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Undergraduate Information Systems (IS) Curriculum and Career Track Development in United States Colleges and Universities: Assessment of Adherence to IS 2010 Curriculum Guidelines

Corbin Christopher Bell
Utah State University

UNDERGRADUATE INFORMATION SYSTEMS (IS) CURRICULUM AND CAREER TRACK DEVELOPMENT IN UNITED STATES COLLEGES AND UNIVERSITIES: ASSESSMENT OF ADHERENCE TO IS 2010 CURRICULUM GUIDELINES

by

Corbin Christopher Bell

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Approved:

Dr. Robert J. Mills, Ph.D. Major Professor	Dr. Nick Eastmond, Ph.D. Committee Member
Dr. Kelly J. Fadel, Ph.D. Committee Member	Dr. Jeffrey J. Johnson, Ph.D. Committee Member
Dr. David H. Olsen, Ph.D. Committee Member	Dr. Mark R. McLellan, Ph.D. Vice President for Research and Dean of the School of Graduate Studies

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ABSTRACT

Undergraduate Information Systems (IS) Curriculum and Career Track Development in United States Colleges and Universities: Assessment of Adherence to IS 2010 Curriculum Guidelines

by

Corbin Christopher Bell, Doctor of Philosophy

Utah State University, 2012

Major Professor: Robert J. Mills, Ph.D.
Department: Management Information Systems

The purpose of this study was to survey information systems (IS) curriculum in Association to Advance Collegiate Schools of Business (AACSB) accredited information systems programs across the United States, to evaluate current adherence to the IS 2010 curriculum guidelines, and to assess the number and type of career track developments initiated as a result of less stringent requirements in the new curriculum guidelines. In addition, an analysis was conducted to see if curriculum in AACSB-accredited information systems programs across the United States changed significantly since other similar evaluations reported in 1996 and 2006, and whether it is closer in adherence to the IS 2010 curriculum guidelines.

The results of this study provided a current-state description of IS curriculums in the United States, specifically: (a) percentage adherance relationships and between

AACSB-accredited information systems programs to IS 2010 curriculum guidelines; (b) defined curriculum profiles or latent class cluster characteristics of recent career track developments that have emerged; and (c) perceptions of adherence by the IS department faculty compared to the assessed adherence to IS 2010 curriculum guidelines.

In the findings, a comprehensive view of the landscape for adherence to IS curriculum guidelines is discussed, including the following. (a) There is a wide range of adherence to the IS curriculum guidelines. In addition, none of the IS program assessed were either entirely compliant or not compliant at all. (b) Some topics are widely covered (over half) as core curriculum while other topics are offered as core curriculum in less than half of IS programs. (c) Very few IS programs have formally implemented the IS 2010 career track guideline recommendations. (d) IS programs implementing formal career tracks specify a reasonably small number of track options for students to consider. (e) IS programs that include career tracks provide unique offerings beyond the proposed sample tracks depicted in the IS 2010 curriculum guidelines. (f) There appear to be reasonably well-defined categories or clusters of IS programs as related to IS 2010 curriculum guideline adherence. (g) IS program faculty describe a higher perceived adherence to IS curriculum guidelines than what is actually assessed in this study.

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PUBLIC ABSTRACT

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The objective of this study was to survey IS curriculum in AACSB-accredited Information Systems programs across the United States, to evaluate current adherence to the IS 2010 Curriculum Guidelines, and to assess the number and type of career track developments initiated as a result of less stringent requirements in the new curriculum guidelines. In addition, an analysis was conducted to see if curriculum in AACSB-accredited Information Systems programs across the United States changed significantly since other similar evaluations reported in 1996, and 2006, and whether it is closer in adherence to the IS 2010 curriculum guidelines.

The findings of this study provide a current-state description of IS curriculums in the United States, concluding: (a) there is a wide range of adherence to the IS curriculum guidelines. In addition, none of the IS program assessed were either entirely compliant or not compliant at all; (b) some topics are widely covered (over half) as core curriculum while other topics are offered as core curriculum in less than half of IS programs; (c) very few IS programs have formally implemented the IS 2010 career track guideline recommendations; (d) IS programs implementing formal career tracks specify a reasonably small number of track options for students to consider; (e) IS programs that include career tracks provide unique offerings beyond the proposed sample tracks depicted in the IS 2010 curriculum guidelines; (f) there appears to be reasonably well-defined categories or clusters of IS programs as related to IS 2010 curriculum guideline adherence; and (g) IS program faculty describe a higher perceived adherence to IS curriculum guidelines than what is actually assessed in this study.

The results of this study provide: (a) the IS community with information necessary to continue to adapt IS curriculum guidelines, standards and policies to relevant IS needs and demands; (b) IS departments with information and decision making ability for offering enhanced IS curricula; (c) IS students with the benefit of a more targeted and individualized curriculum; and (d) society the potential receipt of more prepared graduates entering the workforce as the next generation of IS professionals.

DEDICATION

This dissertation is dedicated to my wife, who is the love of my life

Diane Davis Bell

And our five wonderful children

Nikaila, Marissa, Maliya, Preston, and Danica

Thank you for supporting me in always following my dreams

and sustaining the passion to always be true to myself.

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To my parents-in-law, thank you for the continual love and support of my family and me; I love you and am grateful to you for raising such a wonderful daughter—Diane–

a magnificent woman with whom I am blessed as my eternal companion.

To my father, Christopher J Bell, you are my inspiration. I love you and am forever indebted to you for instilling in me the characteristics for success in life and the eternities. To my mother, Karen Harris Bell, and my Father in Heaven, with whom she now resides—you both molded me into the man that I now am. I love you both and will be forever indebted to you for your continual guidance, influence, and sustaining. Thank you for your sacrifices and many given blessings; I will honor such in this life and the eternities.

Corbin Christopher Bell

CONTENTS

Page

LIST OF TABLES

Table Page

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Research Problem and Study

In the early 19th century, an industrial revolution occurred that completely changed the business landscape. In the last few decades of the 20th century, a technological revolution analogous to the industrial revolution has occurred, likewise completely changing the business landscape anew. To survive in a highly competitive environment, businesses' are constantly assessing and looking for means to update tools and technology necessary to meet current business landscape needs. Fueled by these unprecedented advancements in technology, information systems (IS) departments continually face the need to rethink their standard concepts and principles, incorporating contemporary concepts and specialized technology into their curriculum. Some studies have been completed in past years to assess the state of IS curriculum in educational institutions in the United States. The most recent assessment of IS curriculum across the nations was published in 2006 (Kung, Yang, & Zhang), with a preceding study published in 1996 (Maier & Gambill). Kung and colleagues, and Maier and Gambill both completed studies that looked at the common course curriculum and programming languages found within Information Systems curriculum in primarily Association to Advance Collegiate Schools of Business (AACSB) accredited institutions.

Salisbury, Huber, Piercy, and Elder (2004) defined Information Systems as "building and using systems to manage information to advance organizational objectives" (p. 139). To elaborate, Salisbury and colleagues explained that according to their survey

respondents and panel participants in business and industry, “Information Systems as a discipline focuses on creating, supporting and enhancing organizational socio-technical systems to leverage the informational component of a business organization’s products, services, business processes or business relationships. The purpose is to advance the organization’s objectives” (p. 139). Additional widespread variety of applications in business and industry continues to make it difficult to keep IS faculty and curriculum content current (Ehie, 2002; Maier & Gambill, 1996).

Background of the Problem

In an attempt to incorporate current technology at the university level, IS educators continue to review and update IS curriculum models to assist IS programs at the various colleges and universities with curriculum improvement (Davis, Gorgone, Couger, Feinstein, & Longenecker, 1997; Gill & Hu, 1999; Gorgone & Gray, 2002; Gorgone et al., 2000, 2002; Gorgone, Gray, Stohr, Valacich, & Wigand, 2006; Kesner, 2008; Lee, Trauth, & Farwell, 1995; Maier & Gambill, 1996; Topi et al., 2007; Topi et al., 2008, 2010). As the complexity of specialized technology continues to increase at a rapid pace, research literature confirms that IS majors at colleges and universities across the nation have experienced a trend in decreasing student enrollment numbers (Choudhury, Lopes, & Arthur, 2010; Ferratt, Hall, Prasad, & Wynn, 2010; George, Valacich, & Valor, 2005; Plice & Reinig, 2007).

Many IS faculty have been frustrated with the “IS 2002: Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems” (Gorgone & Gray, 2002) for the stringent 10-course requirement. In some programs, the curriculum

consisted of less than 10 courses (Brookshire, Hunt, Yin, & Crews, 2007; Carlsson, Hedman, & Steen, 2010; Foltz & Renwick, 2011; George, 2005; Gorgone, Gray, Stohr, Valacich, & Wigand, 2005; Plice & Reinig, 2009; Salisbury et al., 2004; Topi et al., 2007; Vician et al., 2004). Due to AACSB accreditation standards, the IS 2002 model curriculum's stringent 10-course requirement left little to no room for alternative elective courses within IS programs existing in colleges of business. AACSB (2011b) required colleges of business to maintain certain standards for accreditation. Curriculum evaluation and development is a significant and critical task needed for many colleges of business facing accreditation renewal or application (AACSB, 2011b). IS faculty face the challenge of helping the schools of business keep curricula up-to-date and compliant with accreditation standards, by continual integration of functional knowledge into the curriculum (Gill & Hu, 1999; Hershley, 2002; Lee et al., 1995; Maier & Gambill, 1996).

IS departments began to feel the need to look at specific career tracks as early as the beginning of this century. The graduate curriculum model "MSIS 2006: Model Curriculum and Guidelines for Graduate Degree Programs in Information Systems," published by Gorgone and colleagues (2006), highlighted this objective in their graduate program guidelines. Plans of doing the same in the undergraduate program guidelines were under-way during the same time period. The task force listed one of the objectives for the revision of the IS 2002 model guidelines as "to provide greater flexibility for schools adopting the curriculum by separating the core of the curriculum from career track electives" (Topi et al., 2007, p. 731). The idea of career tracks would provide greater flexibility for schools implementing the curriculum guidelines and separate the

core of the curriculum from career track electives (Topi et al., 2007).

Additionally, Abraham and colleagues (2006) explained that IS career paths may be evolving toward more delineated or segmented skill tracks, especially with the continued trend of outsourcing. Regarding the student enrollment trends discussed previously, there are concerns that student enrollment may not continue move towards a reversed (positive) trend if IS departments do not cater to a student's individual needs and tendency towards specialization by offering career tracks (Choudhury et al., 2010; Ferratt et al., 2010; George et al., 2005).

A review of current literature and a general inspection of our country's educational institutions revealed a profile of a materialized trend toward specialization. Because of rapid changes in IS technology, and the quick adoption of new technologies by business, the IS field is beginning to see the need to impart technical skills in a proliferating set of sub-specialties, competencies, career orientations, career paths, or career tracks (Boyle, 2007; Carey, Galletta, Kim, Te'eni, & Wildemuth, 2004; Carlsson et al., 2010; Chand, 2004; Conger, Galup, Hernandez, Probst, & Venkataraman, 2007; Gorgone et al., 2006; Igbaria, Greenhaus, & Parasuraman, 1991; Kung et al., 2006; Peslak, 2005; Ramakrishna & Potosky, 2001; Sutcliffe, Chan, & Nakayama, 2005; Topi et al., 2007, 2010; Trimmer, Wiggins, & Beachboard, 2007).

Prior to and since the release of MSIS 2006 model curriculum guidelines, there has been discussion surrounding the need to develop career tracks unique to specific IS department and industry demands in a given area. Current literature suggests several career tracks that may match up with specialized positions within the IS workforce, to

include: (a) security in the IS curriculum (Anderson & Schwager, 2002); (b) enterprise resource planning (Boyle, 2007); (c) human computer interaction (Carey et al., 2004); (d) IT service management (Conger et al., 2007); (e) IS security and computer crime (Foltz & Renwick, 2011); (f) sourcing management (George, 2005); (g) business processes and functions (Peslak, 2005); (h) business analysis (Sidorova, 2007); and (i) healthcare computer information systems (Trimmer et al., 2007).

Curriculum models provide a foundation for local academic units to maintain academic programs consistent with regional, national, and global employment needs within the IS common body of knowledge. In the end, curriculum models are only posited as guidelines, and ultimately IS educators hold the responsibility to apply the model as they see fit in their respective programs. Furthermore, curriculum models may be of little use to the respective IS program if the model is too stringent to follow. When coupled with flexibility, a curriculum model could be helpful in providing guidance and affording institutions the ability to utilize local resources and satisfy local needs, requirements, and conditions. According to Firth, King, Koch, and Looney (2011), for the IS educator, "relevant teaching involves understanding the skills that graduates need and marketing those skills to potential employers" (p. 205).

If curriculum in IS programs is not continually updated to incorporate new technology concepts, and standards as dictated in cooperation by industry and academia, then IS programs may quickly succumb to teaching obsolete material and instructing students in outdated paradigms. IS programs evaluate their own academic programs on an ongoing basis to ensure they are in tune with the needs and trends of industry. During

internal program evaluations, understanding the current career track offerings amongst IS programs throughout the United States may be useful. Logically, one may assume IS programs are not instructing the exact same set of content, or the exact same curricula; however, the most recent general review of IS curriculum was conducted roughly six years ago by Kung and colleagues (2006), and the preceding review 10 years before that in 1996 (Maier & Gambill, 1996).

Maier and Gambill (1996) published a study that looked at the common course curriculum and programming languages found within IS curriculum in AACSB accredited institutions. At the time the study was completed, there were no published IS curriculum guidelines; therefore, assessment against any suggested course or curriculum guidelines did not occur. This study primarily looked at the current IS curriculum landscape, the variety of IS courses being taught across the nation, and the different programming languages of interest being taught at the time. The study published by Kung and colleagues (2006), 10 years after the study by Maier and Gambill, looked at the same characteristics, to include a comparison of the current courses being taught relevant to those suggested by the recently published IS 2002 model curiculum, and the Accreditation Board for Engineering and Technology (ABET) IS curriculum standards. This study looked at curriculum of IS departments found within the schools of business across the nation, which assessed mostly IS curriculum in AACSB accredited institutions.

A review of literature shows that IS departments have faced the continual challenge of helping schools of business keep curricula up-to-date and have felt the need

to look at specific career tracks for their curriculum match explicit department skill set, and the regional or geographical business demands. Current and past studies of skills required by IS professionals emphasize the need for continual reassessment of IS educational curriculum to afford regular updates to curriculum content, concepts, and principles—incorporating newer concepts and specialized technology into the curriculum, suggestively within a specialization, or career track approach (Athey & Plotnicki, 1991; Brookshire et al., 2007; Carlsson et al., 2010; Foltz & Renwick, 2011; George, 2005; Gorgone et al., 2005; Kesner, 2008; Lee et al., 1995; Leitheiser, 1992; Mackowiak, 1991; Plice & Reinig, 2009; Salisbury et al., 2004; Topi et al., 2007; Trauth, Farwell, & Lee, 1993; Vician et al., 2004).

The latest report on model curriculum work in the Information Systems discipline is "IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems" (Topi et al., 2010). The IS 2002 curriculum model is superseded by IS 2010 which has increased flexibility in the IS 2010 curriculum guidelines. As such, one might suppose IS programs have already begun to break out of the box and develop particular career tracks within their programs, feeling in the past several years the need to pursue the unique trends coming from their faculty skill set, and local industry demands.

