A prototype Information Systems Centric Curriculum Model

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ACSTRACT: This paper describes the process used by the College of Computer Science & Engineering (Taibah University, Saudi Arabia) to implement a new curriculum BSc in Information Systems model based on Accreditation Board for Engineering and Technology (ABET) accreditation and under the guiding principles of the IS 2009 Curriculum Guidelines for Undergraduate Degree Programs, Information Systems Association for Computing Machinery (ACM) and Association for Information Systems (AIS). The course has been unique in that it was specifically to meet the needs of business and industry. The curriculum was developed with feedback from academe and industry under a survey regarding undergraduate student’s skills required in the IS programme. It has been reviewed by a group of reviewers. The review led to some revisions. The curriculum has been developed in conjunction with BSc Engineering and BSc Computer Science. This is a flexible and conjunction curriculum, which allows changes without a major design in a way to prepare the modern technology. By emphasising the major systems, the curriculum has been planned with principles and applications to enable the student to integrate knowledge in a variety of business and inter-disciplinary settings.

Key words: Information Systems, Curriculum, Accreditation, Learning model

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1. Introduction

This paper describes a process for developing an outcome based objective model [2] for implementing an undergraduate information systems curriculum for the College of Computer Science & Engineering (Taibah University, Saudi Arabia). The curriculum is based on Accreditation Board for Engineering and Technology (ABET) accreditation and under the guiding principles of the IS 2009 Curriculum Guidelines for Undergraduate Degree Programs, Information Systems Association for Computing Machinery (ACM) and Association for Information Systems (AIS).

The process of developing a BSc degree in Computer Science, Computer Engineering and Information Systems was intended to produce graduates that are readily accepted in today’s business, industry and organisations. We sent surveys to industry and academe to help us identify their expectations from our graduates. It was essential for us to know the demand which could assist industry in planning and decision making. The survey was to help us strength the college’s commitment in identify BSc technical skills needed for our graduates to become successful professionals.
The Curriculum Committee developed this curriculum over a one-year period. The programme has been exclusive blended to meet the needs of business and industry. During the development, it has been received feedback from industry and academe.

A major consideration was given to the outcome as being an integral part of the ABET (Accreditation Board for Engineering and Technology) accreditation guidelines. The first part of this writing will focus on the important aspect of the curriculum followed by module descriptions.

2. Important Aspects Of the Course

The literature focuses on technology education using outcome based objectives to define the graduating student. This in turn is to build the requisite knowledge, skills, and abilities of the student’s primary focus area. A graduate of the programme should have specific sets of knowledge, skills, and abilities spread across the curricula.

IS in its nature is ‘practical’ and applies disciple. This makes it more dynamic than a pure discipline-based area of study. [4, 5] The curriculum is design to be dynamic for change and giving the students an opportunity to change after first year. In both Level 1 and Level 2 of the first year the student will share course with the other three courses (see Figure 1).

<table>
<thead>
<tr>
<th>Level</th>
<th>Course Name</th>
<th>Prerequisite</th>
<th>Category</th>
<th>Hours</th>
<th>Lab</th>
<th>Credit</th>
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<td>CIS</td>
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<td>4</td>
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<td></td>
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<td>CIS</td>
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<td>4</td>
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<td>Introduction to Human-Computer Interaction</td>
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</table>

Table 1. CIS Course Details and Credit Hours
The course is intended to cover all the important aspects of a system design by giving the student a real-life experience in the development of a part of a system in a business or industrial environment. Further group activities that enhance or develop communications skills are highlighted. [4, 5]

Emphasis was put activities that enhance or develop communications skills are highlighted and professional and ethical issues. The personal, interpersonal and technical skills desired in the profile of a graduate is seen also as a major issue.

3. Skills And Subject Area

In addition the graduate is prepared with the fundamental concepts to pursue independent and life-long learning. The curriculum document specifies in detail with the computing courses needed. Besides the computing courses, there also some essential courses such as discrete mathematics, probability and statistics, and quantitative method courses are needed as prerequisites for several of the computing courses. These general education courses should include social science, humanities, writing, and mathematics. Below is the list of personal and general skills:

• Leadership skills
• Systemic thinking
• Collaboration
• Communication Skills (Oral, Written)
• Project Management Experience
• Analytical Thinking/Problem Solving
• Mathematical Foundation

Despite the curriculum includes mathematical modules, an important aspect is that the consideration of information systems as a socio-technological discipline. There has been a trend were some members tried to push IS as science subject, but this discussion let to reach a solution which agreed that IS is more related to business and social science.

