Evolving Trends in Information Systems Education

ABSTRACT: Information Systems (IS) education has evolved over the last fifteen years. The old paradigm for IS education, as described in the paper, failed to provide students with the knowledge and skills that they need to succeed. This paper examines the paradigm shift in IS education and presents it in the form of a word framework. This framework should be useful in course and curricular development.

Eli Boyd Cohen
Lead CIS
College of Business
Eastern New Mexico University
Portales, NM 88130

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There is not a more unhappy being
than a superannuated idol.
Joseph Addison
[The Spectator, no. 1 (March 1,1711)]

INTRODUCTION

Joseph Addison's quote about outdated idols pertains to the idols of Information Systems (IS) education as well as to those of other theologies. Environmental changes force us to abandon our old, inadequate idols in search of new idols or paradigms. Paradigms are the ways science understands phenomena and, as Thomas Kuhn (1) points out, old paradigms die hard. Long after they have ceased to be useful, their adherents continue to promote them. The same is true in IS Education. Our paradigms are failing, and reformers in IS education, from text book authors to curriculum developers, are promoting new ways of teaching IS. The following is a review of the developments these leaders advance.

This article organizes IS educational reforms into five categories using the acronym IDOLS, as seen in Table 1.

Using this acronym as a tool, this paper consolidates the critiques of various leaders in IS education into a set of reforms. This work is dedicated to those pioneers who see the inadequacy of our old paradigms for IS education and courageously break new ground.

THE OLD PARADIGM

This paper asserts that the leaders in our field are breaking with the old paradigm of how to teach IS. What, then, is the old way? Here are some of the characteristics of the old idols for how to teach IS:

1. As new subject matter is determined to be important to IS, we will add it to the curriculum. We do not remove old material as it forever retains its importance.
2. Subjects that are of critical importance to all IS majors are taught in core courses. Each subject is taught in its own course.
3. The introductory IS course should give business majors a flavor for what IS professionals do for a living.
4. We are "the" computer major. Courses involving computers should be offered through our major.
5. Our graduates will be hired as programmers, and because of their superb education, be on the fast track to become analysts.
6. Our graduates will develop large systems on large computers.
7. The best background for teaching IS is to be a specialist in one of the core areas. There is no need to understand another's area in depth.

This list gives a flavor for the old idols that have served us well in the past. Let us now use the "IDOLS" acronym to examine what changes in IS education our leaders recommend.

THE IDOLS FRAMEWORK FOR EXPLORING THE DEVELOPING PARADIGM

The IDOLS framework has five components. It suggests that we carefully consider the issues of Integrations, Distinction of the discipline, Orientation of the discipline, Logical teaching practices, and the Study of current IS practices. Let us now examine each of these in turn.

Integration

The 1991 DPMA Model Curriculum for CIS Education (2) speaks of courses

Table 1: REFORMS IN IS EDUCATION: The IDOLS Acronym

"I" is for Integration
"D" is for Distinction
"O" is for Orientation
"L" is for Logical Teaching Practices
"S" is for Study of Current IS Practices

entitled "Systems Development I" and "Systems Development II" as replacements for courses entitled "Data Base" and "Systems Analysis" found in earlier DPMA curriculum models. This coordination and integration of content from related courses is an example of the integration in IS education; the content of each course is intertwined with that of the others. The courses build on each other.

Heinrichs and Williams (3) emphasize that an integrated curriculum, such as the one that they propose, will provide students "with a greater understanding of the interrelationships" among the systems that comprise IS. For example, instead of taking a separate course in database, students in an integrated curriculum learn and use database concepts when studying analysis, programming, and management courses.

Integration is also evident on the level of the profession itself. The Institute for Certification of Computing Professionals (ICCP) sponsors the Certified Data Processor, Certified Computer Programmer, and Certified Systems Professional certificates. In the past, the ICCP administered different examinations for these different certificates. Currently, passing a common core examination (on general IS topics) is required for each ICCP certificate. Separate specialty examinations differentiate the three areas of certification.

At first blush, integration of courses is nothing new. For years, colleagues have informally collaborated to improve two or more courses by integrating them. For example, my colleague and I had the students work on the same case study for their database and systems analysis courses. What is new is the formal integration of content across courses.

Existing Topics. One of the potential problems with any curriculum is ensuring that important topics have a home course. The term home course is used here to mean the course where the topic is first introduced.

An example of this problem in the IS curriculum is finding a home course for the topic "elements of data structures". Should we expose our students to this topic first as part of COBOL, in database, or perhaps in the introductory IS course? Each of these potential home courses poses its own set of advantages and disadvantages. The issue is not so much which course is chosen as the home course, but that one is chosen.

If a topic, such as data structures, does not have a home, it is taught in any given course at the whim of whichever instructor teaches that course each year. Some years the topic may be repeated in a variety of courses while, in other years, students may completely miss coverage of data structures throughout their course work.

