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Information Systems: A Research Plan to Identify Origins and Destination

Jon D. Clark
jon.clark@colostate.edu

W. John Plotnicki
john.plotnicki@colostate.edu

College of Business
Colorado State University
Fort Collins, CO 80524-1277, USA

Bart Longenecker
longeneckerb@gmail.com

David Feinstein
dfeinstein@usouthal.edu

School of CIS
University of South Alabama
FCW-20
Mobile, AL 36688, USA

Abstract

Information Systems (IS) faculty who entered the workforce in the 1970's saw firsthand the evolution of a new discipline embraced by universities in a variety of ways, including sub groups within existing departments of management science, operations research, and accounting. Within a few years, these split off into separate departments of data processing, management information systems or computer information systems. During this transformation, the source of faculty too evolved from those trained in some other related discipline, to specifically trained faculty at a small but growing number of doctoral programs, each with its own take on the relevant foundation literature. Within a decade, curricula began its standardization as the Institute of Electrical and Electronics Engineers (IEEE), Association for Computing Machinery (ACM), and the Data Processors Management Association (DPMA) began efforts to define and consolidate content required for professionals. The purpose of this paper is to develop a research plan to trace the origins of IS up through its current state, and more importantly, hypothesize its future destination. The following questions must be answered: 1) will we continue as a largely stand-alone discipline; 2) might we instead, be reabsorbed into another core business discipline such as accounting; 3) should we concentrate on serving a set of core business disciplines while maintaining a degree of independence; 4) might we disappear as management science and operations research has, in spite of their impact on the productivity of the 1940's through the 1980's. Our destiny has yet to be determined.

Keywords: IEEE, ACM, DPMA, CIS Curriculum, History of CIS, Future of CIS

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1. INTRODUCTION

Many senior Information Systems and Computer Science practitioners or academics have witnessed the birth and evolution of our fields. Those who sought masters or PhDs in these areas can attest to the early scarcity of these and associated programs. Computer Science PhDs began to appear in the late 1960s while advanced IS degrees appeared sometime later. It was most often the case that the PhDs were earned in other related fields. For Information Systems it was usually management science, operations research or accounting. While for the Computer Science professional, degrees most often came from mathematics and ~~the~~ various engineering fields. Currently, most new faculty members entering IS or CS programs come with PhDs in their respective discipline. This changing trend is evidenced by the way computing accreditation curriculum criteria have evolved. In the late 1980s when computing criteria were first developed the specified faculty members *should* have a PhD in Computer Science or *closely related field.* Now the criteria state for computer science "Some full time faculty members must have a Ph.D. in computer science." Similarly for Information Systems the criteria state "Some full-time faculty, including those responsible for the IS curriculum development, must hold a terminal degree in information systems."

Enrollments in computing programs have fluctuated enormously. The following data from Colorado State University is representative of computing enrollments in the United States. The enrollment trends are shown in Figure-1 for CSU's program which is arguably one of the first in the US with its first course offerings in 1962, with a vocational two-year degree in 1964, followed by a full four-year degree in 1966.

The graph shown indicates several important features including a striking pattern of enrollment peaks and valleys with a cycle of 15 years. The authors are currently attempting to determine the causes of the regularity in pattern including such events as the development of the internet, offering of the personal computer, and finally the end of Y2K. Certainly economic fluctuations may well have had an impact. Hidden in the enrollment totals are tremendous variations in the mix of men and women in the major. As an example, at CSU we have seen the portion of women in the field vary from less than 20% in 1982 to over 50% in the years of 1983 through 1985.

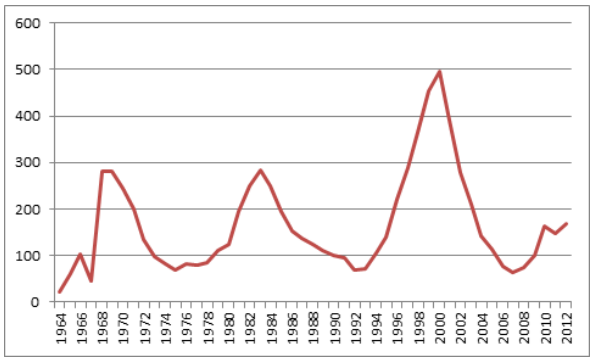

Figure-1: CIS Enrollments at CSU

The explanation for the large fluctuations is probably due to a series of external factors. In 1964, IBM introduced the System/360 which for the first time provided a standardized scalable platform for business applications. As a result, it became easier to deliver a unified curriculum. The period from 1981 to 1984 saw the popularization of the PC. The increase starting in 1991 can be related to the availability and increasing popularity of the internet which culminated in the 2000 with the peak of the dot com phenomenon. What is equally as interesting are the possible reasons for the sharp declines. The dot com bust probably explains the decline starting in 2001 and other declines also seem to be more economy driven than for some technological reason. However, in each cycle influx, students were confronted with the rigor of new and changing technologies in the disciplines which might have contributed to the end of each cycle. Most recently, the slower but healthier growth can be attributed to industries true needs for computing professionals. The outlook for the next ten years is second only to healthcare and shows a 22% increase (Bureau of Labor Statistics, 2012).

