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INFORMATION SYSTEMS
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CIS Program Redesign Driven By IS2010 Model: A Case Study

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Abstract

The release of the IS2010 Model Curriculum has triggered review of existing Information Systems (IS) programs. It also provides an opportunity to replace low enrollment IS programs with flexible ones that focus on specific application domains.

In this paper, the authors present a case study of their redesigned Computer Information Systems (CIS) program that comes into effect in Fall 2012. Of the four tracks in the program, two are aimed at students interested in two diverse application domains: Business Administration and Graphics Communications (Multimedia). The authors describe the context and design constraints in choosing the tracks, as well as the process used in designing their flexible CIS program with consideration made for ABET accreditation. They also discuss how well the core courses in the redesigned CIS program fare against the IS2010 Model recommendations. Further, for the CIS Business track, they illustrate how the courses collectively satisfy the IS Body of Knowledge recommended in the Model document. In addition, they map the domain-related courses in that track onto the different levels of a two-dimensional learning taxonomy to help design the assessments in those courses. They also provide an outline of the Multimedia track they developed using the same process.

Keywords: IS2010 Model, Flexible IS Program, IS Tracks, Intersecting courses, Learning Taxonomy, IS BOK

1. INTRODUCTION

To identify solutions to the current credibility crisis in the IS discipline, Firth et al. (2011) developed six propositions. One of the most poignant of the six being that "the credibility of the IS discipline lies in the design and delivery of excellent courses and curriculum." According to Dick et al. (2007), declining student enrolment contributes significantly to the current crisis that

IS departments face. The IS2010 Model (Topi et al., 2010) is the latest set of curriculum guidelines that educational institutions can use in designing their IS Programs. It may not, however, get us through the crisis completely without the other complementing initiatives to address the issue in a holistic fashion. The IS2010 Model acknowledges the broader scope of the IS discipline by allowing the curricula to go beyond the schools of business and management to attract more IS students interested in different application domains. In this case study, we discuss two IS tracks designed with the IS2010 curriculum guidelines in mind: Business and Graphics Communications. The new CIS program, to be implemented in Fall 2012, also has two other tracks (IT Services and System Development) which are not discussed in this paper.

In Software Engineering, contributors describe the body of knowledge by indicating the levels of understanding using Bloom's taxonomy (Bourque & Dupuis, 2001). We use a two-dimensional cognitive model adaptation of Bloom's Model (Anderson & Krathwohl, 2001) for mapping the knowledge levels of CIS business track courses.

In section 2, we briefly review the structure and characteristics of the IS2010 Model as well as Anderson and Krathwohl's Cognitive Taxonomy. In section 3, we summarize the process of our CIS program redesign. We then discuss the local factors that influenced our CIS program redesign in section 4. In section 5, we discuss the structure of the new CIS program with four tracks and the design details for two IS tracks. In section 6, we verify how these courses meet the IS2010 curriculum guidelines and map the CIS business track courses onto the knowledge elements recommended in the IS2010 model. We also apply Anderson and Krathwohl's Cognitive Taxonomy to those courses for determining appropriate assessments. In the conclusion section, we emphasize the opportunity that exists in enhancing the CIS programs with newer tracks in different application domains.

2. LITERATURE REVIEW

Among the five disciplines under computing (Computer Science (CS), Computer Engineering (CE), Information Systems (IS), Information Technology (IT) and Software Engineering (SE)), the IS discipline is most concerned with organizations (JTFCC, 2005) and application systems in various domains that enable the organization to function, succeed, and comply with legal and regulatory requirements (Agresti, 2011). The crux of the IS discipline is in the value provided by the application of the technology rather than the technical components. With the variety, number, and demand for strategic application of domain-centric applications rapidly increasing, declining enrollments in IS programs and related computing disciplines is of serious concern (Dick et al. 2007). To improve enrollments, Firth et al. (2008) suggested revising the focus of those courses, early in the IS program, to focus more on IS than on CS or IT. Some institutions have already redesigned their IS curricula (e.g., Koch, Van Slyke, Watson, Wells, & Wilson, 2010; McGann, Frost, Matta & Huang, 2007) to address the recruitment problems. In this context, we recognize the value of the new IS2010 model curriculum in addressing enrollment issues through application beyond business domains.