Integrating the courses in the curriculum solves these problems. All topics are assigned a home course. This does not preclude covering the topic in a later course as the need arises. The student in such an integrated curriculum may be exposed to data structures, for example, once, twice, or more. In this case, the re-visiting of a topic is by design, each time at a deeper level. Such an approach to curriculum development is known as the spiral approach (4).

DPMA Model Curriculum. The 1990 DPMA Model Curriculum follows such a spiral model. The contents of the DPMA Model Curriculum's proposed courses are integrated in a spiral curriculum so that students are challenged by the important topics again and again as they progress through school, each exposure at a deeper level of understanding. (A reviewer pointed out that students can become confused should different professors re-visit the same topic using different terminology and notation systems. Ideally, IS professors will agree to some standard approach and use that approach throughout all the curriculum.)

The model curriculum first identifies clusters of skills that our graduates need and progresses from this base to establish proposed courses. Some of these courses only touch on the needed skills (the recognition level using Bloom's (5) taxonomy of educational objectives). Later courses build on this introduction, re-visiting the topic and refining the students' understanding of it.

New topics. This approach also solves the second problem in developing IS curriculum: schools cannot offer new courses to embody each and every important development in our field. Expert systems, group decision-making, and international issues would each deserve a separate course under the old curriculum model. The spiral model allows the curriculum to remain responsive to changing technologies and interests. For example, consider the important issues of ethics and internationalization in the curriculum. Rather than just adding new courses in each of these two areas, the 1990 DPMA Model Curriculum incorporates these issues again and again in various courses. Likewise database concepts are taught and reviewed (at ever-higher levels) in the Introductory Course, Systems Development I and Systems Development II (6)

Distinction

Distinction refers to making the IS curriculum different from the other curricula. Some twenty years ago, faculty accepted as a given that courses dealing with "computerization" and training students to become business programmers and analysts belonged to a "computer" program. In recent years, however, many campuses have discovered a variety of departments offering classes and even majors that directly compete with those offered by the IS department. It is not uncommon to find computer science and mathematics departments respond to their shrinking enrollments by offering IS, even if IS is already taught elsewhere on campus.

In recent years, we find even functional areas offering their own information systems courses. For example, Accounting teaches an Accounting Information Systems course and Marketing teaches a course in Marketing Information Systems.

These politics, for better or worse, are not new. This situation parallels the distribution of statistics classes across disciplines. Some IS professors will fight for the "computer applications" territory, but this author asserts we have already lost the battle. We do not "own" information systems any more than the Statistics Department owns statistics for nurses or Computer Science owns computer art.

Thinking that equates IS with "computer classes" leads nowhere. For many, only a blurry line separates IS from the other disciplines. To become a distinct discipline, we need to demonstrate that which makes IS distinct. We need to clarify our discipline to students, colleagues, and administrators alike. The problem is, do we know what IS is?

Defining IS. One way to define a field involves analyzing the contents of its introductory texts. Such an analysis for IS leads to a quandary. Our introductory text book authors have not settled on a single set of accepted topics. For example, McLeod's Introduction to Information Systems (7) draws heavily from the field of management in his coverage of IS. Ahituv and Neumann's (8) coverage of IS draws from the fields of psychology and mathematics. While such diversity is not inherently bad, it does blur the distinction between IS and its constituent fields. This diversity reflects how IS is viewed by our own professors; different schools have different emphases (Denning, 1989).

My own view is that IS is in the borrowing stage of its development, borrowing principles and research from more established fields. The next developmental stage awaits the genius who will develop the models IS needs for self-definition. In the meantime, we need to emphasize our focus on information, not on computers. Our discipline is the one that provides management with information, for use in decision making and for use as a product. To accomplish our goal, we need to understand what decisions managers make, how they make them, and how to value information. We also need to be conversant in the use of technology so far as technology promotes our goal.

Orientation

Distinction, described above, refers to how we are different from other fields. Orientation refers to where we believe our graduates are headed. The differing and changing needs within the field of IS suggests that we need to address various orientations within IS.

Career-Path Orientation. One approach to IS education is to provide options within our programs for those who wish to pursue various careers paths. For example, the Association for Computing Machinery (ACM) Information Systems Model Curriculum provides for different strands or foci within the curriculum, mostly along the lines of the potential occupations, such as programmer and analyst (10). These strands are offered because these are the current job opportunities.

We need to discover, recognize, and train for the jobs of the future. As IS educators, we are challenged to predict what future occupational skills will be needed by our graduates and to refine our curriculum accordingly. As we do so, we are aiming at a moving target.

Business's reliance on modern technology, including personal computers, alters the job opportunities our graduates are likely to encounter (11). We now find our graduates taking on jobs not only in programming, analysis, and consulting, but also working as end-user computing liaisons and expert system engineers. As the work place evolves, so must our instructional programs.

