Adding Value to the IS'97… Curriculum Models: An Interactive Visualization and Analysis Prototype

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ABSTRACT

Several efforts have been undertaken in the information systems (IS) arena to develop a model IS curriculum. Most notable of these is the IS'97 model that contains not only a list of suggested IS courses but also other sub-course and super-course constructs such as presentation areas, learning units, knowledge elements, and knowledge levels. The richness of this model is intended to enhance its usefulness in understanding the details of a curriculum. However, this richness adds a level of complexity that makes it difficult for all but the dedicated scholar to understand the intricacies of the model beyond the course construct level when reading the IS'97 document. This paper describes the development of an interactive prototype based on IS'97 that captures the details of the model within a relational database in an attempt to make it more useful and readily applicable to a variety of curriculum-related activities. Various forms, queries, and reports were developed to make understanding the model easier and to provide interactive capabilities to help faculty, students, and others experiment with the model. Efforts at utilizing the prototype for curriculum visualization and analysis are presented which help to add value to the existing IS'97 document. Finally, the paper concludes with a proposal to extend the IS'97 model constructs into a curriculum management system for an academic institution.

Keywords: Model Curriculum; IS'97; Interactive; Curriculum Management System

1. INTRODUCTION

Much time and effort have been expended by many groups in developing model curricula for academia. This is especially true in the information systems (IS) area. Of particular interest to this work is the IS'97 Model Curriculum (Davis et al.) and its successors, hereafter referred to as IS'97. The main ideas of the paper, however, are not limited solely to the IS area, but have applicability across all curriculum areas.

The IS'97 Model Curriculum had its impetus many years earlier in the formative stages of the IS discipline and has iterated through several updates, the most recent of which is described by Longenecker et al. (2001). As we describe below, these models have served a valuable purpose. Recently, however, several authors have brought into question the continuing interest in (Landry et al., 2001) and indeed the future value and usefulness of IS'97 (Atchison & Gonsalvez, 2001).

We view the claims of the demise of IS'97 as

premature and describe an interactive prototype based on IS'97 that not only gives new life to the model and its successors, but which can also serve as a foundation for a curriculum management system within an academic organization.

Before presenting the details of the prototype, we discuss potential audiences of IS'97 and review the richness of the model. We then describe the need for an interactive system as a key to unlock this richness for the various audiences. Following this, we present the details of the interactive prototype that is implemented in MS Access 2000 and summarize the feedback that we have received from users of the prototype. Finally, we discuss the implications of the prototype as a value–added addition to the IS'97 efforts and briefly outline our ongoing research efforts to extend the concepts of IS'97 into a curriculum management system.

2. AUDIENCES

It seems clear that the original audience for the IS Model Curriculum was the academic community at large. The original intent of the effort was, in a sense, to prove that IS had its own unique body of knowledge and was a discipline distinct from computer science. As this case has been made and the model curriculum has evolved, the focus has changed to audiences with-in the IS area itself.

The first obvious audience is, therefore, the IS faculty member who is responsible for delivering the course content in a particular class. In preparation for teaching, the faculty member may well ask a series of questions which may include the following:

- What do I include in my course syllabus?
- What textbook should I select for this course?
- Do I need to supplement the text book?
- Have students received the prerequisite knowledge required for this course?
- What other departments utilize this course?

Along this same vein, curriculum committees (IS department, school, university) would also be audiences for IS'97 (Landry et al., 2001). The types of questions that such groups may seek answers to include:

- Does the curriculum meet stakeholder needs?
- Does content level build appropriately across the curriculum?
- Is there improper duplication of content?
- Does class content match the curriculum?
- What other departments utilize a given course?
- What non-discipline courses are required?
- Do discipline and non-discipline courses support each other?
- Is there unnecessary duplication of course content?
- What are the ramifications if we delete a course?

Potential students for a course undoubtedly have their own set of questions that would make them potential audiences for IS'97 as well. Such questions about a course might be found among the following:

- What will be covered?
- At what level of detail is the content covered?
- How will this class help me?
- Do I have the prerequisites?
- Does this class overlap other classes?