IS2010 Curriculum Recommendations

Based upon periodic reviews, the IS Curriculum Task Force came up with the current IS2010 model curriculum (Topi et al., 2010) that is flexible, domain-independent and well structured. The IS2010 model curriculum cuts across the usual departmental silos by allowing the inclusion of any application domain (i.e., going beyond schools of management and business).

IS2010 specifies a set of structured outcome expectations starting with high-level IS capabilities which are translated into three categories of knowledge and skills: foundational, IS- specific and domain fundamentals. With just seven core courses addressing the high-level IS capabilities, this model offers flexibility for designing IS programs with several tracks emphasizing various application domains. It provides catalog descriptions and learning objectives for the core and elective courses as well as a mapping for the depth of knowledge metrics for these courses along with the IS Body of Knowledge.

Cognitive Taxonomy

In 1956, Benjamin Bloom published a learning taxonomy consisting of cognitive (mental), affective (emotions/ feelings), and psychomotor (physical skills) domains focusing on the cognitive domain (Bloom, 1956). Anderson and Krathwohl (2001) revisited Bloom's taxonomy with intentions of updating, revising and "…refocusing education's attention on the value of the original Handbook…" and assisting educators "…as they struggle with problems associated with the design and implementation of accountability programs, standards-based curriculums and authentic assessments (p. XX1)." (See Figure 1.)

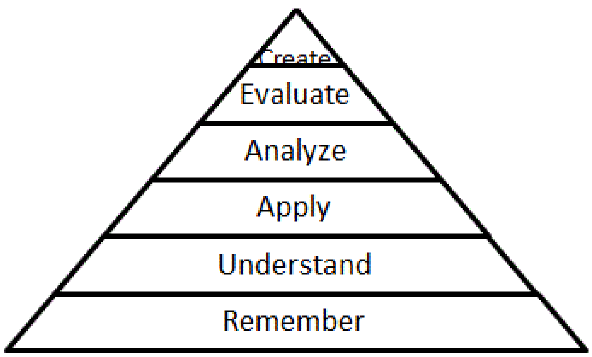

Figure 1 - Anderson & Krathwohl's Cognitive Model

Anderson and Krathwohl noted that, "The revision emphasizes the use of the Taxonomy in planning curriculum, instruction, assessment, and the alignment of these three (2001, p 305). Thus, this model is well structured to use as a guideline for evaluating ABET accreditation standards. The revision represents a significant shift from Bloom Taxonomy's primary focus on assessment to the teaching process where faculty can use the model to classify and identify project objectives.

Similar to Bloom's Model, students' levels of learning progress from a state of memorization of facts, to eventual application of concepts in a distinct functional domain. However, unlike Bloom's single dimension taxonomy, Anderson and Krathwohl's (2001) framework is represented by a two dimensional table consisting of carefully defined categories of knowledge and cognitive processes. The "Knowledge" dimension is divided into four categories: factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge. The "Cognitive Process" dimension provides a means of assessing the retention and transfer of knowledge and is described through six categories of processes illustrated in Figure 1. The "Retention" dimension is most closely aligned with the basic "Remember" level of the model. The "Transfer" of knowledge gains progressively more depth as the tasks involved move from "Understand" to "Create." The following breakdown provides a brief description of each of the categories of knowledge and their associated cognitive process dimension in parentheses.

Factual knowledge (Remember level) is the basic form of knowledge described whereby a student becomes familiar with a discipline and its technical vocabulary. The associated cognitive processes focus upon the retention of concepts through recognizing and recalling relevant knowledge from long term memory.

Elements of the next three knowledge transfer categories can be found in differing degrees throughout the remaining levels of the cognitive taxonomy (Figure 1). The process classification, (in parentheses) is determined by the task being applied.

