

Computer Information Systems and Computer Science: The Domain Battle?

**Joseph S. Morrell, Wayne A. Haga, Gerard J. Morris,
Charles H. Mawhinney, Abel A. Moreno**

Computer Information Systems Department
Metropolitan State College of Denver

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ABSTRACT

The battle for territory has long been fought in the halls of academia between Computer Science(CS) and Computer Information Systems(CIS). In the Mid 1970's the distinctions between the two was reasonably clear: CIS was primarily (business) applications oriented and CS was primarily scientifically oriented. CIS tended to develop computer systems for organization and CS tended to develop software resources such as compilers and operating systems. CIS was more people oriented and CS was more machine oriented. Recently the distinction seems to have become fuzzy. This research will focus on describing academic content for both CIS and CS and determining the intersection as well as the complements of these areas. The authors propose to survey appropriate professional organizations and local industry and academic institutions to address the issues relating to the CIS and CS areas. The result of this study will provide a framework allowing academic institutions to maximize the robustness of programs in both CIS and CS while minimizing incursion and redundancy between the areas.

The Domains: An Historic Perspective

In the earlier years (1950s and 1960s), computer use very quickly split into two application areas:

- Business applications characterized by transaction processing systems like billing and payroll (data intensive, but simple processing).
- Scientific applications characterized by complex mathematics such as that required for supporting sophisticated analytical equipment and launching rocket ships and missiles (less data intensive, but more complex processing).

The 1960s saw the beginning of an era where undergraduate degree programs started to be created to provide technologically qualified personnel to develop and implement computer systems. These programs generally followed the pattern of the above two general applications:

- **Computer Information Systems (CIS)**: Sometimes called Management Information Systems or Business Information Systems, these programs tended to focus on implementing computer-based technology in business organizations. These programs were generally concentrations within existing business degree programs, which usually required a basic thirty or so general business credit hours in addition to the information systems concentration.
- **Computer Science (CS)**: These programs tended to focus on developing scientific application programs and new technology in the form of operating systems. These programs were generally outgrowths of existing programs in mathematics and typically required a minor in mathematics.

In the 1970's and early 1980's the distinctions between the two remained reasonably clear: CIS was primarily (business) applications oriented and CS was primarily scientifically oriented. CIS tended to develop computer systems for organization and CS tended to develop software resources such as compilers and operating systems. CIS was more people oriented and CS was more machine oriented.

The Incursion

The widespread commercial success of the personal computer (which began in the 1980s) has greatly changed the landscape. Fueled by advances in telecommunications technology, applications for computer use have grown at an exponential rate. Computers are now found in almost every organization, both public and private. This rapid growth in the adoption of information technology has created a similar growth in the need for properly trained personnel to develop, implement, and support this technology. This need has greatly outpaced the capabilities of the educational system to supply properly educated college graduates. Commercial education exploded and academic programs reacted as a result of this demand for trained professionals. In an attempt to address the competition from the commercial education sector and to address changing technology and methodology CIS and CS programs expanded and retooled. As a result the distinction between the two areas has become fuzzy. The present status of the two programs is heavily influenced by the politics of the academic morass from which they evolved.

The Domains at Metropolitan State College of Denver: An Illustration

An overview of the evolution of the CIS and CS programs at MSCD is given below. Figure 1 in the Appendix shows the courses in the two programs in 1976. Looking at the two programs in 1990 (see Figure 2) we see that both programs experienced growth in the number of courses offered. However, these new courses were mostly in their own domains. The same could be said up to 1997 (see Figure 3).

The first major incursion by CS into the CIS area occurred in 1998 with the development of the CSS (Computer Science Studies) prefix (see Figure 4). Even the CS department acknowledge that this is an area different from Computer Science as they do not allow their majors to take CSS courses to satisfy part of their major requirements. The CSS 3707 Advanced Multimedia programming course is a good illustration of the incursion as the CIS department already had two existing multimedia courses. The incursion continued slightly in 2000 (see Figure 4) with the addition of another CSS course and a CSI course (CSI 3700 Computer Networks) that CIS objected to as it duplicated material in their program. The last major incursion occurred in 2002 when the CS department, using an external grant as justification, proposed 22 new courses, most of them with the CSS prefix. The proposal also contained six certificates. The college curriculum committee did not approve most of the CSS courses. Nevertheless, six more CSS courses (see Figure 6) were added to the CS program.

