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In this issue:

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Abstract: Systems Analysis and Design (SA&D) is one of the fundamental areas within most Information Systems (IS) curricula. The complexity of teaching this course continues to grow as most of the traditional learning outcomes are required along with an increasing set of skill-related outcomes associated with integrated Computer Aided Systems Engineering (CASE) tools and Object-Oriented Analysis. This paper addresses a survey and analysis of what is currently being taught in the Systems Analysis and Design (SA&D) course as identified by the educators who teach the material. It discusses the perceptions IS educators have about various SA&D topics and concepts, and explores the common problems and obstacles that are associated with teaching the SA&D course. Some IS topics identified as very important are allotted small quantities of instructional time, and some important topics are given no time at all. This dichotomy is a surprise. A new chronology of topic areas is developed based on the survey.

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The State of Systems Analysis and Design

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Abstract

Systems Analysis and Design (SA&D) is one of the fundamental areas within most Information Systems (IS) curricula. The complexity of teaching this course continues to grow as most of the traditional learning outcomes are required along with an increasing set of skill-related outcomes associated with integrated *Computer Aided Systems Engineering* (CASE) tools and Object-Oriented Analysis. This paper addresses a survey and analysis of what is currently being taught in the Systems Analysis and Design (SA&D) course as identified by the educators who teach the material. It discusses the perceptions IS educators have about various SA&D topics and concepts, and explores the common problems and obstacles that are associated with teaching the SA&D course. Some IS topics identified as very important are allotted small quantities of instructional time, and some important topics are given no time at all. This dichotomy is a surprise. A new chronology of topic areas is developed based on the survey.

Keywords: systems analysis and design, analysis topics, design topics

1. INTRODUCTION

The purpose of this paper is three-fold. **First**, the authors will study and analyze the current state-of-the-art in *Systems Analysis and Design (SA&D)* course as taught by information systems instructors. Specifically, we will ascertain what methods and techniques are being taught or employed in the classroom and laboratory (Appendix A, Section I). **Second**, the authors will evaluate an open-ended portion of the survey that seeks to determine perceptions IS educators have about various systems analysis and design (SA&D) topics and concepts (Appendix A, Section II). **Third**, the authors will conclude by examining some of the most common problems and obstacles (Tastle and Dumdum, 1998) associated with teaching the traditional *Systems Analysis and Design*

course and offer suggestions for making the course a more robust and positive learning experience for the student. A suggested course chronology is offered. With exponential growth in the areas of e-business and the expansion of integrated c*omputer aided systems engineering* (CASE) tools for business modeling, the once simple process of teaching analysis and design has become increasingly more complex. Most of the traditional learning outcomes of the course are still required, along with a rapidly increasing set of skill-related outcomes associated with database management, data warehousing, electronic commerce and the use of the integrated CASE tool.

Today, a variety of integrated CASE tools are available for business modeling and model-based development. CASE tools such as Oracle Designer, Rational Rose, People Soft, Visible Analyst and Visio are changing the way the planning, analysis, design and implementation phases of the software development project are being conducted. It is no wonder that businesses continue to stress the need for skills in business modeling. Therefore, it is important that IS students understand the various modeling methodologies, as well as the use of CASE tools that support the various methodologies (Tastle and Dumdum, 1998). The authors believe that educators will prepare a more skilled and marketable student if they integrate automated business-modeling tools into the SA&D lab experiences for their students. The traditional "pencil and paper" design is not only out-of-date, it fails to provide a viable way to teach rapid application development, prototyping or phased development. This is analogous to giving a lecture on the topic of "How to Use MS PowerPoint" by writing on a chalkboard.