Conceptual knowledge (Knowledge transfer) describes a systems-type concept in looking at the "interrelationships among the basic elements."

Procedural knowledge (Knowledge transfer) focuses upon appropriately applying knowledge to solve a subject matter specific issue.

Metacognitive knowledge (Knowledge transfer) is essentially an awareness of what one knows: strategic knowledge, self-knowledge, and knowledge of the cognitive demands for a task.

When designing our IS tracks, we considered the different levels of Anderson and Krathwohl's (2001) Cognitive Model. Next we explain our redesign process. Later in section 5, we apply Anderson and Krathwohl's two-dimensional model for courses in one of the CIS tracks.

3. REDESIGN PROCESS

The intention of our CIS redesign was to select application domains having viable minors and intersecting courses. The first step required assigning a coordinator for managing the team effort and delivering the end product. The CIS team utilized an iterative process for the program redesign which involved:

- Setting basic criteria for the program such as alignment with model curricula.

- Identifying CIS program outcomes that reflected the department's program educational objectives.
- Setting limits on the number of new courses with consideration made for teaching load constraints.
- Identifying viable tracks having courses intersecting with computing by contacting program coordinators in various departments in the University.
- Structuring the program architecture to serve as a baseline design.
- Utilizing existing courses, and involving faculty members for developing new (or redesigning) courses in their respective areas of expertise.
- Liaising with all stakeholders such as the Registrar's Office to ensure the program met all the university-wide requirements.
- Revising the architecture and designs based on internal and external reviews and feedback.

The whole exercise took over a semester. The coordinator was given some release time to manage this redesigning exercise. The IS2010 gave a framework for structuring the program. The existing program outcomes were modified to suit tracks other than business and to allow for possible future ABET accreditation.

The design considered the following constraints: keep the number of newly developed courses to a minimum; make use of existing courses; and identify courses that could be shared among the IS Core courses, foundational and university required courses and domain fundamental courses. As a result, seven new courses were created. One section will be offered for each course per year and added to the teaching load. Intersecting courses, linking IS with application domains, were also identified.

In the next section, we discuss the rationale for selecting the tracks. The local context played a major role in limiting the number of tracks to four.

4. CIS REDESIGN: IDENTIFYING TRACKS

Our CS department, located in the College of Science, offers two programs, CS and CIS. The present CIS program shares several courses with the CS program. The program's intent has been to provide a generalized curriculum in the applied aspects of computing or informatics (Duben et al., 2006). Although the CIS program addressed the domain fundamentals of IS2010 (by requiring a minor or another major), it lacked *intersecting course*s applying the concepts to specific domains. In view of our course load constraints, the domains, already having such intersecting courses, are good candidates for CIS tracks. Next we explain how the local context played a role in choosing the tracks for CIS redesign.

Application Domains

Because computers are used in every discipline, we can have, theoretically, a CIS track for every field of study. The consideration of application domains (as tracks within CIS) will vary from institution to institution, depending on the programs offered and the availability of intersecting courses. Initially, we considered the following academic domains as program tracks: Business, Multimedia /Graphic Arts, Healthcare, Education, Law/Security, and Science.

Local Context

The redesigned CIS program was intended for students wishing to study either the application of computers in a chosen domain or an area of specialization within the computing discipline. At our institution, a track in Business Administration helps fill the gap created by the Fall 2011 termination of the MIS program housed in the AACSB-accredited Business School. Digital Art and Graphic Communications have several intersecting courses, thus also providing a strong option. With their overlapping courses with the CS core curriculum, Science and Mathematics are also natural candidates for domain specific tracks. However, since our CS program requires 12-credit hours of science courses and additional mathematics courses, students with an aptitude in Mathematics and Science may most likely consider majoring in CS rather than CIS. Further, we wish to avoid CIS competing with CS for enrollment. We are also considering developing tracks in Healthcare, Education, and Law/Security. Since many application domains require new intersecting courses, only four tracks, which offer the greatest potential to attract students, will be initially offered.