Statement of the Problem

The review of literature identified various discussions related to curriculum models and IS curriculum reports on the need to develop career tracks unique to the specific IS department. Unfortunately, the reports include a 1996 and 2006 examination of what IS programs were offering in their curriculum, leaving an important gap in the

literature addressing an up-to-date description of what IS programs are teaching, how they are organized, if they are accommodating IS 2010 curriculum guidelines, and if IS programs are implementing any career track options. To assist faculty in making important curriculum decisions, an examination of current IS undergraduate degree programs and their adherence to IS 2010 curriculum guidelines is needed. Additionally, IS departments, educators, and industry practicioners across the nation can benefit from verification of specifics concerning particular career tracks offered in IS programs unique to their curriculum and faculty skill set.

Purpose of the Study

The purpose of this study was to assess, assemble, and analyze data derived from AACSB-accredited undergraduate degrees programs in IS in United States colleges and universities. This study intended to stimulate critical examination of curriculum content, as compared to IS 2010 curriculum guidelines, and explore apparent trends in potential career tracks within IS curricula. The four derivative purposes were as follows.

1. Report the findings from a survey of randomly selected IS undergraduate degrees program, examine the core curriculum based upon the recent and current IS 2010 curriculum guidelines, and describe the current state of AACSB accredited IS undergraduate degrees program curriculum across the nation.

2. Complete a comparative analysis of the current state with prior studies conducted in 1995 (Maier & Gambill, 1996) and 2005 (Kung et al., 2006).

3. Examine the career track trends developing in association with IS 2010 curriculum guidelines adherence, and aggregate the common topics.

4. Conduct a cluster analysis to see if specific curriculum performance profiles emerge depicting different relationships among required courses, elective courses, capstone courses, career track offerings, and the state of adherence to the IS 2010 curriculum guidelines.

A follow-up telephone interview survey with IS department heads was conducted after the initial examination of data retrieved from a random sample of IS department websites and course catalogues has been completed, with the intent to collect undiscovered data in the areas of (a) any required core topics not discovered in the required courses, but possibly offered elsewhere such as an elective, (b) any career track offerings not discovered in the curriculum, but possibly labeled outside of evolving nomenclature, (c) the department heads or directors of undergraduate programs perceptions of adherence to IS 2010 curriculum guidelines, and (d) the subsequent department's point of view on the advantages or disadvantages to following or not following the IS 2010 curriculum guidelines, and to offering career track options in the IS curriculum.

A comparison approach brings forward current-state statistics for compliance and noncompliance to IS 2010 curriculum guidelines, past-state statistics of core curriculum and course offerings, and future-state trends of career track offerings in this field. The findings should provide the community of IS with an up-to-date source on the IS undergraduate program's adherence to the IS 2010 curriculum guidelines and IS specialization and career track trends across the nation. Results may also provide current and future professionals in the field with direction and opportunity to enhance their

personal knowledge and skills in IS, making them even more effective in their chosen profession and specialization. In addition to future success of IS practitioners, regular evaluation of IS programs can also help provide improvement and growth in curriculum and the profession. There are various other subpurposes of this study; they are presented in detail in the "Significance of the Study" section below.

The review of current literature failed to yield any current description of IS program course curriculum offerings and organization, identification of adherence of IS program curriculum to IS 2010 curriculum guidelines, or any trends for career track options in IS program curricula (as suggested by multiple recent authors). The empirical focus of this dissertation is limited to examination of IS undergraduate degree programs offered by AACSB-accredited business schools in the United States, with the intent to provide an up-to-date description of what IS programs are teaching, how they are organized, if they are accommodating IS 2010 curriculum guidelines, and if (with the increased flexibility now present in the IS 2010 curriculum guidelines) IS programs are implementing any career track options in their programs. Specifically, this study explored the following research questions based on information obtained in the review of literature.

1. What is the current adherence among IS courses and topic areas being offered in IS curriculum across the nation, with those suggested by IS 2010 curriculum guidelines?

    a. What percentage of current IS courses and topics being offered in IS curriculum programs conform to the recommendations suggested by IS 2010

curriculum guidelines?

b. What percentage of IS undergraduate programs are offering career tracks options in their curriculum, and:

    i. Among these, what is the average number of career tracks offered?

    ii. Among the selected sample, what are the different career tracks offered?

    iii. Among the selected sample, what are the most common career tracks offered?

c. How have the percentages of IS courses and topics currently being offered changed over time, as compared to the 2006 state of the IS curriculum article (Kung et al., 2006)?

2. What specific curriculum profiles (clusters) emerge based on data collected including number of: required courses, elective courses, career track offerings, and core courses that adhere to the IS 2010 curriculum guidelines?

3. How do perceptions of adherence (subjective data collected) by the department heads, or directors of undergraduate programs compare to the assessed adherence (objective data collected) to IS 2010 curriculum guidelines?

Significance of the Study

Education is designed to prepare students for contemporary roles; therefore, education equips students with skills to fulfill their job requirements; this is the main premise of accreditation standards. To cater to the increasing technological demand of IS, a number of academic professionals have suggested varying specializations, or career

track development within IS undergraduate program curriculum. Since there has been insufficient research conducted on the subject of available career tracks in undergraduate degree programs in information systems, there is inadequate information to analyze utility of career tracks in IS curriculum.

Comparative data in this field would be of value to institutions in long-range planning. Research and documentation of findings in this area would also assist academic counselors in IS programs in directing students to appropriate areas of study, specialization, and potential career track options. The need for this type of data is noticeably beneficial; however, there is a gap in present literature of any current description of IS programs course curriculum offerings and organization, identification of adherence of IS program curriculum to IS 2010 curriculum guidelines, and any trends for career track options in IS program curricula. Visible IS undergraduate programs should be evaluated to reveal emerging career track trends in this field. Such evaluation could encourage the continual development and honing of standards or the perspective programs for accreditation and show plausible connection to potential industry needs and specific knowledge and skills specialization opportunities.

Additionally, leaders in the IS academic community continue to reference the current model IS 2010 curriculum guidelines, and have done so for many years with the past models; however, there is no modern evidence to support whether or not the guidelines are being followed by IS departments across the nation. Without current data on adherence to IS curriculum guidelines, the IS community has no means to infer if continued investment of time, energy, and resources should be given to support

curriculum model development and advancement. An evaluation of undergraduate degree programs in information systems across the country, and the subsequent comprehensive view of the landscape for adherence to IS curriculum guidelines, and listing of emerging IS career track options would be a valuable contribution to the field.

The results of this study should offer future planners at national universities a unique glimpse as to how to incorporate suitable career tracks within IS curriculum and prepare future program graduates with specialization in niche information system positions in business and industry. Specifically, this study could serve as a reference for: (a) departments of information systems in determination of curriculum improvements, advice to candidates, and revisions of course offerings, (b) academic advisement, (c) institutions in long range planning procedures, (d) professional organizations and information systems departments in business in the understanding of available career track offerings and subsequent specialization of information systems professionals (e) undergraduate students in their decision regarding specific programs, and (f) prospective employers in the establishment of qualifications and selection of job candidates.

Definition of Terms

Related terms in this research study are constitutively defined using the following basic definitions,

Accreditation: "Accreditation focuses on the quality of education. Standards set demanding but realistic thresholds, challenge educators to pursue continuous improvement, and guide improvement in educational programs…. Accreditation

observes, recognizes, and sometimes motivates educational quality created within the institution" (AACSB, 2011b, p. 3).

ABET: The Accreditation Board for Engineering and Technology "is the recognized accreditor for college and university programs in applied science, computing, engineering, and technology. Among the most respected accreditation organizations in the U.S., ABET has provided leadership and quality assurance in higher education for over 75 years" (ABET, 2011, p. 1).

Assessment: "One or more processes that identify, collect, and prepare data to evaluate the attainment of student outcomes and program educational objectives. Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the outcome or objective being measured" (ABET, 2011b, p. 2).

Association to Advance Collegiate Schools of Business (AACSB): AACSB "promotes continuous quality improvement in management education. The association was founded in 1916, and standards for business administration were first set in 1919…. The association regularly reviews accreditation standards for opportunities to improve their relevance and currency" (AACSB, 2011b, p. 2).

Baccalaureate or undergraduate degree: Merriam-Webster defined baccalaureate as "the degree of bachelor conferred by universities and colleges" (Merriam-Webster Online Dictionary, 2011).

Capstone course: "the high point: crowning achievement" (Merriam-Webster Online Dictionary, 2011); a course "that should be either the last or one of the last courses that students take" (Topi et al., 2010, p. 384).

Career track: "A short list of core topics that are essential to information systems programs, allowing them to customize other topics by creating a list of electives …can be associated with one or several domains" (Topi et al., 2010, p. 371).

Computer: Merriam-Webster defined a computer as "one that computes; *specifically*: a programmable usually electronic device that can store, retrieve, and process data" (Merriam-Webster Online Dictionary, 2011).

Computer engineering: "Involves the study of hardware, software, communications, and the interaction among them. Its curriculum focuses on the theories, principles, and practices of traditional electrical engineering and mathematics and applies them to the problems of designing computers and computer-based devices" (Shackelford et al., 2005, p. 13).

Computer science: "Spans a wide range, from its theoretical and algorithmic foundations to cutting-edge developments in robotics, computer vision, intelligent systems, bioinformatics, and other exciting areas…computer science offers a comprehensive foundation that permits graduates to adapt to new technologies and ideas" (Shackelford et al., 2005, p. 13).

Core courses: Courses "that specify the required knowledge units and topics that have to be covered in every Information Systems program" (Topi et al., 2010, p. 383).

Curriculum: "Consistent of Core and Electives courses, an overall structure for the courses that focus on IS Specific Skills and Knowledge" (Topi et al., 2010, p. 381).

Database: Merriam-Webster defined a database as "a usually large collection of data organized especially for rapid search and retrieval (as by a computer)" (Merriam-

Webster Online Dictionary, 2011).

Data processing: Merriam-Webster defined data processing as "the converting of raw data to machine-readable form and its subsequent processing (as storing, updating, rearranging, or printing out) by a computer" (Merriam-Webster Online Dictionary, 2011).

Department: Merriam-Webster defined a department as "a division of a college or school giving instruction in a particular subject" (Merriam-Webster Online Dictionary, 2011).

Discipline: Merriam-Webster defined a discipline as "a field of study" (Merriam-Webster Online Dictionary, 2011), which adds some confusion to distinguishing the terms field and discipline. Sommer (2000) clarified that the term field is based on a word meaning "earth" or "land," and is an area or sphere of action, operation, or investigation, a subject of activity or specialization.

Elective course: Courses "offered in the curriculum at any point that fits course-specific prerequisite requirements…. They expand on the coverage provided by the core course within a specific knowledge area or introduce new knowledge areas to the curriculum" (Topi et al., 2010, pp. 383-384).

Evaluation: "One or more processes for interpreting the data and evidence accumulated through assessment processes. Evaluation determines the extent to which student outcomes and program educational objectives are being attained. Evaluation results in decisions and actions regarding program improvement" (ABET, 2011b, p. 2).

Faculty: Merriam-Webster defined faculty as "the teaching and administrative staff and those members of the administration having academic rank in an educational

institution" (Merriam-Webster Online Dictionary, 2011).

Information systems: Focuses on integration of "information technology solutions and business processes to meet the information needs of businesses and other enterprises, enabling them to achieve their objectives in an effective, efficient way.…emphasizes information, and views technology as an instrument for generating, processing, and distributing information" (Shackelford et al., 2005, p. 14). Also, the name used for a degree program in data processing in the school of business.

Information technology: The term "information technology is often used to refer to all of computing. In academia, it refers to undergraduate degree programs that prepare students to meet the computer technology needs of business, government, healthcare, schools, and other kinds of organizations" (Shackelford et al., 2005, p. 14).

Institution: Unless otherwise specified in this document, refers to a college or university.

Interdiscipline: Is a meeting place between two or more disciplines, such as social psychology (Sommer, 2000).

Introductory course: The computer related course that often satisfies the core course requirement set by the AACSB.

Major (area of study): Merriam-Webster defined a major as "of or relating to a subject of academic study chosen as a field of specialization" (Merriam-Webster Online Dictionary, 2011).

Operating systems: Basic course coverage of hardware and "software that controls the operation of a computer and directs the processing of programs (as by

assigning storage space in memory and controlling input and output functions)" (Merriam-Webster Online Dictionary, 2011).

Perceptions: The views or opinions that an individual has about a topic or experience.

Practitioners: Individuals who are employed in the IS professions and apply the skills and knowledge of IS.

Profession: Merriam-Webster defined a profession as "a calling requiring specialized knowledge and often long and intensive academic preparation" (Merriam-Webster Online Dictionary, 2011).

Program: Semi-analogous to department, an outline of the order for the curriculum of a division of a college or school giving instruction in a particular subject.

Program educational objectives: "Broad statements that describe what graduates are expected to attain within a few years of graduation. Program educational objectives are based on the needs of the program's constituencies" (ABET, 2011, p. 2).

Programming: The act of writing or preparing a computer program using a programming language.

Programming language: A specific language used to prepare computer programs, such as COBOL, Visual Basic (VB), C++, Java, and so forth.

Software engineering: "The discipline of developing and maintaining software systems that behave reliably and efficiently, are affordable to develop and maintain, and satisfy all the requirements that customers have defined for them" (Shackelford et al., 2005, p. 14).

Student: Merriam-Webster defined a student as "one who attends school, one who studies: an attentive and systematic observer" (Merriam-Webster Online Dictionary, 2011).

Student outcomes: "Describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program" (ABET, 2011, p. 2).

Standard: Merriam-Webster defined a standard as "something set up and established by authority as a rule for the measure of quantity, weight, extent, value, or quality" (Merriam-Webster Online Dictionary, 2011).

Subdiscipline: According to Sommer (2000), subdiscipline is a specialty area within a discipline that develops its own organizations and training programs, often within disciplinary departments but sometimes in independent departments, e.g. criminal sociology is a subdiscipline, mostly taught in sociology departments but occasionally taught in freestanding departments.

Summary and Organization of the Dissertation

Chapter I contains a brief introduction to the study; the main purpose of this chapter was to describe the definitions and the directions of this study. The purpose of this study, the research questions to be answered, and the significance of the study was delineated. Chapter I also elaborates upon the definitions of terms found within IS curriculum evaluation that were used in this study, which are the definitions that were utilized in the above-mentioned initiatives. This study presents the results of a survey of

IS curriculum in the United States, and evaluates current IS curriculum for adherence to the IS 2010: Curriculum Guidelines, and assesses the number and type of career tracks that have sprung forward as a result of less stringent requirements in the new curriculum guidelines.

The literature review contained in Chapter II, consists of nine sections. The first describes the search techniques used to discover all of the current related literature in the field, relevant to the topic of study. The second section of Chapter II describes a background overview to the topic of study and the connected issues. The third section discusses changes in the IS discipline. The fourth section gives insight into the past discussions on managerial versus technical skill sets. The fifth section elaborates upon the trend toward IS professional career tracks. The sixth section reviews the importance of curriculum evaluation and accreditation. The seventh section is a presentation of prior research that deals with regular assessment and update of IS curriculum, especially in technology-based areas and consistent advancements in industry. The eighth section describes recent research and the need to assess career track development trends in IS curriculum. The ninth section is a summary of the review of literature.