This is not to stay that the use of hand-drawn modeling or paper design does not have its place as a learning tool in an SA&D course. This type of exercise provides a means by which students can quickly learn the basic concepts of modeling, prior to learning the integrated CASE tool. The overhead of instructing students to master the operation of any software CASE tool while at the same time attempting to understand the fundamentals of modeling, leaves students with a partial and unusable knowledge of modeling techniques and a disregard for the power of modeling. Students should become comfortable thinking of business systems in systems in terms of modeling principles at the earliest possible time. So pervasive is the need for students to understand business process modeling (Dumdum, Sivasubramaniam, Garger, Kahai and Tastle, 1999) that we feel that introductory IS courses should include a strong business-modeling component. However, most IS curricula specify the SA&D course as the first incursion into modeling. The primary purpose of this paper is to determine the extent to which various topics are being taught and to investigate common problems and obstacles faced by instructors teaching SA&D courses. In Appendix A, Section I, the authors describe the first part of a survey (questions 1-23) administered to SA&D instructors to determine the current state, i.e. which modeling and development topics, techniques, and tools are currently taught. Instructors were also asked to rank the importance of student skills for both traditional structured analysis and object-oriented analysis. The second part of the survey (Appendix A, Section II) deals with instructor perceptions (questions 24-42) of the importance of various SA&D topics and will discussed and analyzed later.

Section I of Appendix A references the questions related to the topics being taught whereas Section II of Appendix A relates to the perceptions instructors have about various topics taught.

2. SURVEY OF SA&D EDUCATORS

For this study, the survey questionnaire (Appendix A, Section I), was developed around the topics shown in Table 1 below. The topics, methodologies, techniques, and tools listed in the survey are those found most frequently in research (Schambach 2002-2003) and in popular SA&D textbooks (e.g., Satzinger, et. al., 2002; Whitten 2001).

	Topic
1	Overview of Systems Analysis Process
2	Project Initiation and data collection
3	Project management concepts
4	Overview of various system methodologies
5	Data modeling in general
6	Entity relationship diagrams
7	Normalization concepts
8	Process modeling in general

9	Data flow diagramming
10	Decomposition diagramming
11	Use Case
12	Object-oriented analysis in general
13	Class diagramming
14	Sequence diagramming
15	State transition diagramming
16	Cost-benefit and payback analysis
17	Systems design concepts in general
18	Interface design
19	File and database design
20	Program design

Table 1 Topics, Methodologies & Tools in Survey

Instructors were asked to indicate what percentage of the SA&D course were spent on each of the 20 topics, methodologies, and tools listed in Table 1 above. The choices were:

(a) None
(b) Less than 5%
(c) Between 5% and 10%
(d) Between 11% and 15%
(e) Between 16% and 20%
(f) Between 21% and 25%
(g) Between 26% and 50%
(h) Greater than 50%

In addition, instructors were asked to rate the relative importance of certain skills associated with SA&D using a 5 point Likert scale: (1) Definitely important to (5) definitely unimportant. Appendix A, Section II, contains the survey instrument for this part.

3. SURVEY RESULTS

The survey instrument was sent out to over 200 educators across the nation. There were 30 respondents from the Association of Information Technology Professionals (AITP) Educator Special Interest Group (EDSIG) who teach systems analysis and design courses at universities and colleges around the country. Although this number is smaller than ideal, the respondents do represent a specialized cross-section of educators currently teaching this course, so the survey results should be given serious consideration.

Topics Taught

Table 2 illustrates an abbreviated summary of the first part of the survey dealing with topics taught by IS educators and depicts what percentage of the course is devoted to the typical array of concepts, techniques, methods and tools used in the SA&D course. The following provides an abbreviated subset of the first 23 questions and the subsequent findings.

The raw population frequency by category shown in Table 2 is converted to a percentage format based on the total population of 30 respondents, and is illustrated also in table format in Table 3 that follows. Each column describes the percentage of the semester devoted to a particular concept (row). Table 3 becomes the main focus of the first part of the study.