CIS Tracks

Students choosing the CIS program will be encouraged to choose a track pertaining to an application domain or an area of specialization within computing. The authors' university does not offer separate programs in IT and SE so two specialization tracks in these two computing disciplines were developed:

1. Business (includes a minor in Business Administration)
2. Multimedia (includes a minor in Graphic Communications Technology)
3. IT Services (includes a minor in Computer Networking)
4. Software Development (some other minor or specialization in a computing area such as web or game development)

All four tracks have a common core of IS courses discussed in the next section. Each of the first three tracks has a specific minor. In the fourth track, a student chooses a minor other than those three or additional courses relating to system development. To illustrate the broader scope of the IS2010 Model, we confine our discussions to the Business track and its modified application to the Multimedia track. To begin, we discuss the architecture of the CIS program.

5. REVISED CIS PROGRAM

The total credit-hour requirements for our CIS program stands at 124 (41 at three credit hours and 1 at one credit hours) as distributed in Table 1.

CIS Architecture

Our institution requires every undergraduate program to include 17 general education (University Study) courses. Since the CIS core utilizes two of these courses, the program requires 45 credit-hours of courses toward foundational knowledge and skills. Each of these courses addresses some of the generic student learning outcomes including:

- Demonstrate capabilities for critical thinking, reasoning, and analyzing.
- Demonstrate effective communication skills.
- Demonstrate the ability to integrate the breadth and diversity of knowledge and experience.
- Demonstrate the ability to make informed, intelligent value decisions.

These general education courses represent the foundational courses referenced in the IS2010 model. The redesigned CIS program also has courses in domain fundamentals and courses that intersect the domains and computing. In the following, we provide the details of the CIS program architecture.

Table 1: CIS Architecture

Category	Credit hours
University Studies	**45**
CIS Major	**55–58**
Core	40
Supplemental	15-18
Additional Requirements	**21 – 24**
Mathematics	6
Minor or advised courses	15-18
Total	**124**

CIS Core

In a recent study examining the alignment of current IS programs with the IS2010 model, Apigian and Gambill (2010) reported that only four of the seven IS2010 core courses (Fundamentals of Information Systems, Data and Information Management, IT Infrastructure, and Systems Analysis and Design) are in 80% (or more) of the current IS programs. Our CIS program includes these courses as well as a capstone project course that helps entwine the learning experiences of these courses, and others, as the students prepare to enter the workforce.

We split the IS courses into two groups: common *Core* and track-specific *Supplemental*. The additional requirements include track specific courses, which could be for a minor in the chosen domain.

In Table 2, we list the 14 CIS core courses and map 11 of them onto the IS2010 Model. The numbers under the IS2010 Model column correspond to the order in which the core and the sample electives are listed on page 35 of the IS2010 Model document (Topi et al., 2010). Each is a three credit hour course except for, CS495, a one credit hour senior seminar. The Discrete Structure course is included for addressing one of the knowledge areas in computing. The Senior Seminar course focuses upon social and ethical issues in computing.

The Capstone Experience is a project course that consolidates the various knowledge and skills learned in other courses. A zero-credit hour (IS003) Information System Assessment is also required but not listed in Table 2.

CIS Supplement to Core

The (five or six) CIS supplement courses differ according to track. Track specific courses prepare students to meet the technology needs of problems in that discipline (ABET, 2011). For application domain tracks, such as Business and Multimedia, intersecting courses are included under the CIS supplement. These are discussed later for the Business and Multimedia tracks. For the IT Services and System Development tracks, additional relevant CS courses are included.

