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DOES INFORMATION SYSTEMS SUFFER AN IDENTITY CRISIS? A CASE STUDY OF CONFUSION AND MISINFORMATION

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ABSTRACT

More than a thousand colleges and universities have information systems (IS) programs. Many of these programs are housed within departments that also contain Computer Science programs. However, for many reasons, Information Systems still seems to have an identity problem in its constant comparison with Computer Science. Furthermore, there is confusion with MIS and IT—to the extent that these names are used interchangeably. This paper discusses how IS programs seem to be regarded as Computer Science programs instead of being recognized as a stand-alone discipline. As a result, IS programs have become less recognized and acknowledged even within the same academic department and has been reduced to the extent that Information Systems struggles to gain legitimacy as a standalone discipline—in a time period where demand for graduates with IS skillsets supersede supply. The proposed research seeks to provide understanding of why Information Systems continues to be a misunderstood discipline. A case study will be introduced to provide context for the complexity of issues associated with distinction between CS, CIS (IS), and MIS.

Keywords: IS Discipline Identity, Computer Information Systems, IS Curriculum, Information Systems, IS Discipline, Information Systems Identity, ABET Accreditation, AACSB Accreditation, MIS, Computer Science

INTRODUCTION

As computing started to appear in colleges and universities in the 1950's, it was under the auspices of mathematics and engineering. It was not until 1968 the Computer Science was given its own identity—distinct from mathematics and computer engineering. This was the result of the spring, 1968 ACM publication of *Curriculum 68: Recommendations for the Undergraduate Program in Computer Science* [16, 1, 13]. About the same time industry was integrating computers and data processing into everyday business. Computers were no longer idiosyncratic hardware devices where engineering talent was required at the systems level to customize operating systems to make the computer functional. Operating systems came standardized with the computer since the IBM 360 OS was made available after 1964. Focus changed from systems programming to make the computer functional to applications programming—facilitating the business process designed to solve business problems. Skill sets changed from a focus on the computer to a focus on data processing in the context of doing business. As applications programming grew in visibility and importance, in the early 1980'sIEEE and DPMA established delineation between Computer Engineering, Computer Science, and Computer Information Systems [16, 5, 15). Then, in the 1990's, emerged a movement to create a model curriculum for information systems beginning with the DPMA IS 1990 curriculum and IS 1995, 1997 model curricula as joint projects through ACM, AIS, AITP [10]. While this affiliation has continued to this day with IS 2000, 2002, and 2010 model curricula, very few outside the IS community are familiar with this initiative—including students.

While there has been significant effort to distinguish between the academic disciplines of computer science and information systems—the university resources allocation model of funding those departments or programs that have the enrollments has led to further confusion, seeming program duplication, and misinformation. This competition that is internal to the university has been further complicated with recent accreditation movements e.g., ABET-Computer Accreditation Commission (CAC) for IS programs and AACSB accreditation for business programs.

This paper, through a case study of a 9,000 student state institution in the northeast, presents how internal competition; disparate faculty culture, student ignorance, web presence complexity, and accreditation issues can exacerbate rather than rectify an information system identity crisis. First, computer/information systems based accreditations are described, detailed, and differentiated. Second, the case study is introduced with three computer-

based programs at a northeastern public university is described, detailed, and differentiated. Third, strategic issues of organizational consolidation and location with regards to best fit for students and faculty are discussed. Finally, a recommendation is made as to a possible solution to establishing a standalone identity for information systems can evolve.

ACCREDITATIONS: ABET-CAC COMPUTER SCIENCE, ABET-CAC INFORMATION SYSTEMS AND AACSB-MANAGEMENT INFORMATION SYSTEMS

Inherent confusion over a particular identity for information systems has emerged over the past 20 years due to a lack of professional consensus. Hardware and software developers have historically drawn from the computer science arena to satisfy technical programming problems such as speed, memory requirements, security, and cost considerations. Business process application developers and service providers have likewise been drawn to technical expertise coupled with business process understanding and/or experience. The application developers frequently prefer good business process skills over technical skills arguing that it is more difficult to teach business understanding that to enhance an employee's basic technical skills with corporate specific skill sets. However, with the development of academic professional accreditation and associated curricular requirements—there has been movement to a better delineation of skill set expectations associated with degree programs.