Data Modeling Component

Concept	0	<5	5-10	11-15	16-20	21-25	26-50	>50
ERDs	1	11	12	5	1			
DFDs	1	4	16	4	1			
Decomp Diagram	2	13	11	2	0	1	1	
UML	13	9	6					2
Class Diagrams	11	12	4	2				
OOA In General	5	6	5	4	4	1	2	3
File/Database Design	4	12	13	1				
Interface Design	3	12	10	4	1			
Process Modeling In General	0	7	15	3	2			
Data Modeling in General	1	6	12	7	2	2		

Table 2 Summary of Survey Results - Survey of IS Educators. Number of Respondents Indicating % of Semester Spent on Various SA&D Concepts

Concept	0	<5	5-10	11-15	16-20	21-25	26-50	> 50
ERDs and Data Models	3%	37%	40%	17%	3%			
DFDs	3%	13%	53%	13%	3%			
De-comp	7%	43%	37%	7%		3%	3%	
UML	43%	30%	20%					7%
Class Diagram	37%	40%	13%	7%				
OOA in General	17%	20%	17%	13%	13%	3%	7%	10%
File/ Database Design	13%	40%	43%	3%				
Interface Design	10%	40%	33%	13%	3%			
Process Modeling in General		23%	50%	10%	7%			
Data Modeling in General	3%	20%	40%	23%	7%	7%		

Table 3 Summary of Survey Results - Survey of IS Educators. The Percentage of Respondents by Percentage Range Category

Pertaining to data modeling concepts, row 1 of Table 3 indicates that eighty percent (the sum of the first three columns) of the respondents devote less than 11% of class time to data modeling and entity relationship diagramming while 17% of the respondents spend between 11% and 15% of class time on the subject. Only one respondent (3%) spent more than 15% on data modeling. The question must be posed: Is this sufficient time to devote to a very important skill set? According to top information systems executives from JC Penney (Conley, 2003), business modeling is one of the top three listed most frequently emphasized skill sets. There is justification in arguing that more time should be devoted to the topic.

Business modeling will typically involve data modeling (entity-relationship diagrams - ERDs) and process modeling (data flow diagramming -DFDs, decomposition diagramming, etc.) in the structured analysis paradigm; whereas, in the object-oriented analysis (OOA) paradigm the object model consists of class diagrams and "Use Case" diagrams. The "Use Case" diagrams depict actors (representing anything that needs to interact with the system) interfacing with "use cases" (a sequence of steps to complete a task).

Process Modeling Usage

IS educators spend approximately the same percentage of the class time on data flow diagramming as they do on data modeling. Referring to Table 2, twenty-one (21) of the 26 respondents (69%) spend less than 11% of the class time on DFDs. Four respondents (13%) spend between 11-15% of class time with only one spending more than 15% on the subject of process modeling. Twenty-six (26) of the 30 respondents (87%) devote 10% or less of the class time to the decomposition diagram. Typically the decomposition diagram and the DFD are taught back-to-back since the process hierarchy (decomposition) can subsequently be expressed as a series of "exploded" or decomposed processes. Table 3 suggests that a higher percentage of respondents use decomposition diagrams to a greater extent than the DFDs but for a shorter period of time. This makes sense since there is a sharper learning curve with DFDs than with the decomposition diagrams.

UML Usage

Information Systems professors have, of course, become increasingly aware of the importance of object-oriented methods and systems development tools. While object-oriented methods and tools are becoming more manifest and their importance seems to be steadily increasing it still appears that the large majority of the respondents still emphasize structured methods. Referring to Table 3, 43% of the respondents indicate they were not yet teaching the Unified Modeling Language (UML). Thirty percent (30%) are spending less than five percent (5%) while twenty percent (20%) are spending between six (6) and ten percent (10%) on the subject. So it is concluded that 100%

of the respondents spend less than 10% on OOA.

Class Diagramming Usage

Class Diagrams represent classes of objects that contain the definition of all properties, methods and events associated with the class of objects. The diagram illustrates how the various classes are related. It is an essential tool within the OOA methodology and the use of UML. The survey findings, as one would speculate, reveals similar use of the class diagram as compared to the use of UML. It is fairly clear from Table 3 that the majority of SA&D instructors have not made the transition to class diagramming with 23 of the 30 (77%) indicating they use the diagram less than five percent or not at all for the class duration.