Table 2: Mapping of CIS Core Courses on IS2010 Model

Course	Name	IS2010 Model
IS175	Computer Information Systems – I	Core - 1
IS275	Computer Information Systems – II	Core- 3 & Elective- 3
IS340	Information Technology	Core- 5
IS375	Database and Information Systems	Core- 2
IS445	Systems Analysis & Design	Core- 6
IS448	IS/IT Project Management	Core- 4
IS575	IS/IT Strategy and Management	Core-7 & Elective- 6
IS130	Application Development – I	Elective- 1
IS245	Web Development and Security	Electives– 1 & 6
IS320	Human Computer Interaction	Elective- 4
IS330	Application Development - II	Elective- 1
CS245	Discrete Structure	
CS495	Senior Seminar	
UI450	Capstone Experience	

Business Track

The Business track prepares students planning for a career involving application of computers in all areas of business administration. This track replaces MIS (no longer available at our institution) with greater technical content. The supplemental courses are listed in Table-3.

Table 3: Supplements - Business Track

Course	Name
AC330	Accounting Information Systems
IS360	Mobile Application development
IS440	Web Design for Electronic Commerce
IS465	Management Support Systems
MK555	Internet Marketing

Multimedia Track

The Multimedia Computing track is for developing skills required for implementing multimedia designs using computers. The supplemental requirements include courses from Art as well Computer Science as shown in Table 4.

Table 4: Supplements - Multimedia Track

Course	Name
AR104	Design Foundations
AR323	Art & New Technology
IS360	Mobile Application development
IS440	Web Design for Electronic Commerce
IS465	Management Support Systems

IT Services

The IT Services track is centered on a minor in Computer Networking. This track was developed for students considering a career in IT services, such as infrastructure development or support. The supplement requires CS courses in programming, operating systems, and data communications.

System Development

The system development track has built-in flexibility to cater to changing demands in the field. It is oriented toward students who are interested in applying computers in a domain outside those offered through the other CIS program tracks or in a specialized computing area such as web computing or game development. The supplement requires courses in programming, operating systems, and mobile applications development. Students will take 15 hours of domain related or CS/IS courses, as advised by faculty, towards their goal (e.g., web computing, game development).

6. DETAILED CASE EXAMPLE-BUSINESS TRACK

In this section, we provide comprehensive details for the Business track in view of its historical significance. In the next section, we also provide design details pertaining to the Multimedia track – an alternative to the Business track.

Design

As indicated in Table 1, the Business CIS track requires 124 credit-hours of study (41 three credit hour courses plus the one credit-hour CS495). This includes the 15 foundational (University Studies) courses, 14 CIS core courses (excluding the zero-credit assessment course), five supplemental courses, two Mathematics courses, and five courses towards a minor in Business (see Table 3).

Three high-level IS capabilities are described in in the IS2010 curriculum model (Topi et al., 2010, pp 16) IS Specific, Foundational, and Domain Fundamentals. It is possible that some of the courses intersect more than one capability sector. Also, in order to stay within the overall credit-hour requirements, courses are designed in such a way that they are shared among the Foundational and Core requirements.

Table 5: Business Minor (Business Track)

Course	Name
AC221	Principles of Accounting I
AC222	Principles of Accounting II
EC225	Principles of Macroeconomics
FI361	Financial Management
MG301	Principles of Management
MK301	Principles of Marketing

Figure 2 shows the course mapping by capability sectors for the CIS-Business Track. Excluding the IS003 (zero-credit hour), all 41 courses (indicated in Figure 2) are required to complete the CIS-Business track major. Courses located within the "Foundational and University Requirements" circle address the requirements of the program as well as graduation requirements for the University. Within the Business Track circle, we indicate the courses required to obtain a minor in Business and the courses that intersect the IS and Business domains.