Finally, there is another set of audiences such as administrators, accrediting bodies, and employers that would, undoubtedly, have their own set of reasons for using IS'97.

3. RICHNESS OF THE IS'97 MODEL

One of the biggest problems in understanding an academic curriculum is the fact that the curriculum details are only visible at the class syllabus level. Course descriptions in catalogs and on web sites are typically limited to about 30 words. This leanness of description can lead to confusion on the part of those interested in what a particular course covers. This is illustrated in Table 1.

Descriptions for an introductory database course were obtained from the web sites of five universities in the California state system. From the keywords extracted, it would appear that there is very little overlap in any of the courses. This example is intended to be anecdotal only. The reader is encouraged to explore other university web sites for additional comparisons.

In contrast to this, the IS'97 Model Curriculum contains not only course descriptions but also more detailed constructs such as presentation areas, learning units, knowledge elements, and knowledge levels that provide a richness of structure and content for describing the details of a particular course. This richness, however, adds a level of complexity that makes it difficult for all but the dedicated scholar to understand and utilize the model fully by reading the IS'97 documents. Figure 1 is an entity-relationship-attribute data model of the IS'97 constructs that clearly shows this richness and complexity.

It has been our experience that most time-constrained faculty members choose not to utilize the richness of IS'97 for their work on curriculum committees or for

Topic	CSUF	CSUN	SJSU	CSUFU	CSUB
Data Structures	X				
File Design	X				X
Database Concepts	X			X	
Relational Model	X				X
Data Administration	X				
Application/Implementation	X	X	X	X	X
Database Design	X	X			X
DBMS Selection		X			
Data Base Administration		X			
Data Independence		X			
Integrity		X	X		
Privacy		X			
Query		X			
Data Modeling			X		
SQL			X		
Data Analysis & Design			X	X	
Client/Server Development			X		
Issues & Problems				X	
Advantages of DBMS				X	X

Table 1: Comparing Topics Covered in Database Courses

comparisons with courses that they teach. Rather, they tend to focus on the course level and are satisfied to map their courses to those of IS'97 and summarily conclude a good fit based on their tacit understanding of the IS discipline. It is also interesting to note that other efforts to create alternative curriculum models such as those described by Cohen (2000) and Lidtke et al. (1999) have also remained at the course level and do not contain the richness of IS'97. This has relegated the comparisons of these models, such as that of Scime (2001), to the course level as well.

4. THE NEED FOR INTERACTIVITY

It is our hypothesis that the ability to understand and utilize the richness of IS'97 is limited by the constraints of its presentation in document format. For example, when a class of senior IS majors was given the assignment to study the IS'97 document, 62% rated the model as very, or extremely, complex. When given a brief quiz on the constructs of IS'97, the average score for the class was 54%. Of course, we understand that one does not begin to comprehend the details of IS'97 from a casual reading. We do believe, however, that by presenting the model in an interactive format, learning and understanding its complexities will be made easier. In addition, an automated, interactive system could provide various mechanisms to visualize the model from different dimensions and at various levels. Furthermore, such a system would allow the user to analyze the model for completeness and consistency and would allow specific queries and reports to be generated, showing the applicability of the model to local conditions and providing answers to the questions posed by the various audiences in the previous section. Finally, such a system would be able to provide summary statistics about the model that would be useful in building a local curriculum model (ex. There are between 4 and 20 learning units per class with an average of 13).

5. AN IS'97 INTERACTIVE PROTOTYPE

In an attempt to demonstrate the value of interactivity in aiding the user's understanding and utilization of IS'97, we have developed an Access 2000 database based on the conceptual data model presented earlier. Data were keyed into the tables from the IS'97 document by work-study students and briefly edited by the authors. From this, we developed a set of explanatory forms containing descriptions of the IS'97.

Upon entering the system, the user is presented with an introductory form that provides an overview of the prototype system and background on IS'97. From there, the user can navigate to the form showing the IS'97 model constructs (Figure 2). Each construct is a button that can be clicked to go deeper into the model. In the examples that follow, we describe several of the options that illustrate the capabilities of the prototype to aid in visualizing and analyzing the model.