There has been significant research written on programs with ABET-CAC, AACSB and, in some cases, both accreditations [7, 9, 11]. Each accrediting body has specific guidelines for curricular course inclusions. For instance, ABET-CAC computer science focuses on mathematics and programming. ABET-CAC information systems focuses on a common body of knowledge that includes over 39 credits in programming, systems analysis, database, security, project management and operating systems—along with an " information systems environment" i.e., 15 or so credits in business. Meanwhile AASCB focuses on the business common body of knowledge (management, marketing accounting, finance, organizational behavior, strategic planning, etc.) plus an area of concentration like MIS. The MIS concentration is typically less than 30 credits—limited, for the most part to first level IS courses with little emphasis on programming.

ABET computer science curricula best serves systems programming needs—the development of tools and platforms. Efficiency, speed, memory management, compatibility standards, and security with respect to hardware and software are the focus. ABET information systems curricula focus on application development with existing tools and programming languages; interfacing applications between platforms, databases, and networks; designing and developing applications to work in a variety of environments i.e., enterprise, desktop, web, mobile. The design, development, implementation, and maintenance of business applications are the focus. AACSB-MIS programs focus on business analysis—using technology to be integrated in the business process to lower cost and/or to develop competitive or strategic advantage. The focus is on the business process.

While the three academic accreditations are distinctly different, a lack of professional consensus and/or ignorance of the CS, IS and MIS differentials leads to confusion for both students and employers. The relative interchangeable usage of CS, IS, MIS and Information Technology (IT) by employers and students alike is an indicator of the mainstream confusion and inevitable misinformation that surrounds computing in the academic world as well as the business world. Bacon and Fitzgerald [3], state that Information Systems faces an identity crisis and fights to gain recognition as a distinct discipline. Benbasat and Zmud [4] add by stating, "After 30 years, insufficient progress has been made in establishing a collective identity." To most of the world information systems is inherently a computer focused profession—hence the confusion and association with computer science. Topi, et. al. [6], argue that Information Systems, as an academic field of study, exists under a variety of different names that reflect different historical developments of the discipline. While the accreditation process, particularly in the ABET world, has sought to establish individual guidelines that separate and distinguish computer science from information systems and information technology—this world is a closed world limited to those directly associated with their respective discipline that is, for the most part, unknown to others –a "discipline *siloization.*"

The following case illustrates how a particular academic environment with three distinct programs because of "discipline isolation" yields confusion and identity ambiguity.

THE THREE COMPUTER BASED PROGRAMS
COMPUTER SCIENCE PROGRAM

Computer Science (CS) appears to be the most recognized and respected of the three degrees, with the other two being Computer Information Systems and Management Information Systems. With programming and mathematics as the core of the degree, it is very focused and the least flexible of the programs. In comparison to CIS and MIS, the CS curriculum involves courses such as Algorithms, Java, C programming, Data Structures, Computer Architecture and other technical courses. In addition, there are 12 additional credits relating to science, while the math requirements include Calculus I, II, III, Linear Algebra I, II, and other related math courses. It is important to note that there is no business or business related courses required in this program. The mission statement emphasizes the goal of producing successful computer scientists who will remain current in their field while performing ethically and professionally in their field. Table 1 listed below details the mission statement and course curriculum for Computer Science.

Table 1 Computer Science

Computer Science Mission Statement
The mission of the computer science program is to provide students with a high quality, well-rounded education that meets the needs of the Commonwealth. This high quality program focuses on three objectives: • To produce graduates who will be successful computer scientists in industry and graduate school; • To produce graduates who will remain current in their field as life long learners; and • To produce graduates who will perform ethically and professionally in industry and society.