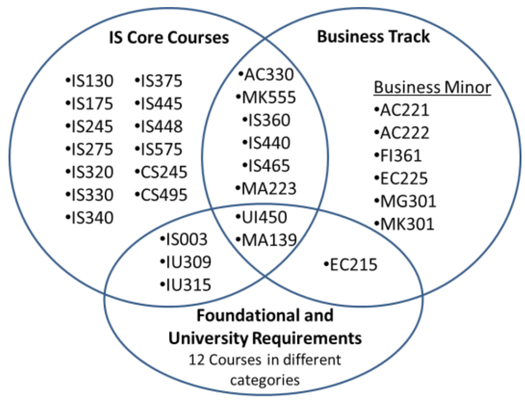

Figure 2: Courses for CIS Business Track

Figure 2 also shows the courses that intersect IS and the application domain which were not in the earlier CIS program. For reasons of credit-hour efficiency, two of the Foundational courses (IU 309 – Technical Writing and IU315 - Cyber Ethics) are shared with the IS Core. In addition, the Foundational course (EC215 Macroeconomics) is shared with the Business Domain while the capstone experience and Applied Calculus (MA139) intersect all three.

Verification

Our redesign process reformulated the program outcomes, while retaining the overall format of other programs in the department, to reflect the applied nature of CIS in a variety of domains. Verification of these outcomes depends on the learning outcomes of the courses. The courses in the redesigned CIS match, as shown in Table 2, the core and some of the elective courses of the IS2010 Model. Course descriptions in the IS2010 model guided the design of the courses in our CIS core as well as some electives.

While this is only a high-level verification, it sets the direction in describing the actual courses meeting the knowledge elements stated under the IS Body of Knowledge: General computing, IS specific, Foundational, and Domain-related (Topi et al., 2010 Appendix-4 pp 81-84). Table 6 maps the courses in the Business Track (Figure 2) having the potential to address the various knowledge elements in the above four knowledge areas. Similar mappings could be administered for other tracks to assist in refining course descriptions.

Table 6: Knowledge Area Mapping

General Computing Knowledge Areas	
Programming Fundamentals	IS130, IS330, IS360
Algorithms & Complexity	CS245, MA139, MA223
Architecture & Organization	IS340
Operating Systems	IS340
Net Centric Computing	IS340, IS440, IS339
Programming Languages	IS130, IS330, IS360
Graphics & Visual Computing	IS130, IS330
Intelligent Systems	IS 465
Information Systems Specific Knowledge Areas	
IS Management & Leadership	IS275, IS575, IS440
Data & Information Management	IS575, IS375, IS465
Systems Analysis & Design	IS445
IS Project Management	IS448
Enterprise Architecture	IS275, IS175
User Experience	IS320
Professional Issues in Information Systems	IS439
Foundational Knowledge Areas	
Leadership & Communication	IU309, Literary & Oral Expression Categories
Individual & Organizational Knowledge Work Capabilities	UI450, CS495, IU315
Domain-related Knowledge Areas	
General models of the domain	AC221, MG301, MK301, FI361, EC215
Key specialization within the domain	AC222, AC330, MK555, EC225
Evaluation of performance with the domain	IS003

Depth of Knowledge Metrics

In addition to the knowledge areas, the depth of knowledge achieved through the various courses using appropriate assessments must also be addressed. Throughout the educational process, students are expected to progress through their courses of study, from that of acquiring factual knowledge and skills, to ultimately applying those resources to a given situation.

Several learning models have been designed to help faculty evaluate and design courses that will aid in assessment and progression. Such models are beneficial for evaluating courses in light of college, program and accreditation considerations. Bloom's Taxonomy was used in the development of the IS2010 model in addressing knowledge metrics (Topi et al., 2010 pp. 78-80). Anderson and Krathwohl furthered Bloom's model to not only assist with assessment, but to also help in the identification and classification of project objectives. In the next section, we apply Anderson and Krathwohl's model to the Business Track courses (Figure 2) from both learning and assessment perspectives. (See Appendix.)

Application of a Cognitive Taxonomy to Business Domain Courses

As described in Section 2 and for assessment purposes, Anderson and Krathwohl (2001) suggest that courses falling into the "Remember" Cognitive Process Dimension could be assessed through prompt-based recognition tools. Assessments for the "Knowledge Transfer" levels from "Understanding" through "Create" require the students to progressively apply their knowledge to new situations. At the "Apply" level, the assessments could require students to determine and apply the necessary procedure to solve a problem or situation. Assessments used at the "Analyze" level could require students to distinguish relevant from irrelevant facts before finding a solution. For the "Evaluate" level, students could be asked to make judgments based upon criteria and standards. Using these definitions, we examine the business track courses and then discuss the assessment options.