In Chapter III, the research methodology used in this study is discussed and the research questions, on which the dissertation is based, are enumerated. The statistical analysis to be used to answer the research questions is described, along with the design and results of the pilot study used to test the survey of data from department websites and institutional course catalogues, and follow-up interviews with information systems department heads, or directors of undergraduate programs. The research methodology

used was conducted to identify curriculum changes in AACSB-accredited IS programs across the United States, and also assessed the characteristics of recent career track developments in AACSB accredited programs. In addition, an analysis was conducted to see if—based upon the current academic institution technological and communications standard of today—curriculum in AACSB accredited IS programs across the United States has changed significantly since other similar evaluations conducted in 1995 and 2005, and whether it is closer in adherence to the IS 2010 curriculum guidelines.

Chapter IV presents an analysis of the results of the statistical tests for the research questions. After data analysis is conducted, the findings for this study are presented. First, after both phases of the study were complete, data were tabulated into the two separate excel spreadsheets appertaining to the two parts of the study, and subsequently imported in to SPSS version 17.0 for analysis. Response rates are then calculated for both phases of the survey. Within the functionality of SPSS, various tests were run to test for normality and goodness of fit, from which the data were shown to be robust to violations of normality. Analyses were also performed on the individual survey data sets to determine differences in the two populations. After the second part of this study or follow-up interviews were conducted, a post hoc statistical sensitivity power analysis was completed to determine the minimal detectable effect size, with "Gpower" for a one-tailed test using the updated post hoc *N*. Descriptive statistics (means, standard deviations, frequencies, and percentages) were run for the study variables of interest to summarize the data as appropriate. The relevant Pearson *r* bivariate correlation statistics was produced and a paired-samples *t* test was run to test for significant difference

statistics, allowing an effect size test to be run to determine the magnitude of the difference found. After all pertinent analyses were complete in SPSS version 17.0, the same two SPSS data files were imported into latent gold version 4.0 to conduct a latent class cluster analysis. The results of these analyses were used to answer the three research questions. Results of these analyses are presented in this chapter.

In Chapter V, the purpose of the study and problem around which the study was formed and executed is reiterated and summed up, after which the research procedures, data analysis and findings are summarized. Then the conclusions formed and the study findings are stated and submitted. After which a discussion about the various themes and trends are presented with possible areas of future research also suggested.

CHAPTER II

REVIEW OF RELATED LITERATURE

Current State Findings in the Review of Related Literature

The review of literature identified factors influencing the trends in IS curriculum revision, and focused on the recent publication of "IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems Curriculum" (Topi et al., 2010), the subsequent adherence to those guidelines by IS departments within AACSB accredited schools across the United States, and any relevant and resultant career track within the respective IS curriculum. Review of this literature identifies the strengths and weaknesses of the current empirical and conceptual work in the field; it also highlights key points of intersection and departure, thereby illuminating opportunities for further research.

Search Techniques

To effectively understand the appropriateness and contribution of a research study to the associated field, it is important to consider the context. In the literature search for this study, several literature review search techniques were utilized to provide a complete perspective of the related literature. To obtain the most inclusive results possible, a combination of techniques was used to improve the likelihood of a comprehensive appraisal of the relevant literature. The initial search for related literature began using generic databases, with a focus on the proposed study: factors influencing the trends in IS

curriculum revision, the new IS 2010 curriculum guidelines, and any relevant and resultant career track within the respective IS curriculum.

Before any study can successfully progress, the constructs being researched must be operationally defined. Fortunately, because IS is a comparatively young discipline, using combination of broad operational constructs returned a somewhat manageable amount of related literature. After location and review of the key IS curriculum models and a few related articles, trends began to emerge with specific journals whose subject material frequently featured the proposed topics. Overall, of the 118 articles, books, dissertations, and reports reviewed in significant depth, 73 were actually related to the topics of the proposed study. Because IS research consists of a relatively young establishment, one would expect a relatively small base of published research, but the general unavailability of published research looking empirically at IS curriculum evaluation was nevertheless surprising.

The researcher utilized the Utah State University e-Journal database (EBSCOHost, Digital Dissertation, National Digital Library of Thesis and Dissertations, etc.) search tool, and library catalog to find resources pertaining to the proposed study, and for any related research studies.

Specifically, in the initial literature search for this study, varying combinations of the following search strings used were: [(SU “graduate degree” or KW “graduate degree”)], [(SU “undergraduate degree” or KW “undergraduate degree”)], [(SU “graduate program” or KW “graduate program”)], [(SU “undergraduate program” or KW “undergraduate program”)], [(SU “career track” or KW “career track”)], [(SU “career

path" or KW "career path ")], [(SU "program evaluation" or KW "program evaluation")], [(SU "comparative analysis" or KW "comparative analysis")], [(SU "Information Systems" or KW "Information Systems")], [(SU "Information Systems curriculum" or KW "Information Systems curriculum")], [(SU "curriculum evaluation" or KW "curriculum evaluation")], [(SU "MSIS 2000" or KW "MSIS 2000")], [(SU "IS2002" or KW " IS2002")], [(SU "IS 2002" or KW " IS 2002")], [(SU "MSIS 2006" or KW "MSIS 2006")], [(SU "IS 2010" or KW "IS 2010")], [(SU "model curriculum" or KW "model curriculum")], [(SU "curriculum guidelines" or KW "curriculum guidelines")], [(SU "AACSB" or KW "AACSB")], [(SU "AACSB accreditation" or KW "accreditation")], [(SU "management Information Systems" or KW "management Information Systems")], [(SU "MIS" or KW "MIS")], [(SU "computer Information Systems" or KW "computer Information Systems")], [(SU "CIS" or KW "CIS")], and [(SU "emphasis" or KW "emphasis")].

Varying combinations of these search strings were used in the Digital Thesis and Dissertation database and resulted in 2,209 records. After review of the abstracts was complete, the potential related dissertation studies were narrowed down to 36. After additional detailed review of the contents of the 36 dissertation studies was complete, all potentially related dissertation studies were deemed either unrelated, or extremely outdated. Additionally, varying combinations of these search strings were used in the National Digital Library of Thesis and Dissertations database and resulted in 3250 records. After review of the abstracts was complete, the potential related dissertation studies were narrowed down to 28. After additional detailed review of the contents of the

28 dissertation studies was complete, all potentially related dissertation studies were also deemed either unrelated, or extremely outdated. It was determined that because of the unrelated and outdated nature of these dissertations, the only useful aspect of three of these dissertations was to give the researcher a general history and understanding of the typical themes in Information Systems, and/or curriculum evaluation. According to the literature research, no meta-analysis studies were found to be conducted in this topic area.

The varying combinations of these search strings used in the EBSCOHost electronic journals database (Academic Search Premiere, Business Source Premiere, Computer Source, ERIC, etc.) resulted in 7,718 articles returned. The scope of related literature search was narrowed to peer-reviewed journals, using the same search term data set, looking for all relevant studies. This resulted in refinement down to 107 potentially related articles. After review of the abstracts was complete, the potentially related articles were narrowed down to 73. All but 11 of the 73 articles were available in full text; those 11 were obtained from the university's interlibrary loan program.

As relevant articles were found, they were added to an Excel spreadsheet library and notated with their main contributing or detracting points for use in this study. After completion of an additional detailed review of the contents of the 73 articles from the e-journal database search, the number was narrowed down to 54 related articles. From the 73 studies reviewed, the references cited led to additional 31 related articles and seven reports (many from nonpeer-reviewed publications) that were subsequently added to the collection with some repetition of the aforementioned procedures. The 31 additional referenced articles were narrowed down to 15 related articles, and the seven referenced

reports were narrowed down to three that related to the research topics.

Finally, a Google Scholar search was conducted, using the same search terms, to identify studies which may have been missed in the previous methods. The returned results that were deemed related to the research topics were mostly redundant with what had been found in the prior related literature search. In all, three additional related articles were discovered, and one book concerning a large academic study of AACSB business programs was discovered that are all referenced in this chapter of the review of related literature.

Background Overview

Complexity of specialized technology continues to expand at a rapid pace. The field of IS continues to face continual advancement of technology combined with the variety of applications in business and industry, making it difficult to keep the instructing faculty and curriculum content current (Ehie, 2002; Maier & Gambill, 1996). IS departments continue to rethink their standard concepts and principles and incorporate newer concepts and specialized technology into their curriculum.

In an attempt to incorporate current technology at the university level, Information Systems educators continue to review and update IS curriculum models to assist IS programs at the various colleges and universities with curriculum improvement. In 1995, in a combined effort by the Association for Computing Machinery (ACM), the Association for Information Systems (AIS), and the Data Processing Management Association (DPMA—now the Association for Information Technology Professionals or

AITP), Couger and colleagues (1995). published “IS’95: Guideline for Undergraduate IS Curriculum.”

After representation of the model at various conferences, feedback was incorporated and in 1997 the IS community (Davis et al., 1997) published “IS ‘97 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems.” In 2000, the IS community (Gorgone et al., 2000) published the “MSIS 2000: Model Curriculum and Guidelines for Graduate Degree Programs in Information Systems.”

In 2002, the IS community (Gorgone et al., 2002) published the “IS 2002: Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems.” In 2006, the IS community (Gorgone et al., 2006) published an updated model for graduate degree programs, the “MSIS 2006: Model Curriculum and Guidelines for Graduate Degree Programs in Information Systems.” And, in 2010 the Information Systems community (Topi et al., 2010) published an updated model for undergraduate degree programs, the “IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems.”

Changes in the Information Systems Discipline

At the beginning of the century, the IS ‘97 model curriculum was under revision and being prepared for publication in the IS 2002 model curriculum. During that time, to compensate for the continued growth in the field and to prepare graduates for competent practice inside industry, IS educators responded by adding more and more content and

requirements to their curriculum. This trend occurred in parallel with the incorporation of additional requirements into the IS 2002 curriculum model. However, research literature confirms that, at the same time, a different trend began to occur and has proliferated forward over the last several years—declining enrollment numbers of students across the nation in IS majors at colleges and universities (Choudhury et al., 2010; Ferratt et al., 2010; George et al., 2005; Plice & Reinig, 2007).

In a recent study, Granger, Dick, Jacobson, and Van Slyke (2007) found evidence that the causes in enrollment decline were resulting in part of pervasive "myths" and other mistaken student perceptions. Some examples listed were perceptions that: all IS jobs will move offshore to India and China, salaries in the field are depressed because of competition from offshore labor, or the job situation is not as strong as it actually is. There is also speculation that the new rigor in requirements and complexity of the curriculum is causing this decrease of interest in the field, while others attribute it to the rapid build-up of demand for anything related to the Internet and then the ensuing crash of the dot.com and telecom companies in the first part of the 21st century (Aspray, Mayadas, & Vardi, 2006; George et al., 2005; Ives et al., 2002).

In the article "Addressing the Credibility Crisis in IS," Firth and colleagues (2011) explained that the perception of available IS jobs was low because of a lack of understanding of the secondary IT sector and unaccounted demand for IS practitioners. Academia has not adequately educated IS students on a key misperception, that is, the lack of

> recognition that IS graduates will obtain jobs in one of two IT sectors: the primary IT sector or the secondary IT sector. The primary IT sectors encompasses the

> "Google's" and the "Microsoft's" of the world. These are companies that produce hardware, software, and information goods. The secondary IT sector, in contrast, supports business needs through the application of IS. This sector includes the IS work that is done in other industries, such as healthcare, distribution, and transportation. It is crucial that IS academics understand this distinction and communicate it to potential students, employers, and university administration. The reason is that, if "the IS field" is only understood to be the primary IT sector, then the actual number of available employment opportunities will be significantly undercounted. To illustrate the point, one of the panelists gave an example of a state-wide study of employment sectors. As originally conceived, the "information and communications cluster" was defined only as jobs in the primary IT sectors. IS jobs in banking, healthcare, education, government, etc., were being classified not as IS jobs but as jobs in these other sectors. The result was that approximately 75 percent of the actual IS jobs in the state were going unrecognized as such. Hence, it is crucial to our survival that IS professionals (both academic and practitioners) continue to clarify the *real scope and size* of IS employment opportunities. (p. 205)

Even with the downturn in enrollment in IS Programs, the demand for IS workers in the United States continues to be significant and grows steadily (Abraham et al., 2006; Brookshire et al., 2007; Peslak, 2005; Reif & Mitri, 2005; Scott, Fuller, Macindoe, & Joshi, 2009). According to the Bureau of Labor Statistics (Lacey & Wright, 2009), long-term occupational employment projections suggest that IS jobs, found within the computer and mathematical occupations section, are expected to increase from the years 2008-2018 by 785,700 in number, a 22.2% increase, surpassed only by healthcare support occupations projected at a 28.8% increase. Additionally, Woods (2009) gave a further breakdown of IS-related jobs, sharing that five of the top 20 fastest-growing occupations in the United States between 2008 and 2018 are IS-related occupations.

Yet oddly enough, the stable increase in demand for IS workers has not completely dispelled the myths of the past, or translated into high enrollments in IS academic programs. One of these speculations might have carried some merit in the past

and is possibly still relevant today. According to Maier and Gambill (1996), it was suggested that students and the choice of Information Systems as a "major" area of study are influenced by a perception of a disconnect between the expressed needs of the business community and the design of IS curriculum.

Managerial Versus Technical Skill Sets

In 1991, Igbaria and colleagues substantiated that business and industry began to look specifically for two main career orientations in IS graduates—managerial and technical. Practicioners in business and industry were also subscribing to these two main career orientations. This was confirmed 1 year later (1992) in a study published by Crepeau, Crook, Goslar, and McMurtrey. They pointed out that their research showed a third career orientation was emerging; an orientation towards positions that were accompanied by stability. Ramakrishna and Potosky (2001) argued that trend has shifted, leading up and through the turn of the century, stating:

> The percentage of individuals holding managerial or technical competence as their dominant career orientation has changed from about 44% to about 8%. Thus the data confirmed our hypothesis that managerial and technical competence are not the prevalent dominant career orientations and that a significant shift has taken place. It appears that new potential dominant career orientations are geographic security, organizational stability, and variety. (p. 86)

This study made no mention as to the perceived cause of this shift in career orientations. Gupta and Watcher (1998) identified the business need to include more managerial experience in IS curriculum about 14 years ago. This literature review confirmed that many other authors of current literature have identified this need, as well as the inconsistency that has arisen between the expressed needs of the business community and

the design of IS curriculum. Specifically, a technical focus prevails in many IS management programs, whereas business and industry has expressed the need to integrate an additional managerial point of view (Abraham et al., 2006; Bullen, Abraham, Gallagar, Simon, & Zweig, 2009; Ehie, 2002; Gupta & Wachter, 1998; Kesner, 2008; Kung et al., 2006; Plice & Reinig, 2007, 2009; Sutcliffe et al., 2005).