Computer Science Program Courses	
Problem Solving & Programming Constructs	Language Translation
Computer Programming I	Language Theory
Object-Oriented Programming	Computer Science special Topics
Programming with Visual Basic	Senior Project Part I
Logic & Switching Theory	Senior Project Part II
COBOL	
FORTRAN	
Assembly Programming	**Courses in Mathematics & Natural Science (30 credits)**
Data Structures	Discrete Mathematical Structures
Java	Statistics
Algorithms Analysis	Calculus I
Computer Architecture	Calculus II
Operating Systems	Calculus III
Computer Science Internship	Linear Algebra I
Artificial Intelligence	Linear Algebra II
Numerical Analysis	
Programming Language Structures	**12 credits of Science**

COMPUTER INFORMATION SYSTEMS

Computer Information Systems program at the case study school is characterized by its blended technical and business orientation. In contrast with Computer Sciences, there is less emphasis on mathematics and science with less programming courses. The focus of the CIS degree is more business application driven with courses such as, Database Management Systems and Design, Database Applications Development, Systems Analysis I and II, Project

Management, and Decision Support Systems. The business component of the program includes courses such as Financial Accounting, Microeconomics, Principles of Management, and several business electives. An array of General Education courses rounds out this interdisciplinary degree to produce a multi skilled, multi-dimensional graduate. As noted in their paper, "The Information Systems Identity Crisis: Focusing on High-Visibility and High Impact Research," Agarwal and Lucas (2005) describes the IS discipline as "of vital importance to managers, academics, and business education. However, the IS discipline has experienced great difficulty in establishing itself in business schools and other departments such as information science and computer science programs." In their article "Thirty Years of IS Research: Core Artifacts and Academic Identity, Nevo, Nevo, and Ein-Dor [14], suggest in their findings that "the IS discipline has a central and enduring core … Specifically, our academic identity can be described as the scientific study of the design, development, and management of information technologies, as well as their use by and impact on individuals, groups, and organizations." Table 2 listed below details the mission statement and course curriculum for Computer Information Systems.

Table 2 Computer Information Systems

Mission Statement of Computer Information Systems
It is the goal of the Computer Information Systems program to produce graduates who: • Meet their professional goals, • Continue to be life-long learners and • Meet their employer or continuing education expectations.

Computer Information Systems Courses	
CIS Core Courses Intro to Information Systems Application Programming I Java) Application Programming II (Java) Systems Analysis I (Sophomore Project) Database Mgmt Sys & Design Database Application Development Web Programming I CISCO CCNA 1 Ethical Issues in Computing Systems Project Management Systems Analysis II (Senior Project I) Systems Development & Implementation(Senior Project II) Visual Programming **Math** Discrete Structures Statistics (or) Business Statistics Calculus I PSY 100 General Psychology Sci & Tech Writing (or) Honors Composition II Public Speaking Course	**Business Courses** Intro to Business Business Core Elective #1 Business Core Elective #2 Financial Accounting Introductory Microeconomics Principles of Management **Electives** CIS Related Elective #1 CIS Related Elective #2 CIS Related Elective #3 CIS Related Elective #4 Free Elective #1 Free Elective #2 Free Elective #3 Natural Science Elective #1 Natural Science Elective #2 Multicultural Awareness Elective Humanities Elective Health & Wellness Elective Fine Arts Elective Values Elective

MANAGEMENT INFORMATION SYSTEMS

In their paper "A Program for Research on Management Information Systems, Mason and Mitroff [12] noted that "an information system consists of at least one person of a certain psychological type who faces a problem within some organizational context for which he need some evidence to a arrive at a solution and that the evidence is made available to him through some mode of presentation". They continue to note how organization structure relates to niche information systems such as management information systems and how they are used within an organization. Generally, management information systems are based on the hierarchy of strategic planning, management control and operational control. In this context, organizational structure is a reflection of the various levels of problems that exist within an organization and the need to solve those problems through management information systems. As a supporting viewpoint in this theme, it is our belief that management information systems are problem-focused situations that are solved through application systems.

At the case study school, management information system is considered part of a concentration with the Business & Economics Department. The department provides all undergraduates with a Bachelor of Science in Business Administration with a supported concentration. The concentrations include Accounting, Economics, Finance, Human Resources, Management, Marketing and Management Information Systems. The Information Technology Management Concentration contains the management information systems area. The curriculum is designed to provide the training and skills necessary to solve diverse business and economic problems. As noted in the university catalog and web site, the concentration specializes in Computer Science (Computer Science and Information Systems) and Management (Management) courses up to 18 credits (six three credit courses) in addition to core business administration courses. Table 3 reflects the required courses for the 18 credits required for the Information Management concentration.