The junior level Accounting Information System course (AC330) focuses upon domain-specific fundamentals addressing data security and transaction cycle concepts. The course focuses upon the first three dimensions of Anderson and Krathwohl's learning taxonomy as students gain factual knowledge about the field, learn new applications, and then analyze and apply their knowledge to projects within the course. (See Appendix.)

Mobile Application Development (IS360), currently under development, will correspond with the first three dimensions of the learning taxonomy. Students will first gain factual knowledge about designing and coding applications for mobile resources and then apply their knowledge throughout the course in the development of small mobile apps.

The Web Design for Electronic Commerce course (IS440) covers all of the dimensions of the Anderson and Krathwohl's taxonomy. Students learn techniques, languages, and tools for building Web pages and finally analyze a client's Web site needs and design and create a site to fulfill those needs.

The Management Support Systems course (IS465) focuses on the last three dimensions of the learning taxonomy. Students gain factual knowledge regarding system design and design tools, however, the focus of the course is in evaluating a business process and creating the design models associated with developing a system for that process.

The Internet Marketing course (MK555) introduces students to the strategic application of Internet technologies to a business' marketing plan. Students examine the characteristics and behaviors of Internet shoppers and the effect that web content has upon their buying behaviors. The course focuses on the first three dimensions of the Anderson and Krathwohl's learning taxonomy model as students gain factual marketing knowledge and then apply their knowledge through the analysis of Internet content and resources.

The capstone course (UI450) is taken by students in all CS/CIS tracks. In this experiential learning course, students apply their accumulated knowledge and skills as they work for a client to analyze, design and develop an IT solution for the client's specific need. The focus of this course is on the last dimensions of the learning model.

The Applied Calculus (MA139) and Elementary Probability and Statistics (MA223), provide a broad mathematical foundation applicable to multiple majors. Due to the general nature of these courses, they are not included in the analysis.

Each of the business domain courses, especially Internet Marketing, contains an element of gaining and remembering factual knowledge. Most of the courses conclude with the students applying their knowledge through a project-type assessment. This is especially true for the capstone experience course where students design and develop a project for an external client. Thus, in assessing students' levels of learning throughout the program, it appears that the assessment instruments should progress from that of fact-based definitional tools to those of development, evaluation, and application.

6. MULTIMEDIA TRACK: AN ALTERNATE DOMAIN

Since our objective is to consider domains beyond Business, we applied the same process for designing a CIS track to Multimedia. Students are required to minor in Graphics Communication Technology (See Table 6). In addition, five other courses are included in this track (see Table 4).

Table 6: Graphics Communication Technology Minor

Course	Name
GM180	Intro. To Industrial Graphics
GM200	Vector & Bitmapped Graphics
GM282	Vector and Text Graphics
GM380	3D Modeling and Animation
GM386	Interactive Multimedia & Animation
GM480	3D Animation Pipeline

Here, students take two Art courses for developing artistic design skills. The core CIS courses provide the necessary computing concepts that help prepare students for lifelong learning (as new technologies emerge) (Walker, 2010).

The courses shared between the three High-level IS capabilities are shown in Figure 3. Excluding the IS003 (zero-credit hour), all 41 courses (indicated in Figure 3) are required to complete the CIS-Multimedia track major. The Art & New Technology course is an intersecting course with Design Foundation as a prerequisite. For reasons of course load efficiency, Photography Fundamentals – PG284 is a shared Foundational course.