Currently the universities have been confronted with serious financial problems. Costs have continually increased but sources of funding, both public and private, have been seriously diminished. Consequently, there has been a movement to consolidate or even eliminate programs. A retrospective of the past 40 plus years could be useful in studying the roots and evolution of the Information Systems discipline. To complicate the situation even more there appears to be a proliferation of related programs or sub-

disciplines such as security, web development, etc. It is suggested that through a careful study of our past we may be able to make suggestions that will lead to a more stable future and an easier way to plan for and allocate resources. For the programs within a business school, other issues are relevant. IS is an enabler of the more core business areas of accounting, finance, marketing, and management. However, IS is not a functional area within business. Within this context, as funding becomes an ever increasing issue, elimination of IS as a distinct program is a reality. According to AACSB (AACSB, 2012) the percentage of doctoral hires has declined from %% in 2005-6 to 4% in 2010-11. Salaries, too have not kept up with other areas of business including finance and accounting.

2. ORIGINS: IEEE, ACM, AITP

Perhaps another useful way to study the IS origins is to look the professional organizations in computing. There are three main organizations responsible for the standards and therefore the direction of the field. The oldest is the IEEE (Institute of Electrical and Electronic Engineers) which dates back to as early as 1884. Its history is fascinating involving such major contributors to life as we know it today, Thomas Edison and Alexander Graham Bell. This organization has had a particularly significant impact on the computing field and in particular IS. This is due partly due to its size and worldwide reach. It has 395,000 members in 160 countries. It also represents practitioners in computer science, software development, and information technology. Professionals from the physical sciences and medical professions also maintain membership.

Another major organization the ACM (formerly the Association of Computing Machinery) has its roots back in 1947 at MIT and its original mission was to promote the development of Computer Science. It has now expanded to include subgroups spanning all the computing disciplines including computer science, computer engineering, information systems, software engineering, and information technology. It serves both professional and public interests by enhancing the interchange of information and promoting the highest professional and ethical standards.
The third organization, currently known as AITP (Association of Information Technology Professionals) was founded back in 1951 then known as the National Machine Accountants Association. It changed its name in 1962 to DPMA (Data Processors Management Association) and finally in 1997 to AITP (AITP, 2012). This organization mission focuses more on the business aspects of Information Technology. AITP has primarily focused on practitioners but also has supported two and four year education and has been a major sponsor of information systems curriculum development.

3. MODEL CURRICULA

A constructive way to look at how information systems evolved is to look at the curricula that have been developed through the efforts of the three organizations as shown in Table-1.

May, 1972	ACM Graduate Professional Programs in Information Systems (Ashenhurst, 1972)
December, 1973	ACM Undergraduate Programs in Information Systems (Cougar, 1973)
March, 1981	ACM Educational Programs and Information Systems (Nunamaker, Couger and Davis, 1982)
1981	DPMA Curriculum for Undergraduate Information Systems Education (DPMA, 1981)
1983	ACM Information Systems Curriculum Recommendations for the 80s, Undergraduate and Graduate Programs (ACM, 1983; Nunamaker, Couger and Davis, 1982)
October, 1984	DPMA Secondary Curriculum on Information Technology and Computer Information Systems
October, 1985	DPMA Associate-Level Model Curriculum in Computer Information Systems
October, 1985	DPMA Model Curriculum for Undergraduate Computer Information Systems
May, 1990	ACM/IEEE Computing Curriculum for Computer Science for Undergraduates
October, 1990	DPMA IS'90 draft document (Longenecker and Feinstein, 1991c)
June, 1991	DPMA IS'90 Curriculum for Undergraduate Programs in Information Systems
July, 1991	ACM CS Curriculum (Turner and Tucker, 1991)
January, 1994	DPMA IS'94 Curriculum for Two Year Programs in Information Systems (Longenecker, Feinstein et

	al., 1994)
January, 1994	ACM Curriculum for Two Year Programs in Computer Information Systems
December, 1994	First Draft of IS'95 from the Joint ACM, AIS, DPMA Task Force (Gorgone et al., 1994; Longenecker et al., 1995; Couger, 1996)
February, 1996	First Draft of IS'97 from the Joint ACM, AIS, DPMA Task Force
December, 1997	ACM, AIS, AITP IS'97 Model Curriculum and Guidelines for Undergraduate Programs of Information Systems
December, 1999	ISCC An Industry Based Curriculum
December, 2002	IS 2002 Model Curriculum and Guidelines for Undergraduate Programs of Information Systems
April, 2009	Draft of IS 2009 (Topi, 2010)

Table-1: Chronology of IS Curriculum

A detailed discussion of how the curriculum models have evolved can be found in various papers by the co-authors.