Table 3 – Information Management

Course	Name	Description
MGT 373	Computer-Based Management Information Systems	This course provides background and insight into the technical foundations of database management for business professionals. It concentrates on information technology systems that support managerial decision-making. This course illustrates how the field of information technology systems supports customer relationship management and supply chain management. It demonstrates how information systems are developed and applied in solving various business dilemmas. The course stresses the importance of properly managing information technology, locally and globally, to obtain and maintain a competitive advantage in the business world. (3 crs.)
MGT 375	Information Technology Ethics	The course provides background and insight into the ethical challenges posed by rapidly changing information technology. Students will examine and analyze the issues and controversies that comprise the field of cyber-ethics and cyber-technology. This course illustrates the broad coverage of cyber-ethics since it covers not only the professional, business aspects of information technology ethics, but also the individual, personal aspects of information technology ethics. (3 crs.)
CSC 120	Problem Solving and Program Constructs	This course will provide the student with a basic literacy of computers; present problem-solving heuristics and structured programming techniques; present language independent data types, operations, programming constructs and statements; introduce arrays and linked lists; and implement fundamental programs using an appropriate programming language. Prerequisite: High school algebra or equivalent. (3 crs.)

CSC 124	Computer Programming I	This course builds on CSC 120. It gives the student a thorough understanding of the presently adopted language so that the student will develop the ability to program in the language. Emphasis is placed on efficient software development using structured programming techniques. Students are required to write, test and run programs. Prerequisite: CSC 120 with C- or better. (3 crs.)
CIS 321	Database Management Systems and Database Design	This introductory course to DBMS (database management systems) provides the student with the theory and practice behind the use of modern DBMS. Database terminology and concepts covered include, but are not limited to, the logical and physical design of databases and the tables within them as determined through the analysis of information needs and modeling, the creation of ERD (entity relationship diagrams) and their translation into relational schemas (logical and physical design), normalization techniques, DDL (data definition language) and SQL (structured query language) for database, table, view and index creation and database performance and optimization. Prerequisites: CIS 299 Systems Analysis I with C- or better or Computer Science junior standing. (3 crs.)
CIS 322	Database Application Development	Building upon the conceptual understanding of a modern DBMS (database management system) and database and table design concepts gained in CIS 321 – Database Management Systems and Database Design, this course provides the student with the practice of applying database technology via the Oracle DBMS to the solution of business and other information-related problems. Experience is provided with database design and implementation based on a thorough analysis of requirements and information modeling. The use of structured query language (SQL) for interaction with a working DBMS for data creation, manipulation and extraction is stressed as well as optimization techniques, such as view creation and indexing. PL/SQL and database triggers are introduced. Prerequisites: CIS 321 Database Management Systems and Database Design with a C- or better. (3 crs.)

STRATEGIC ISSUES OF ORGANIZATIONAL CONSOLIDATION

The strategic issues of organizational consolidation and impact to faculty and students reflect challenges at various levels. Organizationally, the university has the three areas (Computer Science (CS), Computer Information Systems (CIS) and Management Information Systems (MIS)) housed in two different departments. Computer Science and Computer Information Systems are in the Math, Computer Science and Information Systems Department (M, CS and IS) while the Management Information Systems concentration is within the Business & Economics (B&E) Department. Both departments fall under the Dean College of Science & Technology.

With CIS positioned with CS in a math oriented department, it is our belief that the perception of faculty, both within the department and through the university, is that the CS discipline is more hard skill oriented in the areas of engineering, software design based on mathematical algorithms while the CIS discipline is more soft skill oriented in problem solving and decision making while using some technology based solutions along the way. CS is considered a true science and technically based discipline while CIS is considered a generalist program where people use technology along the way. While that assumption may be true, the culture of the department implies that the CS faculty has the more challenging skill sets needed for success in the marketplace while the CIS faculty do not have the intellectual capacity of the CS and Math faculty. If you look at the hierarchy of empowerment within the department, the organization power is driven primarily through math faculty, then the CS faculty and finally CIS from a standpoint of respect for the faculty's respective discipline. CIS is at the bottom of Maslow's hierarchy of

organizational empowerment. To support this viewpoint, to date, the department chair position has always been a math faculty member.