OOA Usage in General

The use of OOA in general reveals a more balanced distribution across the usage bands with approximately 54% of the instructors reporting that they devote less than 11% of their time to the subject, but this also means that 46% are devoting even more time with as much as 10% of the faculty devoting over 50% of the class time to OOA concepts. This indicates that instructors are teaching general OOA concepts while they may be not ready to devote much time to specific OOA diagramming methods. The authors are compelled to ask, "If fewer faculty are teaching UML and Class Diagramming than are teaching OOA in general, then just what are they teaching in the class? This is an important question for a future survey.

File Design

Over half the respondents spend less than five percent on the subject of file and database design. Forty-three percent spend between 5-10% of the class time on the subject. This corresponds closely with the proportions devoted to data modeling and ERDs.

Interface Design

Forty percent of the respondents spend less than five percent on interface design while 10% spend no time at all. Thirty-three percent spend as much as ten percent of their time on the subject.

The bar chart below (Figure 1) graphically illustrates Table 3 data, limited to only four response ranges: 0, <5%, 5-10% and 11 to 15%. Since the remaining ranges (16-25%, 25-49%, and > 50%) are so small in relation to these, the respective bar segments would be hardly discernable. The four ranges listed are the most prominent categories as a percentage of the semester spent on a concept. The horizontal axis represents the percentage of class time and the vertical axis represents concepts taught.

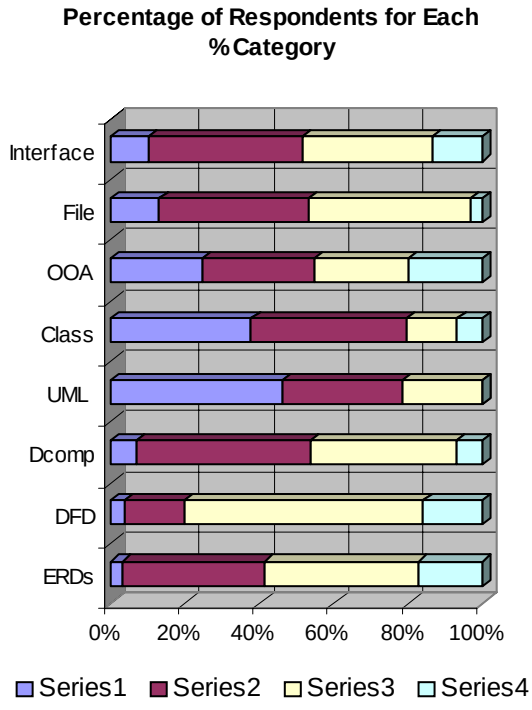

Figure 1: The bar grouping represents the percentage of class time spent on each individual topic. Series 1 through 4 describes the ranges and are illustrated in the legend in the bar graph.

Series (Range) 1 = Spends no time at all on concept.
Series (Range) 2 = Spends < 5 %
Series (Range) 3 = Spends 5-10%
Series (Range) 4 = Spends 10-15%

A cursory investigation of Figure 1 shows that there is a preponderance of instructors teaching ERDs, DFDs, decomposition diagrams, file and interface design all within the 5-10% range. It is observed that a larger

percentage of respondents are not teaching class diagrams, OOA in General or UML.

4. INSTRUCTOR PERCEPTIONS OF THE IMPORTANCE OF VARIOUS SA&D TOPICS

Using the same survey instrument (questions 24-42) the authors also surveyed the same educators within the AITP EDSIG group to determine their perceptions of the relative importance of various subjects, concepts, and techniques taught in the traditional systems analysis course.

Appendix A, Section II, contains these survey questions. Table 4 illustrates a subset of the concepts and skills to be taught. Some of the concepts within this table are the same as in Table 1, but Table 4 includes some additional detailed competencies not disclosed in Table 1. To clarify, this is not comprehensive set of questions from the complete survey, but rather, a condensation specific to this particular study. The authors are interested in knowing in greater detail how much time instructors actually taught on various topics. For example, knowing that instructors devoted time to data modeling in general does not enlighten us with how much time is devoted to normalization specifically.

Table 4 describes the percentage of faculty who responded to the various statements indicating whether they believed the concept was (1) very important to (5) very unimportant. Since no responses were tallied in the "very unimportant" category, that column is eliminated from the table. Thus, the reader will see only columns related to categories (1) through (4) somewhat unimportant.