Need for Business Alliance. A corollary of the above can be stated as follows: as the IS curriculum strives to keep pace with the changing needs of the work place, we increasingly must keep in touch with the work place. To accomplish this, we must know what tools, skills, and knowledge our graduates actually use. One way to obtain this feedback is through strong alumni ties. Another is through advisor boards. Both tools provide us with the feedback we need to refresh and refine our curriculum. The 1990 DPMA Model Curriculum is based, in part, on the needs of our industry on a national or global scale, We need to refine further that model to meet the needs of communities we serve. (Readers who believe that most schools already do this should remember that only a few years ago the ISECON theme was "Bridging the Gap Between Town and Gown".

Logical Teaching Practices

David Kroenke (12), author of a popular text for the Introduction to IS course, calls that introductory course a "Widowmaker". Following Drucker's terminology, Kroenke defines a widowmaker as any course that defeats two instructors in a row who in earlier assignments had done well. Kroenke proposes solutions to this problem in his seminars. The solution he proposes is manifest, not surprisingly, in the most recent edition of his text. A good part of the solution Kroenke proposes is to motivate students by showing them the relevance of this material to the students' careers.

Indeed, in an unpublished manuscript, educator Hans Anderson (13) speaks of five principles that guide successful teaching: 1) provide rationale for learning, 2) provide reinforcement, 3) give clear objectives, 4) provide practice, and 5) present instruction in sequenced incremental steps. Let us look at the first two of his principles.

Relevance. Philips (14) echoes the need to show student how the material we teach is relevant to them. Some topics, such as microcomputer applications, possess face validity as relevant to the students' careers, while others, such as data communications can seem foreign and without career value. Our task then is to demonstrate to students why learning the material is worth their while. Kroenke's solution is to provide the student with scenarios in which characters with whom the student can identify save the day and their career through mastery of the topic.

Reward. A related psychological principle that bears on logical teaching practices is reward. Students find some learning activities, including hands-on computer experience, to be fun and rewarding. The reward of writing a program that works is intrinsic to the defeat of the argumentative computer.

However, some educators advance the proposition that most hands-on computer activity, such as learning a spreadsheet program, belongs to remedial, non-credit courses, not as part of the IS curriculum. The criticism is that there is no enduring educational content to training in a given software package; training is not education.

This author proposes that we can overcome such criticism and use the principle of reward at the same time. We should design our courses so that the sought-after hands-on activities act as a vehicle in the teaching of IS concepts. The purpose of IS is to solve business problems. Let us organize the material so that students become aware of a problem, analyze it, and then learn to solve that problem using some available tool. After the student can solve this problem, we spiral the curriculum to reveal another facet of the problem or another problem, again to be solved.

In summary, our challenge is to design a logical pedagogy that has the following characteristics:

1. **shows students how the topics are be relevant to their careers; and**
2. **uses hands-on activities as a vehicle to teach enduring IS concepts by having students develop solutions to business problems.**

Study of IS Current Practices

We are confronted with the curriculum problem that, even now, we cannot cover all the important and relevant material. One solution described above is integration of topics. Another is learning to abandon topics whose importance for tomorrow is waning. The orientation reform described above will provide us with feedback from employers, but that alone is not enough.

We must follow our own teachings and discover the critical success factors relevant to our courses and curriculum (Bullen & Rockart, 1981). Our students need to know some facts, skills, and concepts very well, others only in passing. Longenecker and Feinstein (1991a), in spearheading the fine work that led to the 1991 DPMA Model Curriculum, confronted that problem. Their work provides an excellent source as to what topics are perceived as important by members of professional societies. From this work to critical success factors is a small but important step.

SUMMARY

The old idols of IS education are superannuated, obsolete. This paper has tracked the changes that leaders in the field have been making to our pedagogy and curriculum. The acronym "IDOLS" summarizes these improvements in Integration, Distinction, Orientation, Logical Teaching Practices, and Study of Current IS Practices. The leaders call for recreating the curriculum from the ground up so as to position it to meet the needs of today and the future. To paraphrase the biblical character Abram, "It is time to break some old idols around here."[1]

[1] *The Biblical character Abram, who developed a new field of theology, broke the idols in his father's shop. To mark his break with the past, he changed his name to Abraham. Perhaps IS needs to change its name (for example, to Information Resource Management) to demonstrate its breaking of old idols.*

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AUTHOR'S BIOGRAPHY

Eli Boyd Cohen, a member of the Golden Spread chapter of DPMA, leads Eastern New Mexico University's CIS program. He has served DPMA locally as chapter director, secretary, and president; nationally as EDSIG director, secretary, and treasurer. He holds DPMA's Gold Individual Performace Award and the CDP, CSP, CCP, CQA and CDE credentials. He has published over 200 articles in journals, proceedings, and the press. He will serve DPMA-EF as the ISECON '94 program chair.

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