Figure 3, for example, graphically depicts each IS'97 course. Color matching and vertical alignment show the relationship between courses and curriculum

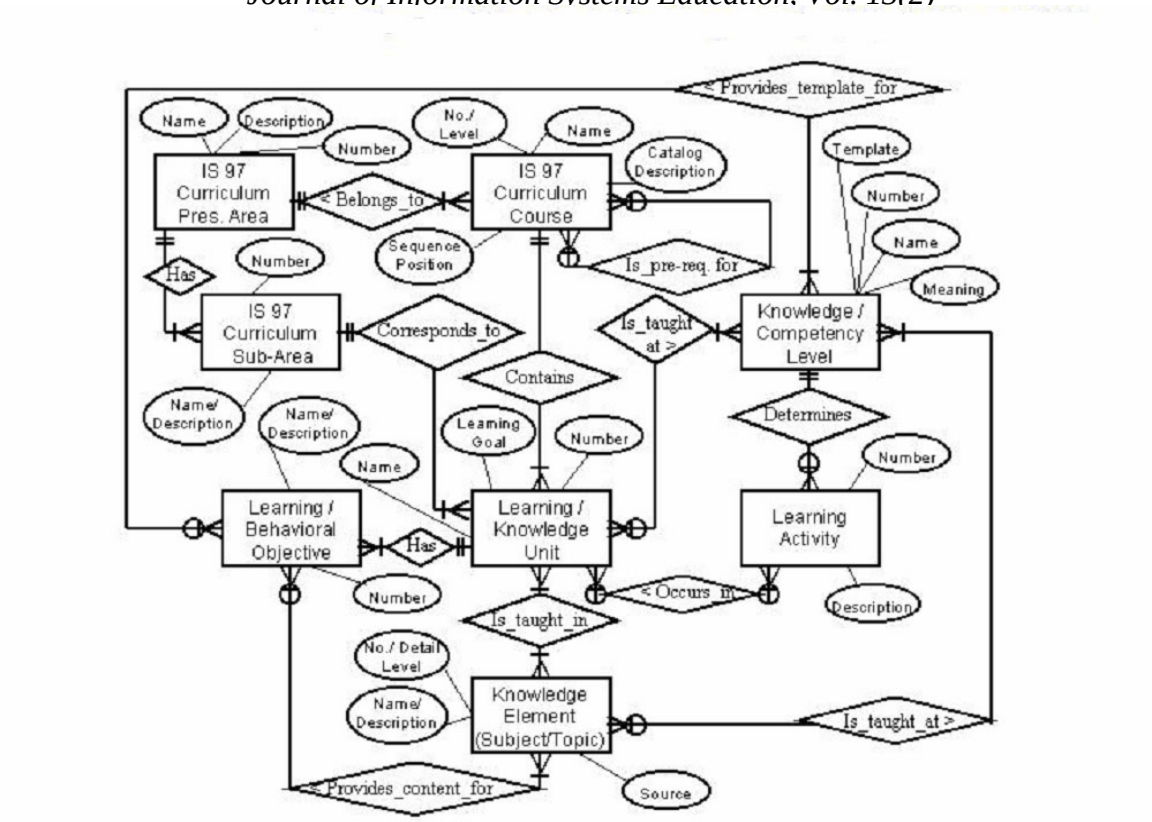


Figure 1 – A Data Model for IS '97