In a recent study (2007), Plice and Reinig's findings suggested current practitioners in industry hold this same career orientation, summarizing that "as the graduates mature in their careers, they increasingly tend to value business content and are more likely to perceive that the technical aspects of the undergraduate curriculum should not be increased at the expense of the business content" (p. 29). In a Plice and Reinig (2009) continuation study 2 years later, study respondents' comments confirmed the prior conclusion, as noted in the following statement:

> The main conclusions from the analysis are the following: (a) The IS program should have opportunities built in for the development of interpersonal communications skills; (b) a broad range of technical topics should be covered in the curriculum, rather than a focus on in-depth coverage of a few specific hardware or software environments or programming languages; and (c) a core competency in systems development, project management, and business and managerial skills should be acquired by students in the IS program. (p. 147)

Additionally, in their 2007 research, Plice and Reinig found "a renewed emphasis on group projects, presentations, and written communications skills throughout the curriculum might be the most important set of actions we can take to help our graduates obtain jobs and advance in their careers" (p. 29). This is one perspective where current literature confirms that the IS 2002 model curriculum has maintained a close alignment to business and industry needs, identified in this literature review (see Figure 1).

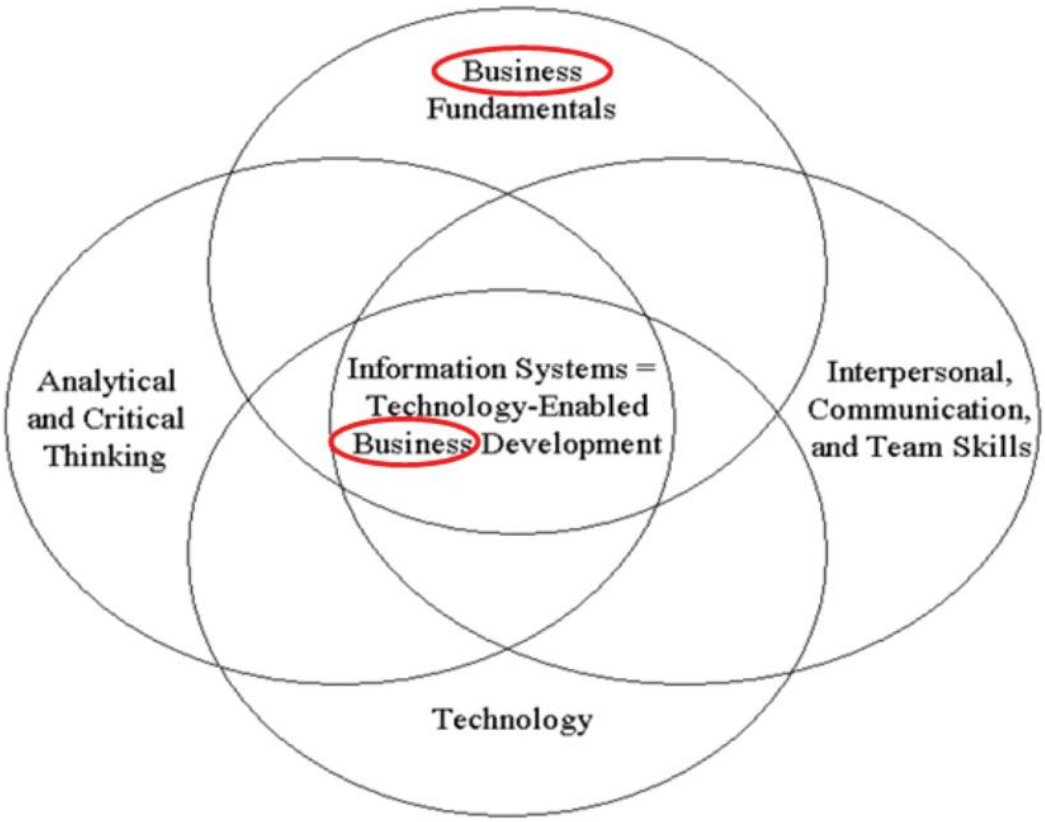


Figure 1. Demonstration of close linkage between information systems and business in IS 2002 (Topi et al., 2010, p. 371; copyright AIS, reprinted by permission—see Appendix F).

Gupta and Watcher (1998) identified this business need in their study 14 years ago. They pointed out that IS curriculum that employs "a series of integrated projects with 'real' clients (who bring with themselves expectations, personalities, and organizational peculiarities), encourages students to learn not only project and time management skills, but also professional behavior toward clients as they serve as consultants" (p. 432). By so doing

> students are afforded the opportunity to reinforce technical skills which have been learned in other courses. An integrated project alone may not be sufficient to stimulate critical business analysis and may only provide a limited outlet for creativity, however, since a client may already have the idea of what they desire and may be acquainted with the business ramifications. (p. 432)

In a survey of IS practicioners, Ehie (2002) found a need for graduates who have good communication and people skills, an in-depth knowledge of different facets of the business, an ability to see the big picture, and understand interfunctional perspectives. As mentioned by Abraham and colleagues (2006),

> The new MSIS curriculum hints that the day of the "Renaissance IT Professional" may be passing. While graduates will have a core understanding of both technology and business, they may choose to emphasize one more than the other, depending on work assignments and how much choice they have in determining a career path. Tracks often separate along business analysis and technical expertise. The business emphasis usually leads to management positions more than a technical emphasis does. Technical career paths may find more reception at IT service providers. Both IT and their client firms will need managers with solid technical foundations. (p. 29)

Additionally, Abraham and colleagues (2006) explained that IS career paths may be evolving toward more delineated or segmented skill tracks, especially with the continued trend of outsourcing. If IS programs were to pursue the development of skill or career tracks, an enhanced IS workforce in the future may result, and possibly be the key to increased enrollment and survival of the IS field.

The IS curriculum may need to train students in both technical and nontechnical skills, developing an IS professional with broad general skills and deep technical skills. Survey results from Bullen and colleagues (2009) indicated that another highly valued version of an IS practitioner would be a person with broad technical skills and deep business skills. In particular, the data on mid-level IS professionals in industry show a real need for project management and business skills. Survey respondents also listed several business and project management skills as missing in entry level hires. The top three missing skills were managing stakeholder expectations, process knowledge, and

business process reengineering.

These three missing skills in IS professionals are just that; skills within a subdiscipline within the field of IS. In the introductory chapter of this dissertation, we defined several terms with the intent to clarify some of the confusion among terms used in academia and industry related to the study and/or practice of any body of knowledge. Four of those terms were: profession, discipline, subdiscipline, and inter-discipline. Please allow the reiteration the definitions of these terms to discuss their relevance to the current IS curriculum evaluation and revision needs.

Related Terms

Profession: Merriam-Webster defined a profession as "a calling requiring specialized knowledge and often long and intensive academic preparation" (Merriam-Webster Online Dictionary, 2011).

Discipline: Merriam-Webster defined a discipline as "a field of study" (Merriam-Webster Online Dictionary, 2011), which adds some confusion to distinguishing the terms field and discipline. Sommer (2000) clarified that the term field is based on a word meaning "earth" or "land," and is an area or sphere of action, operation, or investigation, a subject of activity or specialization.

Discipline has the same root as disciple—one who learns. Thus, a discipline stems from receipt of instruction, or the educational aspect of a field. Sommer (2000) also acknowledged the inconsistent use of terms such as "field," "discipline," and "profession." For the intent of this dissertation, the terms profession, discipline, and field

are used synonymously. One could argue that disciplines are rudimentary to the construction of all knowledge specialties. Professionals within their respective discipline received their instruction in a specialized department. A department typically has a shared epistemological paradigm from which they study many different occurrences. These departments educate their members through that same epistemology, producing professionals in the discipline, or field. Acceptance of this premise leads to the conclusion that a discipline is related to a department. For example, sociology is a discipline, and although sociologists study observations of society, they typically specialize in some subdiscipline such as economic sociology, criminal deviance, family relations, military, work and industry, religion, political sociology, and so forth. Yet, all were educated in sociology and identify themselves as sociologists.

Subdiscipline: according to Sommer (2000), subdiscipline is a specialty area within a discipline that develops its own organizations and training programs, often within disciplinary departments but sometimes in independent departments, e.g. criminal sociology is a subdiscipline, mostly taught in sociology departments but occasionally taught in freestanding departments.

Interdiscipline: is a meeting place between two or more disciplines, such as social psychology (Sommer, 2000).

Given these definitions, it would appear that there are connections at modern-day universities between the following:

- Profession: school or college;
- discipline/field: department;

- subdiscipline: area of emphasis in a disciplinary department;
- inter-discipline: program;

For example, the establishment of a school or a college is typically an indication that the school is dedicated towards a profession, such as the *College of Education* formed to educate those who are in the education profession. The establishment of the *Department of Elementary Education*, the *Department of Secondary Education*, or the *Department of Instructional Technology* is an indication that elementary education, secondary education, or instructional technology are all accepted as their own respective disciplines. Hence, IS is a department and therefore a discipline, but depending upon how we define is we could also classify it as a subdiscipline. The same can be said of the four other past emerging computing technology departments and/or disciplines: Computer Engineering, Computer Science, Information Technology, and Software Engineering. This shows the tendency and even the need that exists in the field of IS for the classification and definition of any subdisciplines within IS. Again, for the intent of this dissertation, we are classifying Information Systems as a field, discipline, or profession.

Trend Toward IS Professional Career Tracks

In the review of current literature, various authors have suggested that today, more than ever, educators need to monitor the attitudes of practitioners in the field, gain a clearer understanding of the business communities' needs and concerns, and respond accordingly. A thorough inspection of our country's educational institutions reveals a

profile of a materialized trend toward specialization. Because of rapid changes in the IS technology, and the quick adoption of new technologies by business, the IS field is beginning to see the need to impart technical skills in a proliferating set of sub-specialties, competencies, career orientations, career paths, or career tracks (Boyle, 2007; Carey et al., 2004; Carlsson et al., 2010; Chand, 2004; Conger et al., 2007; Gorgone et al., 2006; Igbaria et al., 1991; Kung et al., 2006; Peslak, 2005; Ramakrishna & Potosky, 2001; Sutcliffe et al., 2005; Topi et al., 2007, 2010; Trimmer et al., 2007).

Once again, the scope and direction of careers in Information Systems is being re-conceptualized within IS programs in colleges and universities inside and outside of the United States. Thus, a new emphasis on preparing students for the workforce by way of specialized education, subdisciplines, or career tracks is now on the agenda. Departments in higher education are starting to assess themselves within their own discipline as to the degree of proper preparation of students for entry into the specialized positions within the workforce. Current literature suggests several career tracks that may match up with specialized positions within the workforce, to include: (a) security in the IS curriculum (Anderson & Schwager, 2002); (b) enterprise resource planning (Boyle, 2007); (c) human computer interaction (Carey et al., 2004); (3) IT service management (Conger et al., 2007); (e) IS security and computer crime (Foltz & Renwick, 2011); (f) sourcing management (George, 2005); (g) business processes and functions (Peslak, 2005); (h) business analysis (Sidorova, 2007); and (i) healthcare computer IS (Trimmer et al., 2007).

As stated previously, there are concerns that student enrollment might not continue to move towards a reversed (positive) trend if IS departments do not cater to a

student's individual needs and tendency towards specialization by offering career tracks. One of the more recent objectives for career tracks is to increase student achievement in specialized areas of interest through integration of specific academic content. In the book *Rethinking the MBA*, a Harvard Business Press publication, Datar, Garvin, and Cullen (2010) found from extensive research at various business schools,

> …faculty and deans complain of a steady erosion of student interest in, and commitment to, academics. Classes are no longer the centerpiece of the MBA experience, having been replaced by other activities… Several deans reported that measures of the academic work week—the total amount of time students spend in, or preparing for, classes—have declined significantly over time…. Rather than devoting themselves to academics, students were spending increasing amounts of time networking, attending recruiting events, planning club activities, and pursuing the best possible jobs. (p. 81)

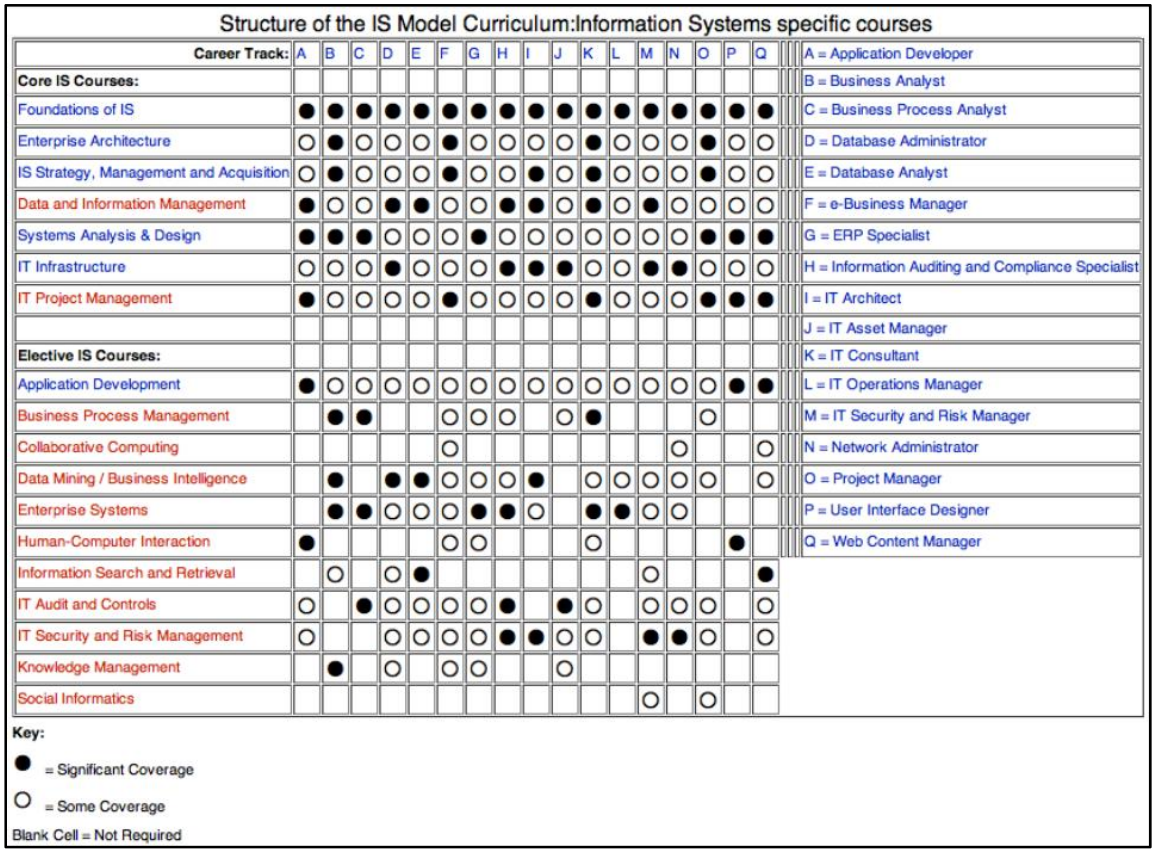
This finding indicates that a shift has occurred from general academics and education to students focused on finding the best individual fit in potential jobs. In our past discussion we have pointed out that demand for IS graduates is still high, and it is therefore logical to consider that unless IS departments continue to work towards individualized education, catering to specific student interest (offering career tracks), they might not increase students enrollment numbers in the department.