4. EXTERNAL FORCES AFFECTING PROGRAMS

Richard Whitley's book (Whitley, 2000) describes how science is transformed along with the changing nature of knowledge production at the end of the 20th century. He offers a conceptual model which describes the influences that bring about scientific transformation including: reputational work; reputational control over scientific work and growth of employment opportunities; degree of dependence between scientists and organization of scientific fields; degree of task uncertainty and organization of scientific fields; organization structure; contexts of scientific fields; and relationship between scientific fields and changes in the organization of the sciences. His book suggests that modern scientific fields emerge as a protection of reputations of those involved, followed by the development of employment opportunities and, finally considers the impact of organization on the field itself.

Clearly, IS has followed this path of emergence from a variety of disciplines. Eventually organizations developed, usually at the departmental level, within certain colleges at universities. Now, however, the organization of the departments is in a state of transition and is likely to have an impact of the science itself.

A significant external force influencing academic programs has been both the growth and fluctuation of employment opportunities for the graduate. Academic institutions have tended to evolve slowly. In the past decade the rapid growth of the industry has put pressure on the academic units to produce ever increasing numbers of competent graduates. At the same time we have seen almost wild fluctuations in enrollments of IS departments. This is contrary to the normal academic mode. There may be a recent trend toward more measured growth. If indeed this trend is maintained it would be a welcome change and may help lead to a more stable situation.

The dynamics of academic program sustainability includes all of the following: revenue reduction from the state; replacement of revenue base with enterprise funds; enrollment fluctuation that cannot support tenure track faculty; within the business school environment IS discipline slipping into functional areas of business.

The Public sector is stressed financially. An easy target to balance the budget is education and, in particular, higher education. Even though for those in higher education it appears as though society is eating its seed corn, state institutional support will probably continue to dwindle. As budgets continue to drop a heavy emphasis on cost reduction will continue. This may well lead to the elimination of programs, and consolidation of departments.

As IS departments develop external revenue sources to increase sustainability, the development and management of these funding sources may change the very nature of the departments they support. Surviving departments increasingly will be required to run a business in addition to the academic enterprise.

Fluctuating enrollments cannot be sustained when tenure track faculty are used to service the teaching load. Accreditation, too, is pressured to allow greater flexibility in faculty assignments.

5. POSSIBLE PROGRAMMITIC DESTINIES

We have confidence in the following four predictions: the number of IS departments will decrease; there will be an increasing competition

among on-line or blended programs; there will be greatly improved marketing efforts on the part of the sustainable programs; there will be more emphasis on interdisciplinary research by IS program faculty.

It is our opinion that through the on-line and blended arena space, though vast, will only support those with a commitment to change. Such things as completely residential programs, fixed faculty schedules, and inflexible faculty assignments will become a thing of the past for all but a few at the most prestigious institutions. Competition may be fierce and the cost of entry high for new comers.

The day of offering a program and assuming students will come is essentially over. We must determine what our new mission will be and how we are to fund these new activities. Those programs that adapt should be able to deliver an ever increasingly complex curriculum with perhaps, more focused and dedicated students. Also, we cannot shy away from increasing technical requirements including programming/application development, data/database management, networking, security, business intelligence/analytics including statistics, service and cloud architectures, virtualization, mobile applications and device management, and data center skills including server storage management not withstanding project management (Pratt, M.K., 2012). Unfortunately many of these skills are not incorporated in IS 2010 (Topi et al., 2010)

6. RESEARCH PLAN

The Charles Babbage Institute at the University of Minnesota may be used for a wide variety of primary and secondary source material. In addition to having extensive collections of publications and records from the ACM, DPMA (AITP) and IEEE, there are records from such early computer companies as Burroughs, Control data, Digital Equipment and Honeywell, and others. A very large oral history has also been captured and is available.

A first step in this research is to identify the various implementation strategies and resulting academic organizations used by institutions adopting the model curricula across time.

Secondly, as IS departments emerged, what was their origin and what affiliation did the faculty and program have relative to the three professional organizations.

Finally, we will determine what is currently taking place relative to adjustment in organization, and content delivery as information systems become more pervasive at all levels of the business enterprise.

7. CONCLUSIONS

The interaction between the academic area of information systems, the external forces cited, and the progression of time have impact on us all. The authors believe that we are at a critical juncture that will result in an important transformation of our field. This research hopes to provide some structure and projection of our destination.

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