IS programmes have been created with a large variety of foci. [22] The results of their graduates should be for a divers disciples such as developers, technicians, analysis, or project managers. IS programmes are also required to have social systems, human behaviour, and being able to deal with gray area in organisational systems. [22]

Another important aspect of the course is seen to be the IS491 Group Research Project 1 and IS492 Group Senior Project 2 which is the sequel of the IS491. The project is intended to give the student a real industrial and academe experience. After graduation, the group is allowed to apply for grant to carry on their project.

4. Development Of Logical Ability

It is important to realize that, in addition to the formal course outlines, many critical skills and performance are incorporated throughout this curriculum and are expected to be a part of every course. The following should be all-encompassing throughout the curriculum:

• The individual development
• The oral and written communications skills
• The use of available tools for developing and managing projects
• The integration of a work ethic and principles of professionalism
• The continuous involvement of industry in providing experiences that support the curriculum’s philosophy.

The student needs to develop analytic capabilities through a study of probability and statistics, discrete mathematics, and quantitative methods. This is intended to provide him/her with tools to analyze data trends, 2) to give his/her the mathematical basis to understand digital devices and data representations, and 3) to support quality metrics. The course progression is considered to present a systems view of an enterprise information system and to introduce the students to team activities
early in the curriculum. Generally, as the course sequence advances the students learn about the development of individual components in an information system and the segment of information systems to which they can contribute. [20] When students have developed competence in the development of the systems components they are ready to put them together. [20] Near the end of the course sequence the curriculum turns once more to the total systems-centric view of an information system and provides the conceptual structure and the practical experience to enable the students to function in a team environment to design and evaluate an enterprise information system. A description of the curriculum and its contents are provided below.

5. Course Descriptions

The credit hours required for the entire course is 134 of which 50 is Information Systems modules. The main courses, which are a part of the curriculum, are listed below, followed by the complete course descriptions:

IS201 Fundamentals of Information Systems
IS211 IT Infrastructure
IS221 IS Analysis
IS331 IS Design
IS321 Enterprise Architecture
IS322 Data & Information Management
IS332 Information Security
IS323 Web Application Development
IS325 Introduction to Human-Computer Interaction
IS324 E-Business
IS421 Decision Support System
IS422 IS Project Management
IS491 Graduation Project 1
IS431 IS Strategy and Management
IS411 Computing, Ethics & Society
IS492 Graduation Project 2

**IS201 Fundamentals of Information Systems**
The focus of this course is on the key components of information systems - people, software, hardware, data, and communication technologies, and how these components can be integrated and managed to create competitive advantage. Though the knowledge of how IS provides a competitive advantage students will gain an understanding of how information is used in organisations and how IT enables improvement in quality, speed, and agility.

**IS251 Information Systems Innovation and New Technologies**
This course is designed to introduce students to new and innovative technologies and examine how these powerful systems have fundamentally reshaped modern organizations along with our society. It help student to understand services and information systems are developed, and how geographically 18 disperse virtual teams collaborate.

**IS211 IT Infrastructure**
This course provides an introduction to IT infrastructure issues for students majoring in Information Systems. It covers topics related to both computer and systems architecture and communication networks, with an overall focus on the services and capabilities that IT infrastructure solutions enable in an organizational context. It gives the students the knowledge and skills that they need for communicating effectively with professionals whose special focus is on hardware and systems software technology and for designing organizational processes and software solutions that require in-depth understanding of the IT infrastructure capabilities and limitations.
IS221 Information Systems Analysis
This module enables students to understand the activities systems and analysis. The analysis encompasses the problem definition phase, the feasibility phase. Case studies are utilized to examine various viewpoints that need to be traded off while encouraging critical thinking that is shared via class discussions. A blend of traditional development with current technologies is used to present a practical approach to system analysis.

IS331 Information Systems Design
This module discusses the processes, methods, techniques and tools that organizations use to determine how they should conduct their business, with a particular focus on how computer-based technologies can most effectively contribute to the way business is organized. The module covers a systematic methodology for analyzing a business problem or opportunity, articulating business requirements for the technology solution, specifying alternative approaches to acquiring the technology capabilities needed to address the business requirements. It enables students to work with business information, using appropriate technologies for developing systems.