In fairness, the integration of career tracks in IS curriculum is a fairly recent phenomenon and over the past seven to nine years has caused educators, administrators, researchers, and policymakers to rethink how the traditional educational curriculum is organized for students. As discussed previously, this phenomenon was sparked by several contemporary events such as the technological revolution, the increased amount of technical IS work being outsourced, globalization in the workforce, and so forth. These factors serve as impetus for educators, administrators, researchers, and business

professionals to assist in the creation of a more seamless integration of career tracks in IS curriculum to potentially increase student selection of IS as a major, also custom fitting the career tracks to local business and industry needs.

The task force responsible for revising the IS 2002 model curriculum intended to expand the scope of the target audience beyond business school centric models of the prior IS curriculum efforts by exploring IS career tracks rather than just technology-enabled business practices. The idea of career tracks would provide greater flexibility for schools implementing the curriculum guidelines and separate the core of the curriculum from career track electives (Topi et al., 2007). To give further structure to these new curriculum concepts, the task force has presented a matrix with core and elective topics in the matrix rows, and the potential career tracks listed in the matrix columns, as seen in Figure 2. This allows for certain topics or courses to be matched with certain career tracks, giving guidance on what topics the individual career tracks focus on (Satzinger, Batra, & Topi, 2007; Topi et al., 2007, 2010).

Kesner (2008) argued contrary to the career track concept in his conclusions from a recent survey of IS employers, he states that "employers expect business school students to possess a general appreciation for the role of MIS in the workplace, but they do not expect a deeper understanding of more specialized topics, such as systems integration or business process design" (p. 641). Still, he also points out a contradiction in this area when employers responded similarly to a later question, requesting specific skills in electronic spreadsheet and data management competencies, stating that "on the other hand, electronic spreadsheet and data management competencies emerged as the



Structure of the IS Model Curriculum:Information Systems specific courses

Career Track:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Core IS Courses:																	
Foundations of IS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Enterprise Architecture	○	●	○	○	○	●	○	○	○	○	●	○	○	○	●	○	○
IS Strategy, Management and Acquisition	○	●	○	○	○	●	○	○	●	○	●	○	○	○	●	○	○
Data and Information Management	●	○	○	●	●	○	○	●	●	○	●	○	●	○	○	○	○
Systems Analysis & Design	●	●	●	○	○	○	●	○	○	○	○	○	○	○	●	●	●
IT Infrastructure	○	○	○	●	○	○	○	●	●	●	○	○	●	●	○	○	○
IT Project Management	●	○	○	○	○	●	○	○	○	○	●	○	○	○	●	●	●
Elective IS Courses:																	
Application Development	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●
Business Process Management		●	●			○	○	○		○	●				○		
Collaborative Computing						○								○			○
Data Mining / Business Intelligence		●		●	●	○	○	○	●		○	○	○	○	○		○
Enterprise Systems		●	●	○	○	○	●	●	○		●	●	○	○			
Human-Computer Interaction	●					○	○				○					●	
Information Search and Retrieval		○		○	●								○				●
IT Audit and Controls	○		●	○	○	○	○	●		●	○		○	○	○		○
IT Security and Risk Management	○			○	○	○	○	●	●	○	○		●	●	○		○
Knowledge Management		●		○		○	○			○							
Social Informatics													○		○		

Key:

● = Significant Coverage

○ = Some Coverage

Blank Cell = Not Required

A = Application Developer	
B = Business Analyst	
C = Business Process Analyst	
D = Database Administrator	
E = Database Analyst	
F = e-Business Manager	
G = ERP Specialist	
H = Information Auditing and Compliance Specialist	
I = IT Architect	
J = IT Asset Manager	
K = IT Consultant	
L = IT Operations Manager	
M = IT Security and Risk Manager	
N = Network Administrator	
O = Project Manager	
P = User Interface Designer	
Q = Web Content Manager	

Figure 2. Structure of the IS 2010 model curriculum (Topi et al., 2010, p. 383).

areas of greatest need and concern among the survey population" (p. 641). Kesner mentioned that his own point of view is intermingled in the conclusions, and insinuated in his findings that even though it does not appear that employers are requesting career tracks or specialized education, IS programs may catch the interest of more students in IS academics by offering a career track variety with perceived potential satisfaction from an individual career choice or specialization opportunity (Kesner, 2008).

Importance of Curriculum Evaluation and Accreditation

Regardless of the recent "erosion of student interest in, and commitment to,

academics" (Datar et al., 2010, p. 81), colleges of business must maintain certain standards for accreditation. The accreditation process exists to help develop and promote academic standards. The AACSB requires that

> student learning is the central activity of higher education. Definition of learning expectations and assurance that graduates achieve learning expectations are key features of any academic program. The learning expectations derive from a balance of internal and external contributions to the definition of educational goals. Members of the business community, students, and faculty members each contribute valuable perspectives on the needs of graduates. (AACSB, 2011b, p. 58)

One main objective of AACSB accreditation standards it to hold IS programs accountable and ensure that the appropriate knowledge and skill accompanies the relevant degree that the students attain (AACSB, 2011b; Mills, Hauser, & Pratt, 2008).

AACSB revised and made their most recent accreditation standards manual available on January 31, 2011. In the Eligibility Procedures and Accreditation Standards for Business Accreditation manual, the AACSB (2011b) defined the focus of accreditation:

> Accreditation focuses on the quality of education. Standards set demanding but realistic thresholds, challenge educators to pursue continuous improvement, and guide improvement in educational programs. It is important to note that accreditation does not create quality learning experiences. Academic quality is created by the educational standards implemented by individual faculty members in interactions with students. A high quality degree program is created when students interact with a cadre of faculty in a systematic program supported by an institution. Accreditation observes, recognizes, and sometimes motivates educational quality created within the institution. (p. 3)

Accreditation is used throughout the world by society and government to establish standards of quality in educational institutions and programs (Gorgone & Gray, 2002). The International Association to Advance Collegiate Schools of Business (AACSB International) is recognized by business schools worldwide as a prominent accrediting

body for business colleges and schools. As of June 2011, 624 educational institutions had earned their accreditation designation, making AACSB the most significant accreditation association for schools of business (AACSB, 2011a).

As stated by Mills and colleagues (2008), "AACSB accredits business schools (where most IS programs are located) and ABET accredits IS programs" (pp. 1-2). There are at least two types of accreditation that impact IS programs. After ABET integrated with the Computer Science Accreditation Board (CSAB), they started accrediting computer science programs in 2001 and IS programs in 2002. Prior to that time, ABET accredited engineering programs for over 75 years (Kung et al., 2006). As of June 2011, there are 33 ABET accredited IS programs in the United States (ABET, 2011). That number equates to roughly 5% of the AACSB accredited IS programs in the United States.

Incessant advancements in information technology (Lightfoot, 1999; Yin & Lien, 2005) coupled with AACSB or ABET accreditation are two key factors obliging continual curriculum evaluation and development in IS departments. The intent of accreditation is to ensure that some uniformity in education is maintained, thus providing assurance that graduates qualify for professional practice and further academic studies because they have met certain minimum standards. AACSB (2011b) clarified as follows:

> While entry qualifications (academic or professional) are important, the world of business changes very rapidly and faculty members must be involved in continuous development throughout their careers to stay current. Regardless of their specialty, work experience, or graduate preparation, the standard requires that faculty members maintain their competence through efforts to learn about their specialty and how it is applied in practice. Likewise, faculty members must engage in constant learning activity to maintain currency with their fields' developing research and theory. (p. 48)

Because curriculum evaluation and development is a significant and critical task needed for many colleges of business facing accreditation renewal or application, many educational institutions and other academically professional organizations use the AACSB guidelines for curriculum development.

Just as business schools are criticized for not preparing students for the "real" business world, IS education is criticized for not preparing students for changes in the technological environment. To obtain accreditation or accreditation renewal, AACSB (2011b) requires colleges of business to ensure that

> faculty and support staff resources are sufficient, when joined with the administrative leadership, to carry out all functions (teaching, curricula development, course development, course delivery, research, academic service, advising, extracurricular activities, etc.) in support of quality management education programs. (p. 3)

Even still, Miles, Hazeldine, and Munilla (2004) pointed out that the traditional AACSB reaccreditation process was designed to support the continuous improvements of management education and was originally based on the assumption that all business schools had similar missions and resources. The new AACSB experimental reaccreditation processes, in contrast, explicitly acknowledges that each candidate institution has a distinct mission, unique sets of stakeholders, and resource base with different outcome expectations. This newer perspective from AACSB supports that trend toward specialized education and specific career track development relevant to the individual IS departments "distinct mission, unique sets of stakeholders, and resources" (p. 29), and the local business and industry demands.

IS faculty plays a critical role in helping the schools of business solve the long-

time and continuing problem of integrating functional knowledge into their curriculum (Hershley, 2002). This continuing need for increased understanding about functional integration is articulated by the AACSB (2011b) in its most recent document on standards and procedures for accreditation; in the Curriculum Management section it states the following:

> Normally, faculty member involvement leads curriculum management processes. This will involve many aspects of the construction and delivery of degree programs. When, for instance, the strategic management decisions of a school propose the development of a new curriculum, faculty expertise will be engaged in the activities that define learning goals for the new curriculum and that create the learning experiences that enact the goals. Faculty members will also be involved in processes to monitor progress and evaluate success of curricula. They will use information from curriculum evaluation and assessments of learning achievement to guide curriculum revision.
>
> In managing curricula, schools may engage perspectives from a variety of sources. The business community engaged by way of advisory councils, recruiters, or surveys, may provide valuable insights into needed characteristics of graduates. University departments outside of the business school (e.g., communications, mathematics, international studies, philosophy, history, ecology, etc.) may add understanding from recent advances in their disciplines. Public policy makers may supply ideas about skills needed in graduates to meet anticipated social demands. Alumni can share useful insights into their experiences as graduates from the school's curricula. (p. 69)

Ensuring that students have the opportunity to acquire marketable knowledge and skill found within IS curriculum, has typically been a challenge that has fallen upon IS educators. Keeping curricula up-to-date to accreditation standards has usually been the main facet of that challenge (Gill & Hu, 1999; Lee et al., 1995; Maier & Gambill, 1996). A curriculum management process normally contains substantial faculty involvement in the monitoring and evaluation to see that curricula are meeting the goals that have been set for them and to see that those educational goals are still appropriate. Where

opportunities for curriculum improvement are found, faculty members use this information to guide further development and revision.

Regular Assessment and Update of IS Curriculum

The field of IS has taken several steps forward over the years to identify a standard model and guidelines for curriculum development and advancement. In 1995, Cougar and colleagues published the first version of the model IS curriculum. After representation of the model at various conferences, feedback was incorporated and IS '97 (Davis et al., 1997) was developed. Similarly over the next few years, additional feedback from academia and industry was incorporated and added into IS 2002 model curriculum (Gorgone et al., 2002). Likewise, on the graduate level, in 2000, the IS community (Gorgone et al., 2000) published the MSIS 2000 model curriculum, and the MSIS 2006 model curriculum in 2006 (Gorgone et al., 2006). In 2010, the IS community (Topi et al., 2010) published an updated model for undergraduate degree programs, the IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems. In the article "Revising the IS model curriculum: Rethinking the approach and the process," Topi and colleagues (2007) explained various motivations for evaluation and revision of the IS model curriculum. They wrote:

> There are several motivations for the IS curriculum update. First, and most obvious, is timing. The last comprehensive undergraduate curriculum revision was IS'97. Also, most of the work done on IS'97 was done in the mid-1990s, making the curriculum elements closely linked to a specific set of technologies quite antiquated. Second, there has been a great deal of change in technology and industry practices…. Third, the interest in the study of IS as a field has dramatically declined among students at most institutions. Therefore, it is imperative that the IS community as a whole address this problem from several

> different perspectives, including curriculum design. Finally, the IS discipline must address its core principles and values within and through the curriculum. By doing so, the importance of clearly articulating the identity of the IS discipline can be established and strengthened. (pp. 730-731)

Topi and colleagues (2010) further explained that "the availability of curriculum models enables local academic units to maintain academic programs that are consistent both with regional, national, and global employment needs and with the common body of knowledge of the IS field" (Topi et al., 2010, p. 361).

On the flip side, if a model is too stringent to follow, then the curriculum model is useless to the particular IS program. A curriculum model that may be of some use to the respective program is one that offers guidance and affords the institution or department to exercise local innovation and adaptation utilizing local resources and satisfying local needs, requirements, and conditions (Ducrot, Miller, & Goodman, 2008). IS programs began to feel the need to look at specific career tracks as early as the beginning of the century. MSIS 2006 highlights this objective in their graduate program guidelines, and talk of doing the same in the undergraduate program guidelines were underway in that time as well.

One of the three objectives listed for revision to the IS 2002 model guidelines was exactly that, "to provide greater flexibility for schools adopting the curriculum by separating the core of the curriculum from career track electives" (Topi et al., 2007, p. 731). Later in this same article, the importance of teaching IS within a domain context is explained.

> Information Systems is a discipline that integrates technology and organizational processes with domain expertise. Therefore, a degree program in Information Systems should never be implemented without a domain context—a program that

> only focuses on technology or technology-related organizational processes is a program in software engineering or information technology not a program in Information Systems. (p. 732)

Topi and colleagues (2007) elaborated upon the main justification for implementing IS degree program within a domain context, stating "The proposal to make the curriculum more context independent is to emphasize that the core knowledge and skills in Information Systems are applicable to a rich variety of domains, and that it is our community that possesses this expertise" (p. 732).

From the turn of the century, there have been significant contextual changes in industry and academia that motivated this curriculum revision process to include more flexibility, and the element of career tracks. Many IS programs have been frustrated with the IS 2002 model curriculum for the stringent 10-course requirement, where the entire curriculum of some programs consisted of total course numbers less than 10 (Brookshire et al., 2007; Carlsson et al., 2010; Foltz & Renwick, 2011; George, 2005; Gorgone et al., 2005; Plice & Reinig, 2009; Salisbury et al., 2004; Topi et al., 2007; Vician et al., 2004). Due to AACSB accreditation standards, the IS 2002 model curriculum stringent 10-course requirement left little to no room for alternative elective courses within IS programs that existed in colleges of business (see Figure 3).

According to Lightfoot (1999), "curriculum designers limited to eight courses have three options: (a) skip early courses that are not prerequisite for advanced courses, (b) skip some advanced courses, or (c) repackage the underlying learning units into a smaller number of courses" (p. 46). Lightfoot submitted "a new solution proposal" (p. 47) in which he explained that "the key to the new solution proposal is the realization that

Business minor (4 courses)	Domain fundamentals Foundational knowledge and skills
Information systems core and elective(s) (8 courses)	Domain fundamentals Foundational knowledge and skills Information systems knowledge and skills
Business core (8 courses)	Domain fundamentals Foundational knowledge and skills
General education core (20 courses)	Foundational knowledge and skills

Figure 3. Undergraduate information systems degree in a typical AACSB-accredited North American business school (Topi et al., 2010, p. 386).

the wrong stakeholder is driving curriculum design. Strategic curriculum planning should be driven by the stakeholder with the longest-term perspective; that is, educators" (p. 47). He also elaborates that "educator stakeholders should be responsible for all strategic curriculum planning" (p. 47), and "accept input from the business stakeholder as to what contemporary topics to teach, and the student stakeholder can select the emphasis track and electives that best suit his or her career goals" (p. 49). To a certain extent, Lightfoot pioneered the concept of career tracks within IS curriculum.