Statement	1	2	3	4
Drawing DFDs	73%	19%	4%	4%
Data modeling concepts	69%	19%	8%	0%
Drawing ERDs	46%	38%	12%	4%
Balancing DFDs	50%	35%	8%	8%
Complete project requiring both data and process models.	46%	38%	0%	0%
Drawing decomposition diagrams	27%	54%	12%	8%
Require that students complete a project as a team.	56%	20%	4%	4%
Require students to normalize a data model.	38%	38%	8%	4%
Require students to demonstrate project management skills	40%	36%	4%	8%
Require students to collect data using interview techniques, surveys etc.	27%	50%	12%	4%
Require the use of CASE tools to implement the business model.	12%	48%	8%	8%
Teach students to draw activity dependency diagrams.	12%	35%	35%	15%
Require students to actually perform in-class interviews in front of the class.	19%	42%	12%	15%
Teach class diagramming.	57%	0%	21%	7%
Teach CASE or Model-Based software tools in the classroom.	14%	36%	7%	36%
Require students to perform cost-benefit analysis within the scope of a project or major assignment.	36%	43%	0%	14%
Require students to complete OO model using project mgmt.	29%	36%	14%	14%
Teach state-transition diagrams.	21%	43%	14%	14%
Teach sequence diagramming.	29%	21%	21%	21%

Table 4 Respondents' Perceptions of the SA&D Concept (Shown as a Percentage of Respondents).

5. Interpretation of Survey Results (Appendix A, Section II)

The following bullets describe several interesting observations in comparing Table 4 (importance) to Table 3(time committed).

1.) From Table 4, 73% of the faculty surveyed thought that teaching DFDs were definitely important, but on-the-other-hand, only 16% (Table 3) of the faculty actually taught the concept more than 10% of the semester.

2) Sixty-nine percent (69%) felt that data modeling concepts were definitely important, but conversely only 20% of the faculty actually spent more than 10% of the class on the subject (Table3).

3) Eighty-four percent (84%) of the respondents thought that drawing ERDs was definitely important, but only 20% spent more than 10% of class time on the subject.

4) Fifty-seven percent (57%) of the faculty surveyed thought that teaching class diagramming was definitely important, but conversely, only 7% taught the concept more than 10% of the time. Actually, 90% of the respondents taught class diagramming less than 5% of the class time.

5) Fifty-eight percent (58%) said it was either important or very important that we should require the use of CASE to implement the business solution, but only 27% said it was important or very important that actually teaching CASE in the classroom is important. This is especially curious, and seems contradictory to the authors.

The five observations shown above raise some questions. The authors plan a second and more comprehensive survey that may determine why an instructor's perception of the importance of the concept was not consistent with the amount of time he or she spent on the subject, why instructors do not view the teaching of CASE tools as important as their belief that it should be highly integrated into project solutions. The authors suspect that instructors would really like to teach more CASE in the classroom, but cannot find class time since they are already occupied with dense set of topics. The authors are sympathetic to this notion, and do have some suggestions.

Some Surprising Survey Results

The authors are disappointed with some of the survey results that indicate faculty are not spending more time on business modeling, in general, especially considering its perceived importance by industry. We speculate that due to the wide gamut of topics typically associated with the traditional SA&D course, there is a tendency to provide a shallow coverage of both data and process modeling or to cover only one or the other with modest rigor. The authors have observed that there is a tendency for the SA&D instructor to assume that the database instructor will surely teach all of ERD information. The fallacy often found here is that the database instructor can also only provide superficial coverage to the ERD area since this topic only occupies a portion of one chapter within an array of database concepts. Since the database course is usually a sequel to the SA&D course it would be logical to provide maximum attention to data modeling in the analysis course. Stating it another way, the authors believe that there is a strong argument that the business-modeling component should be taught adequately enough in the SA&D course so that these skills can be used by the students throughout their upper-level IS courses. In addition, *"Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems"*, also known *as IS'97* and now as *IS 2002* recommends the SA&D course as a prerequisite to the database systems course.

