Integrating the Ethical and Social Context of Computing into the Computer Science Curriculum

An Interim Report from the Content Sub-Committee of the ImpactCS Steering Committee

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ABSTRACT: This paper describes the major components of ImpactCS, a program to develop strategies and curriculum materials for integrating social and ethical considerations into the computer science curriculum. It presents, in particular, the content recommendations of a subcommittee of ImpactCS; and it illustrates the interdisciplinary nature of the field, drawing upon concepts from computer science, sociology, philosophy, psychology, history, and economics.

INTRODUCTION

The Computer Sciences (CS) have advanced rapidly in the last several decades, and this advance has necessitated the continual revision of the curriculum. Not only have new areas of interest been added, but these new approaches have influenced the ways we think about established areas in computer science. One of the fundamental changes in computer science in the last decade is the realization that the context in which technology is used needs to be taken into account in its design, partly because of the ethical implications of its use, and partly because understanding the context of use helps inform and improve the design. This is recognized as one of the foundational principles in Curriculum 1991. Thus, as a part of the natural evolution of a maturing discipline, the social and ethical context of the discipline has been included in its basic undergraduate curriculum.

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This report is an attempt to present a coherent picture of how the computer science curriculum can address this social and ethical context in its courses, laboratories, and other undergraduate experiences. *Curriculum 1991* calls the "Social, Ethical, and Professional Issues" one of the subject areas in its common requirements for the undergraduate computer science curriculum. However, there is very little guidance in the report for those who would teach this subject area, and even less help from other recommended curricula. What guidance there is in *Curriculum 1991* is in the form of a high-level framework for teaching in the area, rather than recommendations for specific content or pedagogy.

This paper is a report from the content subcommittee of a National Science Foundation (NSF) funded project (ImpactCS) to help remedy the lack of content guidelines for this important area. Other stages of the project will involve the compilation and distribution of materials that could be used to teach the subject, and the preparation and implementation of faculty training seminars for those who want to teach in the area.

The recommendations in this report come from a panel of computer scientists, social scientists, and ethicists known for their work in the subject area and for their commitment to teaching it. An interdisciplinary effort is required for a subject that draws content and perspective from computer science, sociology, psychology, philosophy, history, and economics. This kind of integration of disciplines has traditionally been difficult for computer science to achieve, but is necessary in order to understand the ethical and social context of computing. We have throughout, however, attempted to maintain an emphasis on what the undergraduate computer science student should know, and have used other disciplines in their supporting roles.

The social and ethical context of computing is now integral to several subject areas of *Curriculum 1991*, most particularly to Software Engineering, Human Computer Interaction, and Computer Architecture. With the advent of the software life cycle concept, total quality management, participatory design, and fault-tolerant design, much of Software Engineering requires consideration of both the social and ethical context in which designed software is created and used. The recent report of the SIGCHI (Special Interest Group on Computer-Human Interaction) task force on curriculum development lists many topical sub-areas involving social and ethical context, including: social organization and work; models of small groups, organizations, and workflow; quality of work life and job satisfaction; models of communication; task analysis and design specification techniques; and evaluation techniques. Work in Computer Architecture requires careful consideration of fault tolerance, error checking, security of systems, privacy of transmissions, and risk assessment. All of these topics require an awareness of the context within which technology is used, an ability to evaluate that context, and the professional skill to make difficult choices based on that evaluation. These are, in turn, all goals of the subject area under consideration here: the social and ethical context of computing.

In addition to this intense integration with two areas of computer science, the social and ethical context also touches many and likely all the other subject areas of *Curriculum 1991*, to some degree since ethical issues, reliability, accountability, and liability arise in every area. Quality of life, property, privacy, and equality of access issues also arise in many, if not all, subject areas in the curriculum. Of the 12 recurring