These varying recommendations to include more flexibility, and the element of career tracks in IS curriculum were documented in the MSIS 2006 model curriculum guidelines for graduate programs, and have caught support from IS educators, in part because of IS enrollment challenges felt by IS departments across the nation. The new IS curriculum development task force (IS 2010) recognized that the topics covered in a successful IS curriculum were ultimately more important than courses taught. Now, within the IS 2010 curriculum guidelines there are no specified core courses, but rather core topic and subtopic requirements to be taught within the varying courses found in the

respective programs. These topics and subtopics were selected to allow adequate breadth and depth of coverage to ensure students reach the learning outcome expectations. This perspective allows for IS institutions or departments to exercise local innovation and adaptation, teaching a wide variety of courses and educational experiences based on local resources, needs, requirements, and conditions. Almost all IS curriculum can observe the IS 2010 curriculum guidelines; so long as there is compatibility between IS 2010 topics and subtopics requirements and the programs core courses (Topi et al., 2007, 2008, 2010).

As mentioned by Topi and colleagues (2010), the IS 2010 guidelines are "not directly linked to a degree structure in any specific environment, but it provides guidance regarding the core content of the curriculum that should be present everywhere and suggestions regarding possible electives and career tracks based on those" (p. 362). IS 2010 has structured the curriculum guidelines so that it separates the core of the curriculum from electives to support the concept of career tracks. In this way, curriculum design options have enough flexibility to afford adoption in a variety of educational systems contexts. Where many institutions did not find IS 2002 to be responsive to their particular needs, these same institutions may now be able to use IS 2010 concepts within a more flexible framework, and apply the guidelines and principles in their IS curriculum. The seven core courses are:

1. Foundations of Information Systems (IS 2010.1: Foundations of IS)
2. Data and Information Management (IS 2010.2: Data & Info Mgmt)
3. Enterprise Architecture (IS 2010.3: Enterprise Architecture)

4. IS Project Management (IS 2010.4: IS Project Management)

5. IT Infrastructure (IS 2010.5: IT Infrastructure)

6. Systems Analysis & Design (IS 2010.6: Sys. Analysis/Design)

7. IS Strategy, Management, & Acquisition (IS 2010.7: IS Strat, Mgmt, & Acq)

The core courses and their recommended sequence are presented in Figure 4. "Note that these seven courses in the model can be implemented in a specific local context as independent courses or as components within fewer courses" (Topi et al., 2010, p. 361).

The IS 2010 Curriculum Guidelines also required that all IS curricula must offer sufficient coverage of the seven core topics related to IS -specific knowledge and skills. In addition, the curricula for a particular program must cover a selection of elective topics depending on the career track(s) that a given institution has decided to offer, along with topics related to foundational and domain knowledge (see Figure 5). The IS 2010

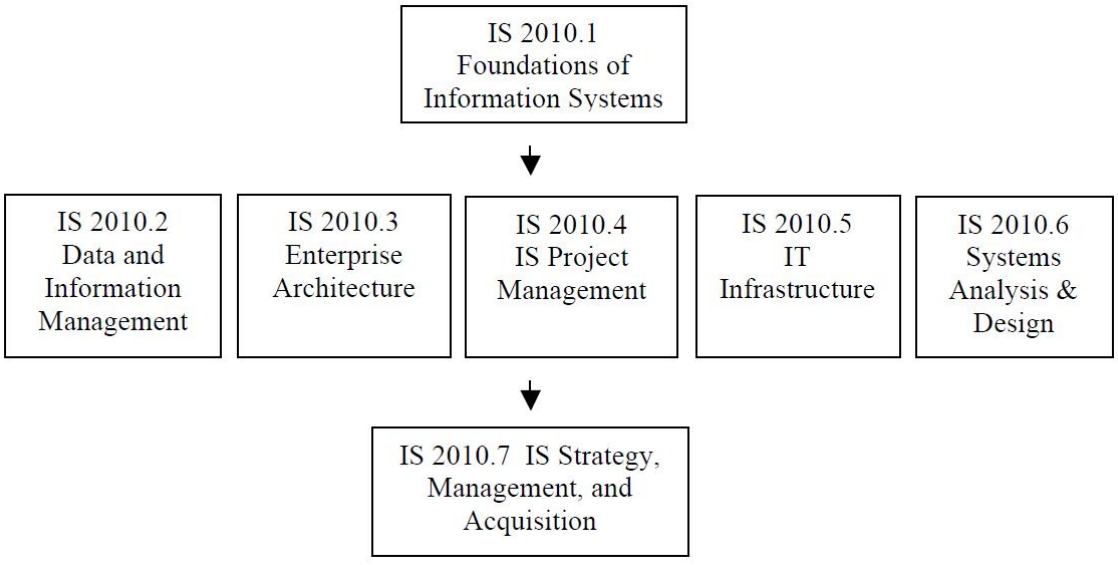


Figure 4. IS 2010 core courses (Topi et al., 2010, p. 384).

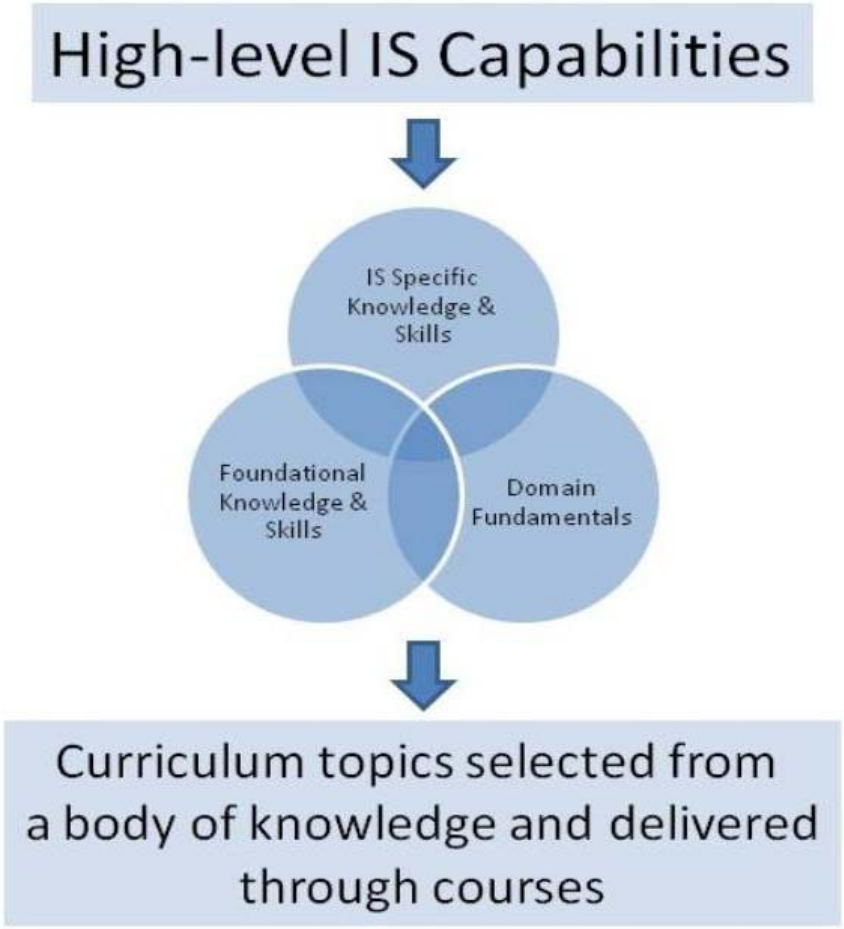


Figure 5. Overall structure of the basic concepts (Topi et al., 2010, p. 376).

curriculum structure allows a much more dynamic curriculum than the prior version. In addition, "it supports the rapid expansion of the curriculum into new exciting domains (e.g., bioinformatics) and the easy addition of new topics and new career tracks as warranted by the inclusion of new domain areas, new technologies, or new concepts" (Topi et al., 2007, p. 735).

Topi and colleagues (2010) confirmed acknowledgement of this standard in the IS 2010 guidelines by stating that "not all programs are able to cover all aspects of the core at the same level of depth, but some level of coverage of these topics is required for a

program to be identified as an Information Systems program" (p. 371). And, "finally, by separating the core curriculum from career track electives, we are able to provide the flexibility desired by nontraditional IS programs while also offering exciting options for programs constrained by AACSB or other restrictions" (Topi et al., 2007, p. 735).

Leading up to the publication of IS 2010 curriculum guidelines, the curriculum at many IS programs in the United States was aligned with the IS 2002 model curriculum. In 2003, a survey by Kung and colleagues assessed undergraduate IS program curriculum for seven core IS courses indicated in the model curriculum. Operating systems was found offered at 16% of the universities, IS capstone course at 47%, introduction to IS at 61%, telecommunications at 71%, programming at 88%, database at 92%, and systems analysis and design was offered by 94% (Kung et al., 2006). Maier and Gambill published an analogous study in 1996, as did Gill and Hu in 1999, and both found very similar results. In their 1995 assessment, Maier and Gambill also looked at the exact names of the various IS programs and found that "the most widely reported names for this program of study were Computer Information Systems (CIS) and Management Information Systems (MIS)" (p. 3). Pierson, Kruck, and Teer (2008) conveyed actual percentages of the comomon names for Information Systems programs of study for the year 2004 and 2007, and those general numbers are likely applicable today. This information was deemed pertinent enough by Topi and colleagues (2010, p. 373) to be included in the IS 2010 curriculum guidelines article, and is listed as follows:

- Management Information Systems, representing 41 percent of programs;
- Information Systems, representing 21 percent of programs;
- Computer Information Systems, representing 18 percent of programs.

In 1985, from a survey of 145 AACSB accredited business schools, MIS/CIS departments were asked about their beliefs concerning the future trends in IS undergraduate curriculum content. Of the 145 AACSB accredited business schools surveyed, 114 responded, identifying 16 topics to receive greater focus in the future. Among those listed, was a trend toward micro-based MIS designs, the most prevalent, followed by decision support systems, data bases, end-user computing, networks, fourth generation software, and office automation. Others mentioned were said to receive more focus, like EDP Auditing and telecommunications, and currently emerging areas of study were artificial intelligence and the behavioral aspect of end-user computing (McLeod, 1985).

Need to Assess Career Track Development Trends in IS Curriculum

Prior to and since the release of MSIS 2006 model curriculum guidelines, there has been much discussion surrounding the need to develop career tracks unique to the specific IS department and industry demands of the area. As suggested by current literature, these topics for greater focus discussed over the last 25 years have evolved into the career tracks of today, which as mentioned earlier in *The Trend Toward IS Professional Career Tracks* section are: (a) security in the IS curriculum; (b) enterprise resource planning; (c) human computer interaction; (d) it service management; (e) IS security and computer crime; (f) sourcing management; (g) business processes and functions; (h) business analysis; and (i) healthcare computer IS.

A few years later, in a study of IS graduate curriculum content (Gupta & Seeborg,

1989), from a survey of 274 AACSB-accredited business schools, to which 153 responded, MIS/CIS departments were asked, “What major change, if any, do you feel that coverage of the MIS topics will undergo in the next five years?” About 74% of the respondents commented on the future predictions for the direction in the field (p. 132). What the study found was that “the predictions of the future trends were more consistent with the suggestions made in the literature than are the topics actually taught” (p. 132).

If curriculum in IS programs is not continually updated to incorporate new technology concepts and standards as dictated in cooperation by industry and academia, then IS programs may quickly succumb to teaching obsolete material and instructing students in outdated paradigms. IS programs are typically involved in evaluating their own academic program on an ongoing basis to ensure that they are in tune with the needs and trends of industry. During their internal program evaluation, it might be useful to understand the trends that other programs perceive currently in the field. Industry may also find it of value to know what specialized preparation MIS students are getting in college. On the other hand, it would be logical to assume that IS programs are not instructing the same set of content, or the exact same curricula. The latest report on model curriculum work in the IS discipline is “IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems” (Topi et al., 2010). The IS 2002 curriculum model is superseded by IS 2010, and with the increased flexibility now present in the IS 2010 curriculum guidelines, one might suppose that IS programs have already begun to break out of the box and develop particular career tracks within their programs, having felt in the past several years the need to persue the unique trends

coming from their faculty skill set, and local industry demands.

As mentioned, curriculum models provide a foundation for local academic units to maintain academic programs that are consistent both with regional, national, and global employment needs, within the IS common body of knowledge. In the end, curriculum models are only posited as guidelines, and ultimately IS educators hold the responsibility to apply the model as they see fit to their respective programs. Furthermore, curriculum models may be of little use to the respective IS program if the model is too stringent to follow. If coupled with flexibility, a curriculum model could be helpful in providing guidance and affording institutions the ability to utilize local resources and satisfy local needs, requirements, and conditions. According to Firth and colleagues (2011), for the IS educator, "relevant teaching involves understanding the skills that graduates need and marketing these skills to potential employers" (p. 205).

A thorough review of literature shows that for some time, IS programs have felt the need to look at specific career tracks for their curriculum that match up with the explicit department skill set, and the regional or geographical business demands. And, with the continual enhancements in technology, current and past studies of skills required by IS professionals emphasize the need for continual reassessment of IS educational curriculum. This can afford regular update to their curriculum content, concepts, and principles—incorporating newer concepts and specialized technology into the curriculum and suggestively within a specialization, or career track approach (Athey & Plotnicki, 1991; Brookshire et al., 2007; Carlsson et al., 2010; Foltz & Renwick, 2011; George, 2005; Gorgone et al., 2005; Kesner, 2008; Lee et al., 1995; Leitheiser, 1992; Mackowiak,

1991; Plice & Reinig, 2009; Salisbury et al., 2004; Topi et al., 2007; Trauth et al., 1993; Vician et al., 2004).

In this review of literature various discussions were evaluated surrounding the need to develop career tracks unique to the specific IS department. Absent from current literature is an up-to-date description of what IS programs are teaching, how they are organized, if they are accommodating IS 2010 curriculum guidelines, and if they are implementing any career track options in their programs. The findings from this literature review require the question to be asked: Is there an actual trend of career tracks being created within IS departments across the United States, and if so, what are they? However, the most recent review of IS curriculum was conducted roughly 6 years ago by Kung and colleagues (2006). Six years is a long time, when talking about the speed of advancement in IS and technology. At the same time that the last research study or evaluation of IS undergraduate curriculum occurred, the *MSIS 2006: Model Curriculum Guidelines for Graduate Degree Programs in Information Systems* was being published. The need to incorporate career tracks into IS curriculum guidelines is covered in detail in the MSIS 2006 model guidelines, and similar discussions about career tracks were being held around the time that IS 2002 was published. That was almost 10 years ago. In that time much has changed in the undergraduate IS curriculum arena.

Hence, there is a need to examine IS undergraduate degree programs offered by business schools in the United States, and understand the adherence to and affects of the recently published (April) *IS 2010: Curriculum Guidelines for Undergraduate Information Systems Programs.* Additionally, it could be very beneficial to IS

departments, educators, and industry practicioners across the nation to verify if, because of the increased flexibility of IS 2010, IS programs are developing particular career tracks unique to their curriculum and faculty skill set.