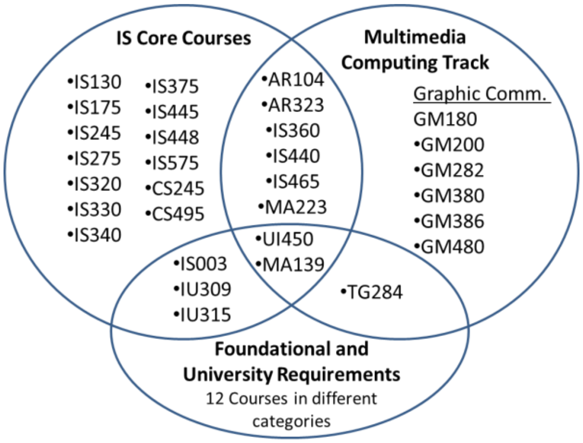

Figure 3: Courses for CIS Multimedia Track

The verification for this track will be similar to the one shown in Table -6, except for domain related knowledge areas. Here, the courses with GM and AR prefixes will map for general models of the domain and key specification areas within the domain. We can also apply the Anderson and Krathwohl's cognitive taxonomy to Multimedia domain courses.

7. CONCLUSION

The IS2010 model provides opportunity for designing a flexible IS program reaching out to all possible application domains. Walker (2010) noted that, although local resources, limitations, and priorities will influence programmatic elements, essentially all CS programs attempt to build problem-solving skills, from vision to implementation, to assist in IT solution development for people in diverse fields. Thus, institutions will adapt the IS2010 model to suit their local context.

In this case study, the authors describe a flexible CIS program at their institution that has been approved to start in Fall 2012. This program utilizes the IS2010 model to reach out to multiple knowledge domains. Four tracks were chosen to suit their local conditions. The redesign's architecture offers considerable flexibility in terms of adding new tracks. This is achieved through (1) having a supplemental component to the IS core that allows inclusion of appropriate intersecting courses to bridge computing with application domains and (2) requiring a minor in the application domain or having a mechanism for faculty to advise a set of relevant courses in an area of specialization.

The program's core courses were examined through the frameworks of the IS2010 model and Anderson and Krathwohl's. cognitive model. These mappings aid in choosing the appropriate topics for, and designing appropriate assessments in, program courses. The presented design process and the concept of tracks in application domains serves as a case study that is based on the IS 2010 Model. In addition, the mapping techniques, using a cognitive model, can be applied to courses in various tracks for matching course objectives with appropriate assessment techniques with consideration made for ABET accreditation.

Our general process can be replicated by other universities. We utilized a case study approach, explained in Section 3, for our redesign initiative. We addressed the important higher level issues -such as program objectives, accreditation intentions - at the very beginning. Creating a baseline program architecture that is agreed upon by all department members is crucial. Involving all of the faculty members and consulting all of the stakeholders (including the Registrar) helps in speeding program approval. Another key step is identifying domains that have intersecting courses with computing. If there are no constraints, it is possible to develop intersecting courses jointly with domain-specific departments. Context will dictate the choice of tracks.

One of the recent CIS revisions (Pauli et al., 2010) has five categories of specializations (Software Development, Web Development, Business Analysis, Infrastructure Analysis and Change Management). It is encouraging to note that they have realized growth in enrollment through their CIS revision. We expect similar results as three of their specializations are considered in our CIS redesign. Such aims to address, in part, the crisis through which the IS discipline is currently undergoing. Extending IS beyond the Business domain through additional IS minors should attract more students from other majors. However, the results of these program modifications are yet to be realized at the authors' institution as the foundation for change is being set into place.

8. ACKNOWLEDGEMENT

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Missouri State University. The program design presented here is a departmental effort.

9. REFERENCES

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Appendix: Anderson and Krathwohl's Taxonomy Table

Course #	Course Name	The Cognitive Process Dimension				
		Remember	Apply	Analyze	Evaluate	Create
AC330	Accounting Information Systems	X	X	X		
IS360	Mobile Application Development	X	X	X		
IS440	Web Design for Electronic Commerce	X	X	X	X	X
IS465	Management Support Systems			X	X	X
MK555	Internet Marketing	X	X	X		
UI450	Capstone Experience			X	X	X