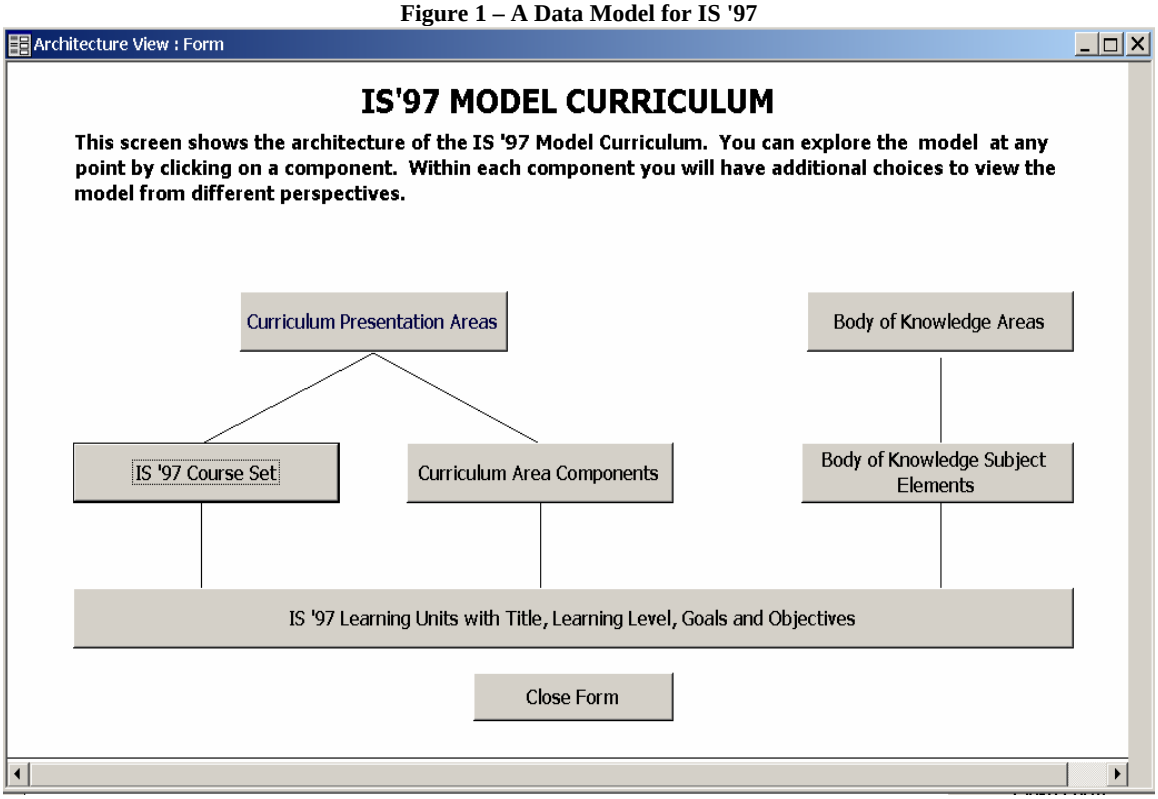


Figure 2: The Main Form Showing IS'97 Constructs

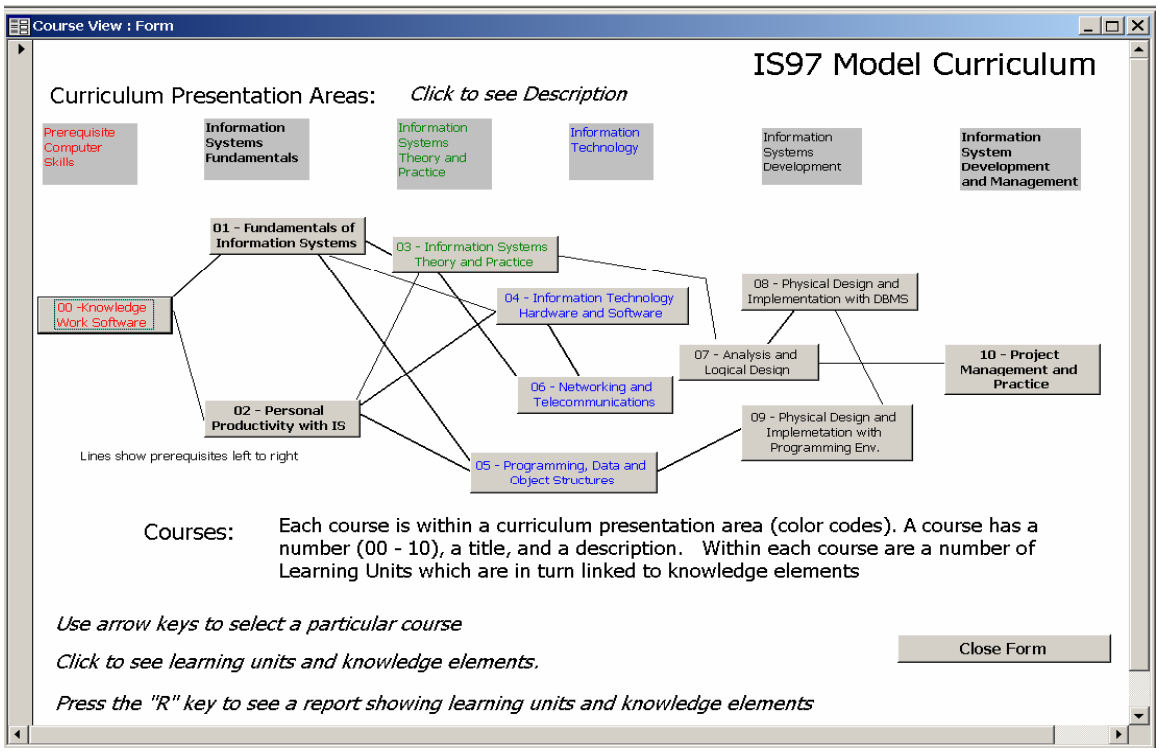