Questions and Opportunities Facing the SA&D Educator

The SA&D educator will certainly be challenged in this decade because of the new methodologies, new business modeling tools, and new development platforms encompassing object-oriented and event-driven applications.

Here are some challenging questions facing the SA&D educator today:

1. How does the SA&D instructor gear up to teach both OOA methods as well as the traditional structured methods?

2. How does the SA&D instructor continue to pile on additional material to the formidable list of concepts already covered in the typical course?

3. What new business modeling tools need to be considered in the classroom, and how does the instructor gain the needed training to be successful in the classroom?

4. What corporate alliances should their university consider, and how the corporate alliance agreement.

5. How does the IS department build and fund the needed laboratories that support integrated CASE tools, business modeling tools that support both structured and object-oriented methods?

6. How will the SA&D educator create linkages with other courses that support what is now being taught in the new systems analysis and design course? The integration of new methods will need to influence how the gamut of other IS courses are taught, whether it be the database course, data warehousing, programming languages, client-server etc.

Certainly, these six questions will not be answered quickly with information systems schools and colleges of business working with tight budgets. Additionally, the authors do not purport to know the answers.

As SA&D instructors gear up for OOA methods, they will be also be compelled to provide coverage of older (but still viable) methods such as structured analysis and design. The SA&D educator will continue to be perplexed with how to teach the topics listed in Table 1 and provide enough depth in business modeling to insure that industry is pleased with their hands-on skill sets and new development methods and platforms.

Top IS executives are fully aware that IS educators are challenged by a formidable task of keeping abreast of new web-development, web-enablement platforms involving "Smart Client" development such as MS.Net Framework (Hollis, 2002). This will require educators to become more multidimensional in their understanding of both structured methods and OOA methods. As we see companies incorporating the MS.Net Framework into their future development goals for the future it is incumbent upon the instructor to learn and teach object-oriented analysis methods. Many educator agree that students should continue to learn structured methods as well as OO methods, since the new analyst or developer will be required to work with both for a considerable period of time into the future (Hollis, 2002).

Many educators are aware that CLS-complaint languages, such as *Visual Basic.Net* require a student to grasp the basics of the object-oriented paradigm (Bradley, 2003). For those that are heavily involved with teaching *VB.Net* or even dabbled in the differences with VB 6.0 it is quite obvious that we are dealing with a world of objects, classes, attributes, methods, encapsulation, instantiation and all the other key words of object-oriented analysis and development. It is incumbent upon the IS educator community to address the fact that corporate America is identifying new development strategies that require the SA&D course to evolve. Webster defines the word, "evolve" as "develop by degrees" or "to come forth gradually into being." This does not mean that we should throw away old methods and tools and jump on the bandwagon toward only, let's say, object-oriented analysis especially when approximately 80% of all new analysis and modeling continues in structured methods. Certainly, this is no time to abandon the ERD, Decomposition Diagrams, Data Flow Diagrams, Structure Charts, etc. (Gilmore, 2003). Industry will be disappointed if they were to learn there was no source of new hires in IS or IT with structured skill sets.

A Continued Need for Structured Analysis and a Growing Need for Object-Oriented Analysis

Even in the midst of a growing object-oriented market there is still a strong continued need for both data and process modeling as well as a growing need for OOA. Traditional structured analysis is still important today as empirical evidence suggests that industry has not heavily invested yet in the object-oriented paradigm (Schambach, 2001). Certainly with the Microsoft.Net Framework and the movement toward "Smart-Client" platforms there will likely be an upsurge in OOA usage. This upsurge will in no way discount the importance of traditional structured modeling techniques and tools (Conley, 2003).

Today, our SA&D and database systems courses often get low marks by corporate IS management because they perceive the new IS grad to be weak in their understanding of data and process modeling, less than ideal communication skills and business knowledge in general. These observations were

summarized from meetings with IS executives with both JC Penney Corporate Headquarters and with the systems development director with State Farm Insurance (Conley, 2003).