Summary

A thorough review of the related research and literature revealed a need for curriculum in IS programs to continually updated to incorporate new technology concepts, and standards into the their curriculum, to avoid teaching obsolete material and instructing students in outdated paradigms. Curriculum models provide a foundation for local academic units to maintain academic programs that are consistent both with regional, national, and global employment needs within the IS common body of knowledge. If coupled with flexibility, a curriculum model could be helpful in providing guidance and affording institutions the ability to utilize local resources and satisfy local needs, requirements, and conditions.

Other trends evident in the literature include an increase in need for IS programs to look at specific career tracks for their curriculum that match up with the explicit department skill set, and the regional or geographical business demands. This could afford regular update to their curriculum content, concepts, and principles—incorporating newer concepts and specialized technology into the curriculum and suggestively within a specialization, or career track approach. However, the most recent review of IS curriculum was conducted roughly six years ago by Kung and colleagues (2006).

As theory and literature demonstrate, a number of different entities influence the

development of university curricula, including the institution itself, industry, society and various stakeholder groups that include practitioners, current students, and alumni. Absent from current literature is an up-to-date description of what IS programs are teaching, how they are organized, if they are accommodating IS 2010 curriculum guidelines, and if they are implementing any career track options in their programs. There is a need to examine AACSB IS undergraduate degree programs in the United States, and understand the adherence to IS 2010 curriculum guidelines. Additionally, there is a need to verify if, because of the increased flexibility of IS 2010, IS programs are developing particular career tracks unique to their curriculum and faculty skill set.

The research methodology used in this study and presented in Chapter III was conducted to identify curriculum changes in AACSB accredited Information Systems programs across the United States, using a survey technique simlar to those of Datar and colleagues (2010), Kung and colleagues (2006), and Miller and Crain (2007). However, in addition to the objectives of these similar studies, this study also assessed the characteristics of recent career track developments in AACSB accredited IS programs across the United States. Also, an anlysis was conducted to see if—based upon the current academic institution technological and communications standard of today—curriculum in AACSB accredited IS programs across the United States has changed significantly since other similar evaluations conducted in 1995, and 2005, and whether it is closer in adherence to the IS 2010 curriculum guidelines.

CHAPTER III

RESEARCH METHODOLOGY AND DATA COLLECTION

In this section, the research methodology is discussed and the research questions, on which the dissertation is based, are enumerated. The statistical analysis used to answer the research questions is also described, along with the design of the survey of data (similar to past studies) from department websites, institutional course catalogues, and interviews with undergraduate program directors. The research methodology used in this study examined the core curriculum and describe the current state of AACSB accredited IS undergraduate degree program curriculum across the nation; based upon the current IS 2010 curriculum guidelines and IS Departments' adherence to the recently published curriculum guidelines. Curriculum changes in AACSB-accredited IS programs across the United States were identified and compared to two similar studies of the past—Kung and colleagues (2006), and Maier and Gambill (1996)—using a survey technique similar to those of Datar and colleagues (2010), Kung and colleagues, and Miller and Crain. An analysis was conducted to see if—based upon the current academic institution technological and communications standard of today—curriculum in AACSB accredited IS programs across the United States had changed significantly since similar evaluations conducted in 1995 (Maier & Gambill, 1996), and 2005 (Kung et al., 2006), and whether it is closer in adherence to the current IS 2010 curriculum guidelines. In addition to the objectives of these similar studies, this study also assessed the characteristics of recent career track developments in IS programs across the United States, affording a comprehensive view of the landscape for adherence to IS curriculum guidelines, listing of

emerging IS career track options present in the field, and thereby providing the IS community the means to infer if continued investment of time, energy, and resources should be given to support IS curriculum model development and advancement.

Study Design and Proceedings

Research Questions

Using a cross-sectional descriptive research design with retrospective comparison to past studies to detect trends over time in adherence to standards and curriculum change, to include a cluster analysis of current state naturally occurring curriculum profiles, this study intended to explore the following research questions based on information obtained in the review of literature.

1. What is the current adherence among IS courses and topic areas being offered in IS curriculum across the nation, with those suggested by IS 2010 curriculum guidelines?
    a. What percentage of current IS courses and topics being currently offered in IS curriculum programs conform to the recommendations suggested by IS 2010 curriculum guidelines?
    b. What percentage of IS undergraduate programs are offering career tracks options in their curriculum, and:
        i. Among these, what is the average number of career tracks offered?
        ii. Among the selected sample, what are the different career tracks offered?

iii. Among the selected sample, what are the most common career tracks offered?

c. How have the percentages of IS courses and topics currently being offered changed over time, as compared to the 2006 state of the IS curriculum article (Kung et al., 2006)?

This study was a cross-sectional descriptive research design with retrospective comparison to past studies to examine the state of IS curriculum, to show trends over time in adherence to standards and curriculum change, and to provide any recent evolution in IS career track trends. Consistent with the 2006 study, this study measured the characteristics of the sample populations, stated above, on the prespecified variables listed in Appendix A, and organized, analyzed, and summarized the data sets to provide descriptive statistics as appropriate to the measurement scale, i.e., measures of central tendency and variability (mean, standard deviations, variance, range, etc.) for continuous and interval measures and frequencies and percentages for categorical and ordinal measures. The cross-sectional descriptive research design with retrospective comparison was chosen because of the nature of the data being assessed, in that the research study is looking at a man-made phenomenon where the form or actions change over time, with interest in change in curriculum retrospective to change in adherence to the standards, over time.

2. What specific curriculum profiles (clusters) emerge based on data collected including number of: required courses, elective courses, career track offerings, and core courses that adhere to the IS 2010 curriculum guidelines?

The Research Question 2 used the data collected from Research Question 1 and completed a cluster analysis to create profiles that help describe the state of adherence to curriculum guidelines. The analysis was performed on the clusters of naturally occurring profiles for required courses, elective courses, capstone and project courses, career track offerings, core courses that adhere to the IS 2010, and possible perceived adherence statistics.

3. How do perceptions of adherence (subjective data collected) by the department heads, or directors of undergraduate programs compare to the assessed adherence (objective data collected) to IS 2010 curriculum guidelines?

The Research Question 3 used the data collected for Research Questions 1 above (part one of the survey instrument—the prespecified variables listed in Appendix A) compared to the follow-up telephone interviews (part two of the survey instrument—Appendix E), and computed the respective Pearson *r* corollary measurement, providing the relevant bivariate correlation statistics. Additionally, a *t* test was performed to assess the magnitude of any differences in perceived adherence versus assessed adherence of IS programs to IS 2010 curriculum guidelines.

Population and Sample

The academic population for this study consisted of undergraduate IS program curricula at AACSB-accredited institutions across the United States. The selection of only AACSB-accredited schools was justified due to the large percentage of institutions that were accredited. At the time of the study, there were 488 schools in the United States that are either business, or business and accounting accredited by AACSB, with an

additional 398 schools registered and seeking accreditation in one of those two areas. There were 286 schools that offered a major in IS at the baccalaureate level that were AACSB accredited (AACSB, 2011a). This population was selected to facilitate a comparison of past reported Information System curriculum characteristics common to the studies completed by both Kung and colleagues (2006), and Maier and Gambill (1996).

This study included a randomly sampled portion—one half or 143 of the 286 IS curriculum programs in the United States offering a major in IS at the baccalaureate level that were either business or business and accounting accredited by AACSB. A random sample among the 286 AACSB accredited IS programs was obtained within Microsoft Excel by first assigning a random number to each of the 286 rows representing the IS departments or programs. The random values were assigned to the rows by typing in the formula text box "=RAND()" at which point the subsequent column displayed random eight decimal numbers corresponding to each row. However, the cells containing the formula could not be sorted, so the "copy column values" and "paste values" functions were used to paste the random values in the adjoining empty column. The values were then sorted in ascending order, lowest to highest and the numbers one through 143 were chosen for website and course catalog assessment.

Data and Instrumentation

The instrument formulated to gather data for this study was a survey developed from a review of literature, other research survey instruments concerned with IS

curriculum evaluation, and interviews and consultation with Utah State University's Department of Management Information Systems faculty members. The survey instrument was revised and refined through faculty in the Management Information Systems department at Utah State University where an evaluation of the survey instrument and indication concerning any questionable or ambiguous items were made.

Survey Instrument: Part One

Similar to Kung and colleagues (2006), this study used a "direct survey" (p. 232) method to collect data on undergraduate IS programs in the United States. The purpose of survey research was "to collect data from a sample that has been selected to represent a population to which the findings of the data analysis can be generalized" (Gall, Gall, & Borg, 2003, p. 223). The data survey instrument implemented in the study consisted of two parts. Part one (Appendix B) of the instrument was strictly quantitative in nature and utilized university web sites and course catalogs as the primary source of information for the initial survey of data. This survey technique was used by other similar studies that have demonstrated this research methodology proof of concept; namely Datar and colleagues (2010), Kung and colleagues (2006), and Miller and Crain (2007).

The survey also gathered data related to variation of specific core and elective courses taught, course curriculum prerequisites and sequencing, and any career track offerings that were present. For each program curriculum, the study attempted to answer the following questions using the direct survey: (a) What does the program offer in terms of the core course categories (see Figure 4), (b) What career tracks options does the program offer (see Figure 2), and (c) does the course curriculum sequencing (see Figure

4) adhere to IS 2010 curriculum guidelines? Because the publication of course catalogs sometimes come later than actual changes in degree requirements, if there was a difference between the degree requirements shown in the catalog and those shown on the department's website, the study used the degree requirements posted on the department's website. This heuristic was confirmed from a few statements made within some of the follow-up interviews. In accordance with Gall and colleagues (2003), prior to inception of the official research study, a pilot study was conducted with several IS faculty at a large agricultural Carnegie 1 research university in the west. This was completed to pilot test parts one and two of the survey instument.

Survey Instrument: Part Two

In addition, Part two (Appendix E) of the survey instrument, conducted follow-up telephone interviews (six questions) with the department heads, or directors of undergraduate programs for verification, clarification, and confirmation of the data assessed from university web sites and course catalogs. Phone interviews allowed for obtainment of complete data for a significant portion of the population to be sampled and subsequent examination of the core curricula to be completed. Data were entered for each institution in roughly seventy fields of an Excel spreadsheet, detailing IS department, program, and curriculum characteristics. Only undergraduate IS programs were examined; graduate programs in IS were not assessed or analyzed.

The follow-up telephone interview survey was conducted after the initial examination of data retrieved from a random sample of IS department websites and course catalogs was completed, with the intent to collect undiscovered data in the areas of

(a) any required core topics not discovered in the required courses, but possibly offered elsewhere, such as an elective, (b) any career track offerings not discovered in the curriculum, but possibly labeled outside of evolving nomenclature, (c) the department heads, or directors of undergraduate programs perceptions of adherence to IS 2010 Curriculum guidelines, and (d) the subsequent department's point of view on the advantages or disadvantages of following or not following the IS 2010 curriculum guidelines, and of offering career track options in the IS curriculum. This comparison approach brings forward current-state statistics for compliance and non-compliance to IS 2010 curriculum guidelines, past-state statistics of core curriculum and course offerings, and future-state trends of career track offerings.

Data Collection and Verification

Data Collection Strategy

In the first part of this study, data for 143 curriculum programs were surveyed or collected from department websites and course catalogs. Any department that did not have enough data regarding the program's curriculum was classified as non-respondent, but there were no such websites lacking programs curriculum data; there were five programs of study that only offered an MIS graduate degree, with no undergraduate degree. Subsequently, those five departments or programs were classified as non-respondent in the first part of the study, since the study scope was set to only evaluate undergraduate programs. In all, data for 138 programs were surveyed or collected from department websites and course catalogs.

The second part of the study was carried out as follow-up interviews conducted with the IS department heads, or directors of undergraduate programs within the schools of business. The random sample of the defined population was surveyed according to the research questions set forth in the prior section of this chapter. Of the 143 IS program websites and course catalogs assessed, 53 follow-up telephone interviews were conducted.

The follow-up telephone interviews were semi-structured, conducted over a land-line telephones and recoded via audio cassette tape from the researcher's private work office. Prior to commencement of the interview, the interviewer reminded the interviewee of the previously sent email and letter of consent/information from the university Institutional Review Board (IRB), and requested to record the phone interview. In all, 53 phone interviews were conducted, of which all but two were recorded to audio cassette tape. Two department faculty members requested not to have the interview recorded and those two interviews were conducted at a slower rate and transcribed while the interview took place. Directly upon completion of those two interviews, they were reviewed and corrected. Upon completion of the interviews, seven 90-minute audio cassette tapes representing 51 interviews with IS faculty members were sent to a commercial audio transcription service. The company returned the audio tapes with the resultant transcriptions in MS Word documents. At that point, the researcher listened to the audio cassette taped interviews while reading the transcriptions to verify the accuracy of the transcriptions. Where any errors were noted, the researcher corrected the interview transcriptions. A sampling of the interview transcriptions are attached in Appendix E.

The questions asked during each interview were the same, with the exception of and occasional follow-up questions about courses that the interviewee had not confirmed present in the IS program curriculum. For the sake of expediency, a few of the standard questions were not asked in some interviews as the answers had already been confirmed in program websites and course catalogs, hence there may be a slight amount of variability between interviews.

Telephone interview survey questions script. For each of the 53 follow-up interviews, six follow-up questions were asked (Appendix C). Questions 2-4 were quantitative questions that confirmed and validated the data collected from the program websites and course catalogs, and questions 1, 5, and 6 were qualitative questions that assessed the subjects perceptions and opinions generally about that current happenings in the field. Specifically, Question 1 asked: "Out of 100%, how compliant is your IS curriculum with the IS 2010 curriculum guidelines in terms of the seven required topics, identified career tracks, and the capstone course taken during a student's final semester?"

Question 2 was asked as follows: "We were unable to locate the following (core) topics within your department's program of study (undetected IS 2010 core topics). Can you confirm that these topics are not included in your IS program, or provide the title and how they are included (such as an elective)"? Question 3 was asked as follows: "We were unable to locate the IS Strategy, Management and Acquisitions topic (IS 2010.7) taught by your department's program of study. Can you confirm if this course topic is included in your IS program, and if so, the title and how it is included (such as an elective), and whether it is a capstone course, meaning it is taken during a student's final

semester"? Question 4 was asked as follows: "We were unable to locate any career tracks within your department's program of study. Can you confirm that currently there are no career tracks, or if there are, what are they and where can that information be found?"

Questions 5 and 6, the two remaining qualitative questions, were both open-ended questions and allowed the respondent to elaborate as long as desired. When there appeared to be an ending statement and a pause, question 6 was asked and then likewise when there appeared to be a conclusion statement and a pause the subject was thanked for their participation, and notified that the findings would be reported in several months and forwarded to each school interviewed. Explicitly, Question 5 was a qualitative follow-up question to Question 4 and asked: "From your point of view, can you share the advantages and disadvantages of offering IS career track options (and specifically why your department offers the following career tracks _____)?" Question 6 asked: "From your point of view, what are the advantages and disadvantages of following the IS 2010 curriculum guidelines"?