Figure 3: Curriculum Presentation Areas and Courses

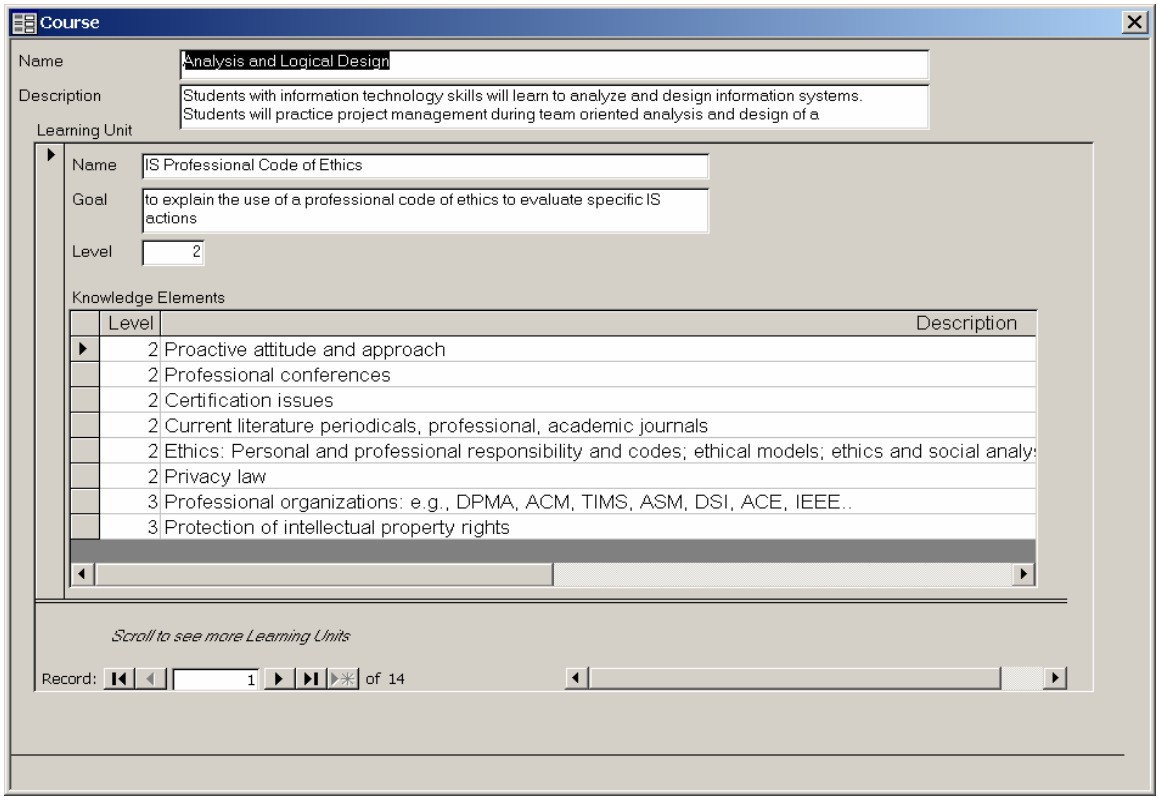
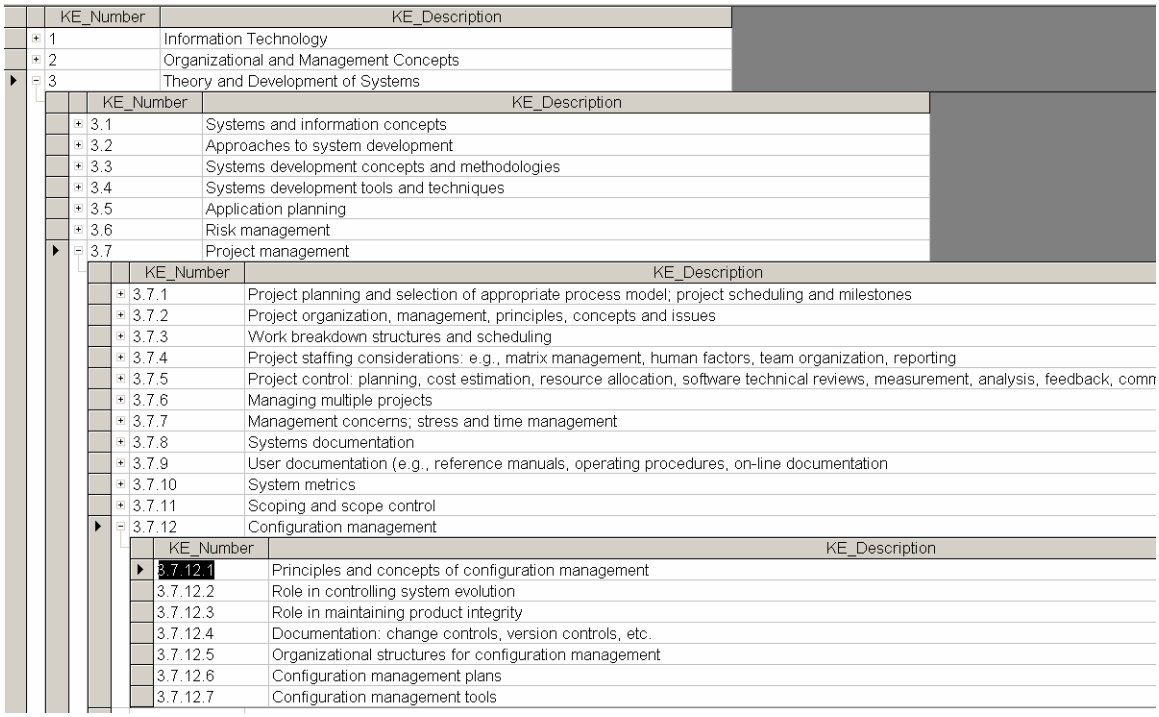


