IT schools. It is a welcome development in the growth of an IT profession. The movement is gaining a momentum that overcomes the traditional territorialism." [Denning, 2001] This solution can recognize that IT is a profession of many specialties. Programs can share some core courses, there is coordination between the fields, and faculty can easily develop new courses to enrich programs. However, this structural change moves away all computer-related programs from their traditional disciplinary areas (business, science, and technology). "They are driven more by external stakeholders and new constituencies than by interests within the academic community." [Berghell; Sallach, 2004] The results might be still compelling because the created academic units have more majors and have higher credit-hour production.
2. Leave CS in the School/College of Sciences, leave IS in the School/College of Business, and create an information technology (IT) and/or software engineering (SE) program in the School/College of Professional Studies, where all the other technology related disciplines and departments can participate in the program development and justifications (e.g., Electronic Engineering). This idea is supported by research analysis which shows that the disciplines do not really mix, and the topic domains and methods are different and well-defined for Computer Science, Software Engineering, and Information Systems [Glass; Ramesh; Vessey, 2004]. Accreditation efforts can help to distinguish these programs from each other, and force faculty to clearly define objectives within the discipline for the programs [ABET, 2003].
3. Leave CS in the School/College of Sciences, leave IS in the School/College of Business. Let the two basic areas create additional programs in Software Engineering (SE), Computer Engineering (CE), Information Technology (IT), and Management Information Systems (MIS). In that sense, SE and CE fit better in the Computer Science area, IT and MIS in the Information Systems. In our readings, this is the approach that model computing curricula proposals recommend where the document presents a detailed explanation on the program descriptions, topics, and emphasized areas [ACM; AIS; IEEE-CS, 2004].

HOW BRIGHT IS THE FUTURE

Several articles and industry reports call for more concept oriented education than teaching specific skills in computer science. "The great principles of computing have been interred beneath layers of technology in our understanding and our teaching. It is time to set them free." [Denning, 2003] Researches also suggest additional areas for possible curriculum expansion that are emerging from interdisciplinary areas like cell biology, medical imaging, artificial intelligence, or virtual simulations [Chabrow, 2004]. Computer science is devoted to apply schema and instances [Wedekind; Ortner, 2004], and use the mechanics, design, and computing practices to solve problems at scientific and engineering levels.

The Information Systems curriculum requires constant review of new technologies, methods and practices, tools, and business applications. Businesses are looking for graduates who know and understand the latest solutions, and master their application to support decision makers at all levels. Systems that can help to solve business problems must be precise, robust, scaleable, user-friendly, and adaptable. Information and content management is a key objective within the corporate strategy.

Today the technology is seen as a tool to achieve objectives. Development and management of enabling technologies need contributions from all computing disciplines. All of them have their own special roles and are necessary to enter 'the brave new world' of information society.

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