IS321 Enterprise Architecture
This module explores the design, selection, implementation and management of enterprise IT solutions. The focus is on applications and infrastructure and their fit with the business. Students will learn frameworks and strategies for infrastructure management, system administration, content management, distributed computing, middleware, legacy system integration, system consolidation, and software selection, total cost of ownership calculation. Students also sharpen their ability to communicate technology architecture strategies concisely to a general business audience.

IS322 Data & Information Management
This module provides the students with an introduction to the core concepts in data and information management. It is centered around the core skills of identifying organizational information requirements, modeling them using conceptual data modeling techniques, converting the conceptual data models into relational data models and verifying its structural characteristics with normalization techniques, and implementing and utilizing a relational database using an industrial-strength database management system. The module will also include coverage of basic database administration tasks.

IS323 Web Application Development
This module teaches site developers who perform architectural planning, technology selection, or Web site programming tasks how to create enterprise-level Web sites that use component object model (COM) components on both the client and the server.

IS332 Information Security
The module covers the administration and management of security of enterprise information systems and networks. Principles and tools related to intrusion detection systems, vulnerability analysis, anomaly detection, computer forensics, application logging, auditing and data management, risk management, contingency planning and incident handling, digital immune systems, and alarms and responses. Security standards, evaluation and certification process; security planning, ethical and legal issues in information; privacy, traceability and cyber-evidence.

IS325 Introduction to Human-Computer Interaction
This course provides an introduction to the field of human-computer interaction (HCI), an interdisciplinary field that integrates cognitive psychology, design, computer science and others. Examining the human factors associated with information systems provides the students with knowledge to understand what influences usability and acceptance of IS. This course will examine human performance, components of technology, methods and techniques used in design and evaluation of IS.

IS324 E-Business
Explores what an e-business is and how it is managed. As an interdisciplinary topic encompassing both business and technology, e-business aspects and applications throughout the business world include commercial business, government, education, and health services. The major characteristics, opportunities, and limitations of this form of business are explored. Students study various issues and risks that exist in the rapidly changing world of e-business.

IS422 IS Project Management
This module discusses the processes, methods, techniques and tools that organizations use to manage their information systems projects. The module covers a systematic methodology for initiating, planning, executing, controlling, and closing
projects. This module assumes that project management in the modern organization is a complex team-based activity, where various types of technologies (including project management software as well as software to support group collaboration) are an inherent part of the project management process.

**IS431 IS Strategy and Management**
This module explores the issues and approaches in managing the information systems function in organizations and how the IS function integrates / supports / enables various types of organizational capabilities. It takes a senior management perspective in exploring the acquisition, development and implementation of plans and policies to achieve efficient and effective information systems. The module addresses issues relating to defining the high-level IS infrastructure and the systems that support the operational, administrative and strategic needs of the organization.

**IS411 Computing, Ethics & Society**
Electronic systems now reach into all levels of government, into the workplace, and into private lives to such an extent that even people without access to these systems are affected in significant ways by them. Information is a source of power and, increasingly, the key to prosperity among those with access to it. Consequently, developments in information systems also involve social and political relationships - and so make ethical considerations in how information is used all the more important.

**IS492 Graduation Project 1 & 2**
To give the student the chance to build an integrated project. The student will study in the first part (IS491 Research Project) how to analyze, learner and be engaged in research projects centering on questions raised in the research. In the second part, IS492 Graduation Project 2, the student will be able to apply what he/she has learned in the first by designing and implementing what questions raise in the first part.

6. Conclusion

This paper described a process for developing an outcome based objectives model (Helps, Lunt, & Anthony, 2005) for implementing an undergraduate information systems curriculum for the College of Computer Science & Engineering (Taibah University, Saudi Arabia). The curriculum is based on Accreditation Board for Engineering and Technology (ABET) accreditation and under the guiding principles of the IS 2009 Curriculum Guidelines for Undergraduate Degree Programs, Information Systems Association for Computing Machinery (ACM) and Association for Information Systems (AIS).

The curriculum provides a strong start and help student in developing the broad view of systems, personal and interpersonal skills which business and industry are required. The Information Systems program has been redesigned as part of the ongoing continuous improvement efforts to have the ABET compliant objectives to demonstrate knowledge of computer information systems principles and applications and be able to integrate this knowledge in a variety of business and interdisciplinary settings. This is also to help student understand and be able to analyze the important issues with regard to the social impact of advanced and emerging computer information technologies.

**References**

[3] Information Systems Department, BSc Information Systems Program, College of Computer Science and Engineering, Taibah University, Madinah, Saudi Arabia.