With MIS positioned within a business-oriented department, the area is treated as a support concentration that has minimal commitment. There is no full-time faculty member within the 14 members of the department who have the credentials and experience to support the courses in MIS. Adjunct professors teach all of the MIS courses. During the 2011-2012 academic year, a CIS faculty member provided the role of interim chair to the Business & Economics Department. One of the administrative goals for the interim chair was to "build a bridge" between the faculty and CIS program within the Math, Computer Science and Information Systems Department to the faculty and MIS program within Business & Economics. Ongoing discussions between the faculties for both departments reflected an interesting scenario related to programs, disciplines and possible consolidation. While the faculty within CIS was open and interested in possibly merging the two disciplines/programs under one organizational umbrella, the faculty within B&E wanted separation by sharing their viewpoint that CIS faculty and their courses do not reflect the overall business content needed for the B&E area. Their viewpoint was that CIS faculty and their courses are technical in nature while not providing the content and theory needed in business. The CIS faculty found this as an intriguing viewpoint because three of the four CIS faculty had at least 20 years' experience in business before moving in academia, and one CIS faculty member had an M.B.A. to support his academic credentials.

Administratively, the opportunity for consolidation between the two departments deteriorated after further discussions. The B&E department informally negated the consolidation because of their territorial position on not allowing outsiders into their department who did not have the perceived required skill sets and credentials. The Math, Computer Science and Information Systems department informally negated the consolidation because the chair and faculty did not want to lose faculty numbers which would require adjunct faculty to teach CIS related courses that would remain in the department. Also, the department did not want to lose faculty who were considered competent and excellent resources in the areas of teaching, service and scholarship. Lastly, with the union's collective bargaining agreement, an organizational consolidation would need to be approved by both faculties under the existing organizational structure. With both faculties questioning the consolidation, administration at this time decided not to pursue that change.

Another area of observation between the two departments and the three areas relate to the current situation and future opportunities for both faculty and students. With a lack of faculty commitment to the concentration in B&E, it is not surprising to find that during the 2011-2012 academic year, only 11 students were in the MIS concentration from a population of over 850 undergraduate students in the Business & Economic Department. The concentration in not marketed by existing faculty in a committed fashion and tends to exist because of decisions made decades ago. It should be noted that the B&E Department has one of the largest student enrollments on campus, only behind Education College. Their class sizes are normally 75-90 students and they have the highest student/faculty ratio within the College of Science & Technology. Conversely, there is a faculty commitment to the CIS program where the student enrollment numbers have increased from 0 to 71 students since the founding of the program in fall 2005. Student class sizes are 15-25 students where the four faculty members can provide dedicated, one-on-one advisement and mentoring to the CIS students. Senior capstone courses have a capstone of 20 students, so the applied experience is worthwhile for students and faculty for CIS majors. To consider a similar model in B&E would be challenging to provide an applied experience in the classroom where the student numbers can be over 75 students.

CONCLUSIONS

While the three programs presented above can easily be differentiated; students, employers, and faculty outside of the three programs see the programs as similar, if not the same. Because the programs are different with radically different objectives and purpose, employer expectations and resulting student success will depend on jobs and skill sets matching. It appears that confusion, misinformation and organizational issues and dynamics can lead to this mismatch. One possible solution is to identify the program with labels that would be as descriptive as possible. Programs with the term "Information Systems" in its title appears to have the greatest identity crisis, such as Computer Information Systems within the Math and Computer Science area or Management Information Systems

and Information Technology within the Business area of the university. Since an academic program that is positioned to encompass a business application focus though technology based solutions for problem solving, it would be more accurate and identifiable to go into the past and consider renaming such programs as Business Information Systems to eliminate the confusion with Computer Science.

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