The credibility of CIS/MIS curricula will be improved if strides are made in the way we teach modeling in general and the SA&D course in particular. As advocates for a stronger business-modeling component the authors believe that the most significant outcome will be an overwhelming increase in software productivity and quality with project teams, both real and virtual, being able to work with heightened precision. This heightened precision will enable more complex systems to be built faster and with more reliability. Students must acquire these skills using the various integrated CASE tools in their SA&D or database systems course (Dennis and Wixom, 2000).

6. RECOMMENDATIONS FOR EVOLUTION IN SA&D

1. Center the SA&D course around business modeling principles even if it means giving up a few of your almost favorite topics.

2. Teach a balance of both structured and OOA concepts.

3. Teach students to model business activity using pencil and paper first.

4. Teach and demonstrate a viable CASE tool in the classroom. Find class time to integrate this into the course.

5. Require CASE lab assignments. Require students to demonstrate skill sets in using the CASE product.

6. Require a semester or final project where students must produce a business model using the CASE product. Require students to provide a database design and a corresponding interface design.

7. If you have the good fortune of having two systems related classes (supported by the *IS 97* Curriculum) then consider teaching a stronger set of structured analysis skills in the first course followed by an emphasis on OOA in the second course. The authors have been successful with this chronology have found that students who understand ERDs and DFDs in the structured class find Class diagrams and Use Case scenarios easier in the second design and development course.

7. A NEW SA&D CHRONOLOGY CENTERED ON BUSINESS MODELING METHODS

Future thinking about the content of a systems analysis and design course that teaches modeling concepts by hand to internalize those concepts, then introduces the CASE or model-based tool, will produce a set of learning outcomes that are more marketable to industry. Many requests from various companies (e.g., JC Penney, and State Farm Insurance) point to the fact that new hires need more skills in business modeling. Corporate recruiters often indicate great satisfaction with new hires in the area of programming skills, but are quick to criticize the typical or average new hire prospect as being weak in the area of business modeling. It is common to have graduates returning to campus comment that one of the strongest skills they have available to them is that of being able to model a business system.

A new and improved systems analysis course needs to be anchored in business modeling. It will need to include definitions and terminology surrounding the various life cycles, planning, analysis, design and implementation, business process automation, business process improvement, business process re-engineering and data gathering. This coverage ideally should be condensed into approximately one-half of a semester to allow ample time to cover both data and process modeling thoroughly in the remaining one-half of the semester. It will theoretically permit one-half the course to be devoted to business modeling.

A course chronology that is anchored in business modeling would also involve a final project requiring a “mini” proposal/feasibility analysis; a complete business modeling exercise encompassing both structured and object versions along with an interface design should be included. Certainly, an instructor could require a more formal database design as well. The key is to increase the amount of time for business modeling laboratory experiences and project assignments.

8. CONCLUSION

Students with a strong business modeling focus coupled with skills in both structured and object modeling techniques and using automated modeling tools will be highly marketable products in the future. This will not likely happen unless SA&D educators create additional focus toward this very important topic. Industry seeks new hires that can learn to work with precision, as a team participant, toward a business solution in a repository-based environment using automated tools. Students who are able to perform well in such a systems analysis and design course will likely perform well on the job. Although, SA&D instructors realize the importance of these concepts and skill sets, this survey indicates that only a small percentage of class time is actually devoted to those concepts and skills.

It is evident that in spite of the formal IS curricula developed over the recent years, the curriculum prescription substantially varies from that actually delivered. Even when IS educators acknowledge the importance of particular topical areas, insufficient time is allocated to support student mastery over the material.

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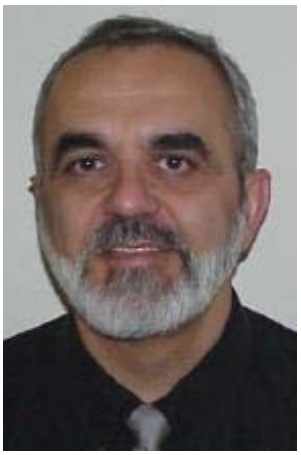

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