Figure 4: Details for a Particular Course



KE_Number	KE_Description
1	Information Technology
2	Organizational and Management Concepts
3	Theory and Development of Systems

KE_Number	KE_Description
3.1	Systems and information concepts
3.2	Approaches to system development
3.3	Systems development concepts and methodologies
3.4	Systems development tools and techniques
3.5	Application planning
3.6	Risk management
3.7	Project management

KE_Number	KE_Description
3.7.1	Project planning and selection of appropriate process model; project scheduling and milestones
3.7.2	Project organization, management, principles, concepts and issues
3.7.3	Work breakdown structures and scheduling
3.7.4	Project staffing considerations: e.g., matrix management, human factors, team organization, reporting
3.7.5	Project control: planning, cost estimation, resource allocation, software technical reviews, measurement, analysis, feedback, comm
3.7.6	Managing multiple projects
3.7.7	Management concerns; stress and time management
3.7.8	Systems documentation
3.7.9	User documentation (e.g., reference manuals, operating procedures, on-line documentation
3.7.10	System metrics
3.7.11	Scoping and scope control
3.7.12	Configuration management

KE_Number	KE_Description
3.7.12.1	Principles and concepts of configuration management
3.7.12.2	Role in controlling system evolution
3.7.12.3	Role in maintaining product integrity
3.7.12.4	Documentation: change controls, version controls, etc.
3.7.12.5	Organizational structures for configuration management
3.7.12.6	Configuration management plans
3.7.12.7	Configuration management tools

Figure 5: Knowledge Elements in Expandable/Contractible Format

KE_Numb	KE_Description	Course # & Name	LU_Name	KE_Level
1.3.7.27	Very high level languages: SQL, 4th-GL	-		
1.6.6.2	DML, query, QBE, SQL, etc.: database c	00 - Knowledge Work Software Tool Kit	Systems and IT Concepts	1
1.6.6.3	Application and user interfaces (DML, qu	02 - Personal Productivity with IS Technology	Database Terminology and Concepts	1
1.6.6.3	Application and user interfaces (DML, qu	03 - Information Systems Theory and Practice	Systems, Work-Flow, Organizational Systems	1
1.6.6.2	DML, query, QBE, SQL, etc.: database c	02 - Personal Productivity with IS Technology	Implementing An Event Driven Application	2
1.6.6.3	Application and user interfaces (DML, qu	02 - Personal Productivity with IS Technology	Implementing An Event Driven Application	2
1.6.6.2	DML, query, QBE, SQL, etc.: database c	05 - Programming, Data and Object Structures	Problem Solving, Algorithm Development	2
1.6.6.3	Application and user interfaces (DML, qu	05 - Programming, Data and Object Structures	Problem Solving, Algorithm Development	3
1.6.6.3	Application and user interfaces (DML, qu	08 - Physical Design and Implementation with DBMS	IS Database Application Structuring	3
1.6.6.3	Application and user interfaces (DML, qu	09 - Physical Design and Implementation with Progra	IS Development Testing	3
1.6.6.2	DML, query, QBE, SQL, etc.: database c	09 - Physical Design and Implementation with Progra	IS Application with Programming Language	4
1.6.6.3	Application and user interfaces (DML, qu	09 - Physical Design and Implementation with Progra	IS Application with Programming Language	4

Figure 6: Knowledge Elements Across Courses for the Topic "SQL"

KE_Numb	KE_Description	Course # & Name	LU_Name	KE_Level
1.6.8	Distributed databases, repositories	02 - Personal Productivity with IS Technology	Accessing/Retrieving/Storing Data	1
1.6.8	Distributed databases, repositories	03 - Information Systems Theory and Practice	Systems, Work-Flow, Organizational Systems	1
1.6.8	Distributed databases, repositories	04 - Networking and Telecommunications	Telecom Central/Distributed Systems	2

Figure 7: Knowledge Elements Across Courses for the Topic "Distributed Database"

presentation areas. The lines entering a course show its prerequisites. The user can click on a presentation area or a course to see more details. Figure 4 shows the results of clicking on Course 7, Analysis and Logical Design. The course name and description are shown along with its first learning unit and the knowledge elements within that learning unit. Next to each knowledge element is the level at which it is presented. The typical Access record-navigation control shows 14 different learning units for the course and allows the user to scroll to view each unit in successive order.

Figure 5 shows the IS'97 knowledge elements in a presentation where the user can click on the +/- in front of each element to expand or contract the hierarchy.

To help the user understand how knowledge elements are taught at increasing levels of depth and detail

across the curriculum, a query was written to allow the selection of a particular topic. All knowledge elements containing the topic string were retrieved and sorted in ascending order by level. Figure 6 shows the result of running the query for the topic "SQL." The increasing level of detail across the curriculum is clearly shown. When the same query is run for the topic "Distributed Database", the results show(Figure 7) it being presented at levels one and two only, a pattern consistent with most undergraduate IS programs.

Numerous other queries and reports were written as part of the prototype that are not discussed in this paper. It suffices to say that the interactive capabilities of the prototype help to reveal the richness of the IS'97 model and provide answers to questions that could not otherwise be answered easily using the static IS'97 document. In this sense, we believe that the prototype has indeed added value to the IS'97 efforts. In a larger sense, however, the real value that the prototype suggests is in its application to the development of a similar system for the specific curriculum of an academic organization. We discuss this idea further in the final section of this paper after briefly reviewing some of the feedback we have obtained from users of the prototype.