The Role of Professional Organizations

The authors intended to rely on information from professional organizations. Some obvious questions: What is the position of professional organizations relative to curriculum recommendations? Why is this not the focus of study?

ACM and AITP have both established and updated curriculum guidelines for CS and CIS respectively. However, these guidelines establish overall curriculum topics and areas and make no determination or suggestion about the political entity (department/program/etc.) that offer these topics. In many instances the guidelines from one or the other have been used to argue that CS or CIS must offer courses on certain topics. Thus rather than clarify, the professional organizations have been unwitting accomplice to the incursion.

Continuing Research

The authors are in the process of doing parallel research in local and regional academic institutions and intend to do an in-depth statistical study to determine if the circumstances at MSCD are an anomaly. However, a cursory analysis of other institutions in the area with similar programs indicates that the observed phenomenon is not peculiar to MSCD. The degree of incursion may differ, but it still exists.

Conclusions

There are strong indications of incursions on domains by either CS or CIS. As noted above, research is still in progress regarding the history, the measure of incursion, and the status quo of CS and CIS in local and regional institutions and the authors are analyzing results.

The authors hope further research will provide a framework for academic institutions to address the overlap, incursion, and shortcomings of the relative CS and CIS programs so that the institutions can better address the resource needs in the computer area. The hope is that domains can be well defined and boundaries can be established within which each program can thrive.

Appendix

Figure 1 – CS and CIS Programs at MSCD in 1976

1976	CS¹
CSI	
MTH151	Computing I (Algorithms and Programming)
MTH251	Computing II (Numerical Applications)
MTH448	Numerical Analysis
MTH451	Advanced Computing I(Algorithms/Compiler Design)
MTH452	Advanced Computing II

1976	CIS²
CMS 101	Introduction to DP
CMS 210	FORTRAN
CMS 211	COBOL
CMS 214	Fundamentals of Programming-Assembler
CMS 215	JCL
CMS 301	Assembler
CMS 305	Fundamentals of Systems Analysis and Design
CMS 306	File Design and Data Base Management
CMS 309	Job Control Language and Operating Systems
CMS 311	Advanced COBOL
CMS 312	BASIC Programming and Graphics for Computers
CMS 314	Advanced Assembler Language
CMS 315	Programming Small Business Computers
CMS 316	PL/1
CMS 322	Analysis of Computer Hardware and Software
CMS 323	Data Communication Systems
CMS 441	Management Information Systems
CMS 451	Data Processing Management
CMS 465	Designing and Implementing Expert Systems

¹ Computer Science courses had the MTH prefix at this time.

² Computer Information System courses use the CMS prefix.

Figure 2 – CS and CIS Programs at MSCD in 1990

1990	CS
CSI 101	Introduction to Computer Science (2 + 2 credits)
CSI 130	Introduction to Structured Programming (4 credits)
CSI 150	BASIC Programming (2 credits)
CSI 210	Computer Organization and Architecture (3 credits)
CSI 222	The C Programming Language (3 credits)
CSI 230	Advanced Programming and Data Structures (4 credits)
CSI 310	Discrete Mathematics (4 credits)
CSI 311	Data Structures (3 credits)
CSI 312	Organization and Structure of Operating Systems (4 credits)
CSI 316	Assembly Language Programming (3 credits)
CSI 320	Algorithm Analysis (3 credits)
CSI 321	Principles of Programming Languages (4 credits)
CSI 411	File Structures (3 credits)
CSI 412	Foundations of Artificial Intelligence (4 credits)
CSI 420	Computing Theory (3 credits)
CSI 421	Software Development and Engineering (4 credits)
CSI 451	Computer Graphics (3 credits)
CSI 452	Advanced Computing: Variable Topics (3 credits)

Figure 2 – CS and CIS Programs at MSCD in 1990 (continued)

