

# Computing Curriculum Analysis and Development

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## INTRODUCTION

Information technology (IT) is an umbrella term that encompasses disciplines dealing with the computer and its functions. These disciplines originated from interests in using the computer to solve problems, the theory of computation, and the development of the computer and its components.

Professionals from around the world with similar interests in IT came together and formed international professional organizations. The professional organizations span the disciplines of computer engineering (CE), computer science (CS), software engineering (SE), computer information systems (CIS), management information systems (MIS), and information technology (IT) (Freeman & Aspray, 1999). Note that information technology is both an umbrella term and a specific discipline under that umbrella.

These organizations exist to promote their profession and one method of promotion is through education. So, these professional organizations defined bodies of knowledge around the computer, which have been formalized and shaped as model curriculums. The organizations hope that colleges and universities will educate students in the IT disciplines to become knowledgeable professionals.

Because of the common interest in computing, there is a basic theory and a common technical core that exists among the model curricula (Denning, 1999; Tucker et al., 1991). Nevertheless each of the model curricula emphasizes a different perspective of IT. Each fills a different role in providing IT professionals. It falls upon the colleges and universities to select and modify the corresponding curriculum model to fit their needs.

## BACKGROUND

Currently, there are a number of model curricula for computing (Table 1). A Joint Task Force on Computing Curricula created by the Association for Computing Machinery (ACM), and the IEEE Computer Society (IEEE-CS) developed Computing Curricula 2001 (CC 2001). This model focuses on programs in theoretical and applied

computer science with various areas of emphasis in all areas of computing including computer engineering (CE), the engineering of computer hardware, and computer science (CS), the theory and design of hardware and software (Computing Curricula, 2001).

The field of information systems (IS) can be divided into the management of information systems (MIS), the engineering of computer information systems (CIS) and the use of existing commercial software applications to solve organizational problems or information technology (IT). The Information Resource Management Association (IRMA) and the Data Administration Managers Association (DAMA) have a curriculum model for MIS known as the Information Resource Management (IRM) model. It takes a management of data approach to information systems (Cohen, 2000). For a strong accounting and management MIS orientation, the Information Systems Auditing and Control Foundation has developed an interdisciplinary curriculum known as the Information Systems Auditing at the Undergraduate and Graduate Levels (ISA) model (ISACF, 1998).

IS 2002 (Information Systems, 2002) is a model curriculum developed through the joint efforts of the ACM, the Association for Information Systems (AIS), and the Association of Information Technology Professionals (AITP). This curriculum model focuses on information systems development as well as on management (Gorgone, Davis, Valacich, Topi, Feinstein, & Longenecker, 2002). The Information Systems Centric Curriculum (ISCC '99) model was developed by a task force that included members from academe and industry. It is oriented to large-scale system design and implementation. The focus is on the construction of the tools necessary for information management (Lidtko, Stokes, Haines, & Mulder, 1999).

The IT education special interest group of the ACM (SIGSITE) has developed a curriculum proposal. This curriculum is oriented toward the use of computing applications to solve organizational problems (IT Curriculum Proposal – Draft, 2002). An existing IT model is the Organizational and End User Information Systems (OEIS) model developed by the Office Systems Research Association. It is aimed at IT support of end-users. (Office Systems Research Association, 1996).

The Software Engineering Institute (SEI) has developed a model that follows the engineering approach of

*Table 1. IT professional organizations and curriculum models*

<b>Professional Organization</b>	<b>Curriculum Models</b>
Association for Computing Machinery (ACM)	Computing Curricula 2001 (CC 2001) Information Systems 2002 (IS 2002)
Association for Information Systems (AIS)	Information Systems 2002 (IS 2002)
Association of Information Technology Professionals (AITP)	Information Systems 2002 (IS 2002)
Computing Society of the Institute of Electrical and Electronic Engineers (IEEE-CS)	Computing Curricula 2001 (CC 2001)
Data Administration Managers Association (DAMA)	Information Resource Management (IRM)
Information Resources Management Association (IRMA)	Information Resource Management (IRM)
Information Systems Audit and Control Association (ISACA)	Information Systems Auditing at the Undergraduate and Graduate Levels (ISA)
International Federation for Information Processing (IFIP)	Informatics Curriculum Framework 2000 (ICF-2000)
Office Systems Research Association (OSRA)	Organizational and End User Information Systems (OEIS)
Software Engineering Institute (SEI)	Software Engineering Institute (SEI)
Special Interest Group in Information Technology Education (SITE) of the ACM	Information Technology Curriculum Proposal (IT)
An independent group of Academics and Professionals	Information Systems Centric Curriculum '99 (ISCC '99)

design first in the construction of software for embedded, large, and critical systems. The model strongly suggests specialization in a specific application domain (Bagert, Hilburn, Hislop, Lutz, McCracken, & Mangal, 1999).

Internationally, the International Federation for Information Processing (IFIP) in coordination with the United Nations Educational, Scientific and Cultural Organization (UNESCO) has developed a framework within which schools can develop an IT curriculum (Mulder & van Weert, 2000). The Informatics Curriculum Framework 2000 (ICF-2000) considers the needs of developing countries for IT knowledgeable workers. These needs are balanced against the country's educational resources. The result is a tailored IT curriculum based on the established models.

## **CONSIDERATIONS IN DEVELOPING A CURRICULUM**

To select or develop a curriculum, a school needs to assess their objectives and capabilities in providing graduates to the IT work force. A school with a strong liberal arts

tradition has a different philosophy than a technically oriented school. A large university may have schools of computing and business; the focus of each may produce different information technology professionals. Some schools prepare students for further study while others are oriented to the job market. Schools with an international or national focus have different objectives than schools providing entry-level professionals locally.

The resources of a school may limit the curriculum as well. Time is a critical resource. Some model curricula require a student begin studying information technology courses in the first semester, others require only 4 or 5 semesters of IT and begin in the 3<sup>rd</sup> year of study. IT disciplines vary on the requirement for facilities. Courses requiring hands-on hardware to test theory or practice application require laboratories similar to those in an electrical engineering department. Some curricula stress practical application in commercial settings. This requires the school have close working relationships with local sponsors. The interests of the IT faculty also have an impact on curriculum development. Ideally, IT departments are well balanced in faculty expertise. However, it

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