6. FEEDBACK ON PROTOTYPE USAGE

In an effort to gain feedback on the usefulness of the prototype, ten Business School faculty members and twelve senior IS students at the authors' institution were asked to experiment with the interactive prototype and then to complete a brief questionnaire about their experience. All of the participants had at least looked at the IS'97 document. Two-thirds of the respondents felt that the prototype "greatly" or "very greatly" helped them better understand the complexities of the IS'97 model curriculum. The parts of the prototype that helped them to visualize the model constructs (Figures 3 & 5) were rated the highest value followed by those outputs that let the experimenter see how various IS topics were presented across the curriculum (Figures 5 & 6). When asked about the value of a similar system containing data about the local curriculum, there was near unanimous agreement that such a system would be "extremely useful" to students, faculty, and curriculum committees.

Admittedly, the above results are preliminary. Interested readers are encouraged to download a copy of the Access 2000 prototype from ftp://ftp.business.uvsc.edu/johnsodw/is97 and to complete an experience questionnaire which they return to the authors.

7. IMPLICATIONS & FURTHER RESEARCH

In this paper we have described the need for, implementation of, and feedback from the use of an interactive prototype of the IS'97 Curriculum Model. As with the cobbler's children, IS curriculum Our research is continuing in the effort to determine the applicability of each of the IS'97 constructs to such a system. Furthermore, we are exploring the implications that such a system has for an organization's curriculum development, deployment, and assessment processes.

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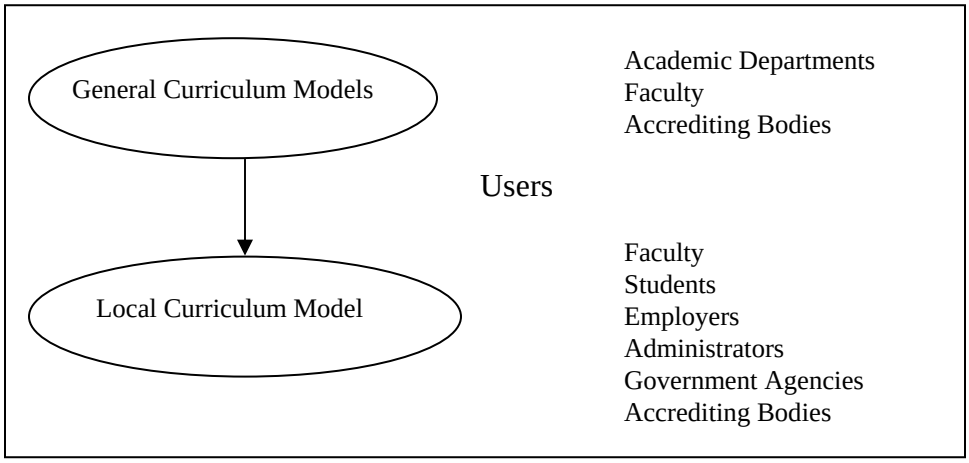

Figure 8: Local Curriculum Management

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David Johnson is chair of the Information Systems Department in the School of Business at Utah Valley State College. He received his Ph.D. from The University of Michigan in Information Systems. Dr. Johnson has both industry and academic experience. He worked as an information scientist at the Upjohn Company and has taught at Western Michigan University, International College in Naples FL, and Florida Gulf Coast University prior to coming to UVSC. His expertise includes strategic IT planning, enterprise computing, systems analysis and design and database management.. His research interests include curriculum management, the use of IT to support teaching and learning.

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Robert Figueroa's interest in computers began during his days as a writing student in the early 1980s, when he discovered the advantage even primitive text editors held over typewriters. His subsequent early career as a professional writer, editor, and desktop publisher led to increasing involvement in the rapidly evolving technology and the industry driving it. During the 1990s he performed a variety of functions for companies like Sybase, Computer Associates, and Siemens, which included copy and technical writing, business administration, and IT support. He received his B.A. in literature and writing from the University of California at San Diego. He recently completed an M.S. in computer information systems at Florida Gulf Coast University.

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