1990	CIS
CMS 101	Introduction to Computers
CMS 201	Principles of Information Systems
CMS 208	PASCAL
CMS 210	FORTRAN
CMS 211	COBOL
CMS 214	Fundamentals of Programming-Assembler
CMS 223	Word Processing
CMS 305	Fundamentals of Systems Analysis and Design
CMS 309	Job Control Language and Operating Systems
CMS 311	Advanced COBOL
CMS 312	BASIC Programming and Graphics for Computers
CMS 313	Implementing Business Systems in UNIX Using C
CMS 314	Advanced Assembler Language
CMS 315	Programming Small Business Computers
CMS 322	Analysis of Computer Hardware and Software
CMS 323	Data Communication Systems
CMS 324	Computer Auditability and Control
CMS 325	Automated Office Systems
CMS 327	Micro Based Software
CMS 341	Micro-Based Computer Systems
CMS 361	Introduction to Artificial Intelligence for Business
CMS 363	Artificial Intelligence Languages and Tools
CMS 405	Advanced Systems Analysis and Design Seminar
CMS 406	Advanced Data Base Systems
CMS 407	Systems Development and Implementation
CMS 416	Advanced Programming Seminar
CMS 441	Management Information Systems
CMS 451	Data Processing Management
CMS 465	Designing and Implementing Expert Systems

Figure 3 – New CS and CIS Courses at MSCD in 1997

1997	CS New Courses
CSI 1080	The World Wide Web the Internet and Beyond (3 credits)
CSI 2250	The C + + Programming Language (4 credits)
CSI 2610	Computer Programming for Educators (4 credits)
CSI 3280	Object-Oriented Software Development (4 credits)
CSI 3310	Fundamentals of Database Systems (4 credits)
CSI 4190	Software Development and Engineering for Technical Writers
CSI 4250	Software Engineering Principles (4 credits)
CSI 4260	Software Engineering Practices (4 credits)

1997	CIS New Courses
CMS 1080	The World Wide Webthe Internet and Beyond
CMS 1110	Computer Literacy and DOS
CMS 1120	Word Processing with WordPerfect
CMS 1130	Spreadsheets with Lotus 1-2-3
CMS 2010	Computer Applications for Business
CMS 2110	Business Problem Solving: A structured Programming Approach
CMS 2230	Word Processing
CMS 3180	Business applications in OOP: C++
CMS 3260	Systems Development with GUI Development Tools
CMS 3280	LAN and WAN Systems for Business
CMS 3290	Micro User Operating Systems for Business

Figure 4 – New CS and CIS Courses at MSCD in 1998

1998	CS New Courses
CSS 1027	BASIC Programming (2 credits)
CSS 1247	Introduction to Programming: Visual Basic (4 credits)
CSS 1607	Java Programming Fundamentals (4 credits)
CSS 2227	The C Programming Language (3 credits)
CSS 2257	The C++ Programming Language (4 credits)
CSS 3607	Advanced Web Programming: Java and Perl (4 credits)
CSS 3707	Advanced Multimedia programming (4 credits)

1998	CIS New Courses
CMS 4280	Network Installation and Administration

Figure 5 – New CS and CIS Courses at MSCD in 2000

2000	CS New Courses
CSI 3700	Computer Networks
CSS 1427	Introduction to UNIX (2 credits)

2000	CIS New Courses
CMS 3030	Business Web Page Development
CMS 3141	Multimedia Business Information Systems Development
CMS 3142	Advanced Multimedia Business Information Systems Development
CMS 3145	Business Application Development with Visual Basic
CMS 3190	Business Application and Web Applet Design with Java
CMS 4030	Web Site Administration
CMS 4260	Database Administration

Figure 6 – New CS and CIS Courses at MSCD in 2002

2002	CS New Courses
CSI 4281	Software Requirements (3 credits)
CSI 4282	Software Development Management (3 credits)
CSI 4283	Software Testing and Quality Assurance (3 credits)
CSI 4284	Software Product Engineering (3 credits)
CSI 4285	Best Practices in Software Development (3 credits)
CSS 1201	Understanding Programming (3 credits)
CSS 2267	The Java Programming Language (4 credits)
CSS 3227	UNIX Programming (3 credits)
CSS 4727	Network Programming (3 credits)
CSS 1427	Introduction to UNIX (2 credits) changed to
CSS 2425	Introduction to UNIX (2 credits)

2002	CIS New Courses
	None

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