The follow-up telephone interviews were intended to be conducted for no less than one fourth (36 programs) and up to one half (72 programs) of the assessed population (143 intented IS curriculum programs) to confirm and validate data collected. Because our sample was fixed in terms of possible size, we performed a sensitivity analysis in place of a power analysis, so that given our sample size, we could project detecting differences for the predetemined population size. We therefore took a sampling of each of the publications sample size estimation and level of differences. The intent

was not to complete a difference analysis, but to look at a current state and complete a meta-analysis done with effect sizes. Because we were also comparing self-reported data to assessed adherance, with one sample but two comparisons between the adherance, we conducted a sample size analysis to determine power to detect that difference. Without knowing what difference to expect, we conducted a sample size analysis looking at the two past comparable studies within their different time frames, and the current state of affairs.

Sample size and statistical sensitivity power analysis. Prior to study implementation, we looked at two past studies which afforded a sense of what statistical difference to expect whether small, medium, or large. We were then able to complete a power analysis and determine the ideal amount of people for the study. We knew how many we thought we could get because our sample was predefined, and we justified that it was reasonable in that it was prelimited at 286 (number of available programs). We used a sensitivity analysis to determine the minimal detectable effect size with that upper limit, and adjusted appropriately. Expecting the difference to be moderate, and based on that expectation, we completed a power analysis with “Gpower” for a one-tailed test. Because perceived adherance self-reports are typically reported greater than they are in reality, a moderate (medium) effect size, only required 27 programs to be assessed. On the high extreme, a paired difference between self report needs 156 programs to be assessed for a small effect size. That is, for an alpha of .05 and a power of .8 with a one-tailed test examining the difference between self-report and assessed adherance, a medium effect size required 27 curriculum programs to be assessed, and a small effect

size required 156 curriculum programs to be assessed.

In the originally planned study, we expected to assess data for 143 programs by surveying or collecting the data from department websites and course catalogs, and to conduct follow-up interviews with at least 27 of the 138 programs for which data were collected. The statistical sensitivity power analysis was performed for sample size estimation prior to study completion, based on our expected possible sample size for interviews. This was done for both the comparison of self report adherence and assessed adherence and for the comparison of current curriculum data to past curriculum data. We had set that number at 72 programs, as our maximum expected possible sample size. The minimal detectable effect sizes (*ES*) were .29 and .38, respectively, low medium using Cohen's (1988) criteria with alpha = .05 and power = 0.80 (GPower 3.1). Thus, our expected possible recruitment base was more than adequate for the main objectives of this study, given our expectations of moderate differences. If we obtained all 143 follow-up interviews we would have a small effect size of .21.

IRB approval. Survey participants were not required to sign a consent form, but merely to receive a copy of a letter of consent (or information) prior to the interview. This was the case as the survey portion of this study qualified for "exempt" status, as outlined in Utah State University's IRB Protocol Submission Instructions. The IRB approval letters for both the survey and case study portions of this research are included in Appendix C.

Participant recruitment for interview. Participants in the interview survey were self-selected. The survey frame was that of IS department heads, or directors of

undergraduate programs (IS faculty) within the schools of business. The research study employed two methods to recruit faculty to complete the telephone interview survey. Begining October 1, 2011, an email request for a 5-10 minute follow-up interview was sent out individually to all 143 IS programs whose websites and course catalogs had been assessed. The letter of consent, or letter of information in this case, with an explanation of the request and the IRB approval detail was embeded in the end of the email and also attached to the individual emails (Appendix D). On October 8, 2011, a second email request for a 5-10 minutes follow-up interview was sent out individually to all 143 IS programs whose websites and course catalogs had been assessed. The letter of information was again attached and mentioned that a call would be placed to them in the coming days.

IS 2010 guideline variables assessed. IS 2010 provides a list of seven core course or topic areas (see Topi et al., 2010), the survey looked for the presence of these seven core course or topic areas within the surveyed curricula. Topi and colleagues highlighted the course architecture and sequence of courses within IS 2010 curriculum guidelines. By comparing Topi and colleagues' course/topic area requirements with curricula requirements for IS programs, the study was able to map the basic coverage of the seven core course/topic areas. The prerequisite course/topic is Foundations of Information Systems - IS 2010.1. Data and Information Management - IS 2010.2 follows with the four others: Enterprise Architecture - IS 2010.3, IS Project Management - IS 2010.4, IT Infrastructure - IS 2010.5, and Systems Analysis and Design - IS 2010.6, all of which are suggested prerequisite courses to the IS Capstone course/topic area: IS

Strategy, Management & Acquisitions IS 2010.7. The IS 2010 standards provide the list of core topics that serve as core requirements in IS programs (see Figure 4).

Response rates. From the 143 programs that were emailed, 26 responded. Of the 23 email respondents, 11 communicated their office hours and willingness to participate in a follow-up interview, five declined participation in the study, and seven redirected the interview to take place with other faculty members who would be better equiped to host the follow-up interviews. The same email request for a 5- to 10-minute follow-up interview was sent out individually to the seven other deferred faculty; one of the seven responded as willing to take part in the follow-up interview, and the other six did not respond. Interview times with the 12 that expressed willingness to participate were coordinated through email, and scheduled interviews began on Thursday, October 13, 2011. From October 13, 2011, through November 1, 2011, three separate phone calls were placed to the remaining 126 email nonrespondents. Resultant from those phone calls, an additional 31 follow-up interviews were conducted for a total of 53 follow-up interviews completed with IS Department Heads, or Directors of Undergraduate Programs for IS programs within AACSB-accredited schools of business.

As mentioned previously, there were five programs offering an MIS graduate degree and relative curriculum, classified as nonrespondents leaving data for 138 programs surveyed or collected from the intended 143 department websites and course catalogs, giving a response rate of 96.5%. In the second part of this study, all 143 curriculum programs were emailed twice and then contacted by phone three times requesting a follow-up telephone interview. From the multiple requests for interview to

the 143 programs of study, 53 follow-up telephone interviews took place, giving a response rate of 37%. The results of both parts of the data survey and collection were combined for analysis purposes. Analyses were also run on the individual survey data-sets to determine whether there were differences in the two populations. Results of these analyses are included in the next chapter on survey findings.

Data Collection and Analysis

Data analysis was carried out in several steps. First, after both phases of the study were complete, data were tabulted into the two separate Excel spreadsheets pertaining to each part of the study, subsequently imported in to SPSS version 17.0 for analysis, and then response rates were calculated for both phases. Within the functionality of SPSS, various tests were run testing for normality and goodness of fit, from which the data were shown to be robust to violations of normality. Analyses were also performed on the individual survey data sets to determine differences in the two populations. After the second part of the study or follow-up interviews were conducted, a post hoc statistical sensitivity power analysis was completed to determine the minimal detectable effect size, with "Gpower" for a one tailed test using the updated post hoc *N*. Descriptive statistics (means, standard deviations, frequencies, and percentages) were run for the study variables of interest to summarize the data as appropriate. The relevant *Pearson r* bivariate correlation statistics was produced and a paired-samples *t* test was run to test for significant difference statistics, allowing an effect size test to be run to determine the magnitude of the difference found. After all pertinent analyses were complete in SPSS version 17.0, the same SPSS data file was imported into latent gold version 4.0 to

conduct a latent class cluster analysis. The results of these analyses were used to answer the three research questions. Results of the analyses follow in the next chapter.

Summary

Chapter III presented a summary of the methodology used for phase one and two of the research study. Using a direct survey method to collect data on IS curricula, this study assessed the resulting course/topic categories to summarize the current state of core requirements in IS programs curricula across the United States. A direct survey has the advantage of focusing on a specific program of interest (i.e., undergraduate), allowing collection of data in a systematic way, and facilitating standard quantification of data. Hence, this methodology provided a comprehensive snapshot of undergraduate IS programs in the United States. The basic design of this evaluative study was to collect and evaluate a snap shot of available IS program characteristics data from each website and university catalog of AACSB accredited IS departments in the United States. Data were extracted from these websites and used to evaluate various features that make up each IS program curriculum. Data were also confirmed and validated in follow-up telephone interviews in phase two of data collection, with IS department directors and faculty in AACSB-accredited business schools throughout the United States.

CHAPTER IV

DATA ANALYSIS AND FINDINGS

This study focused on programs in IS with the intent to obtain data from AACSB accredited domestic educational institutions. Data obtained from the respondents regarding degree curriculum programs offered within IS and program adherence to IS 2010 curriculum guidelines have been analyzed and the subsequent findings submitted in this chapter. Perscriptive data are used to give a description of the current state of AACSB accredited IS undergraduate degrees program curriculum across the nation. Specifically given are: (a) percentages of AACSB accredited IS programs adherance to IS 2010 Curriculum guidelines and the relevant descriptive statictics to show percentage relationships between IS program core courses and the core topics suggested by the IS 2010 curriculum guidelines, and the relevant change of percentages of IS topics and core courses being offered over time; (b) definitions of curriculum profiles or latent class cluster characteristics of recent career track developments that have emerged, based on data collected including number of: required courses, elective courses, career track offerings, and core courses that adhere to the IS 2010 curriculum guidelines; and (c) the perceptions of adherence by the IS department heads, department faculty, or directors of undergraduate studies compared to the assessed adherence to IS 2010 curriculum guidelines. From the analysis, a comprehensive view of the landscape for adherence to IS curriculum guidelines, listing of emerging IS career track options present in the field, and the means to infer if continued investment of time, energy, and resources should be given to support IS curriculum model development and advancement is afforded.

Study Design and Findings

Using a cross-sectional descriptive research design with retrospective comparison to past studies to detect trend over time in adherence to standards and curriculum change, and including a cluster analysis of current state naturally occurring curriculum profiles, this study intended to explore the following research questions based on information obtained in the review of literature.

1. What is the current adherence among IS courses and topic areas being offered in IS curriculum across the nation, with those suggested by IS 2010 curriculum guidelines?
    a. What percentage of current IS courses and topics being currently offered in IS curriculum programs conform to the recommendations suggested by IS 2010 curriculum guidelines?
    b. What percentage of IS undergraduate programs are offering career tracks options in their curriculum, and:
        i. Among these, what is the average number of career tracks offered?
        ii. Among the selected sample, what are the different career tracks offered?
        iii. Among the selected sample, what are the most common career tracks offered?
    c. How have the percentages of IS courses and topics currently being offered changed over time, as compared to the 2006 state of the IS curriculum article (Kung et al., 2006)?

2. What specific curriculum profiles (clusters) emerge based on data collected including number of: required courses, elective courses, career track offerings, and core courses that adhere to the IS 2010 curriculum guidelines?

3. How do perceptions of adherence (subjective data collected) by the department heads, or directors of undergraduate programs compare to the assessed adherence (objective data collected) to IS 2010 curriculum guidelines?

Data Collection Results

As mentioned, of the 143 IS programs surveyed for data, five programs were classified as nonrespondents in the first part of this study, leaving 138 programs for which data was surveyed and collected, giving a response rate of 96.5%. In the second part of this study, all 143 curriculum programs were included in the respective emails and telephone contacts requesting follow-up interviews. From the 143 programs of study, 53 follow-up telephone interviews took place, giving a response rate of 37%. The results of the descriptive analysis of both parts of the data survey and collection were in the analysis proceedings. Analyses were also performed on the individual survey data sets to determine differences in the two populations. Results of these analyses follow in this chapter. Minimal corrections (seven individual data points in total) to the website and course catalog sample population from the follow-up interview sample population substantiates the thorough nature of the data collection process in phase one of the study. After phase two ended a post hoc statistical sensitivity power analysis was conducted.

Post Hoc Sample Size and Statistical Sensitivity Power Analysis

Data were intended to be collected for no less than one fourth of the sample population (36 programs) and up to one half (72 programs) or more of the assessed sample population (143 intented IS curriculum programs). Prior to study inception, we performed a sensitivity power analysis because our sample was fixed in terms of possible size, so that given our sample size we could project the minimal detectable effects (i.e., the difference between assessed adherence and self-reported adherence data and the difference between current curriculum programs and prior programs).

Looking at the two different past studies afforded a sense of what difference to expect, whether small, medium, or large. Having completed a power analysis prior to the study, we determined the ideal amount of people for the study. We knew how many we thought we could get because our sample was predefined, and we justified that it was reasonable in that it was prelimited at 286 (number of available programs). Using a sensitivity analysis to determine the minimal detectable effect size with that upper limit, and based on our expectation of the difference to be moderate, we recompleted a power analysis with "Gpower" for a one tailed test using the updated post hoc *N*.

In total, data for 138 programs was surveyed or collected from department websites and course catalogs, and follow-up interviews were conducted with 53 of the 138 programs for which data were surveyed. The statistical sensitivity power analysis that was performed prior to study completion for sample size estimation was based on the expectation for follow-up interviews to be conducted with a minimum of 27 programs and possibly a sample size of up to 72 of the expected 143 programs to be assessed, for

both the comparison of self report adherence and assessed adherence and for the comparison of current curriculum data to past curriculum data. The minimal detectable *ES*s were .29 and .38, respectively, low medium using Cohen's (1988) criteria with alpha = .05 and power = 0.80 (GPower 3.1). Thus, our expected possible recruitment was more than adequate for the main objectives of this study, given our expectations of moderate differences. With a significance test for 53 programs, the actual number of follow-up interviews completed, out of 72 expected from the actual 138 programs assessed, the minimal detectable *ES*s were .35 and unchanged at .38, respectively, still low medium using Cohen's criteria with alpha = .05 and power = 0.80 (GPower 3.1). Thus, our expected possible recruitment based remained more than adequate for the main objectives of the study, given our expectations of moderate differences.

Data Verification Procedures

After both phases of the study were complete, data were tabulted into the two separate Excel spreadsheets appertaining to the two parts of the study, and subsequently inported in to SPSS version 17.0 for analysis. To confirm data integrity, a comparison was performed between the two Microsoft Excel 2007 spreadsheets and the two SPSS data files. For each set of data, both files were opened and twenty five random values were selected and compared. As no differences were detected, advocation that the data import function of SPSS version 17.0 had functioned correctly and no data were altered resulted. For all varibles with coded numbers, column names were changed into meaningful names by the researcher.

Within the functionality of SPSS, various tests were run to test for normality and

goodness of fit, from which the data was shown to be robust to violations of normality. Descriptive statistics (means, standard deviations, frequencies, and percentages) were run for the study variables of interest to summarize the data as appropriate. The relevant Pearson *r* bivariate correlation statistic was produced and a paired-samples *t* test was run to test for significant difference statistics between IS programs percentage of adherence and self-report percentage of adherence to the IS 2010 curriculum guidelines. After all pertinent analyses were complete in SPSS version 17.0, the same two SPSS data files were imported into latent gold version 4.0 to conduct a latent class cluster analysis. The results of these analyses were used to answer the three research questions. Results of these analyses follow in the next chapter.

Data Analysis

Data Test for Normality or Goodness of Fit

At first glance, the data seem to conform to a normal distribution or curve; looking at a histogram of assessed compliance shows similarity to a normal curve (Figure 6). A test for normality was performed on the data to determine if the sample met the assumptions of normality. The Shapiro-Wilk significance levels found the data to be non-normal for the variables in the study. To further explore how robust the data were to violations of normality, a paired-samples *t* test (parametric) was run on two key variables, which showed significant difference with statistical significance $p < .0001$. Additionally, the non-parametric Wilcoxon signed ranks test was run on the same two key variables and also found significant difference with statistical significance $p = .0001$. According to

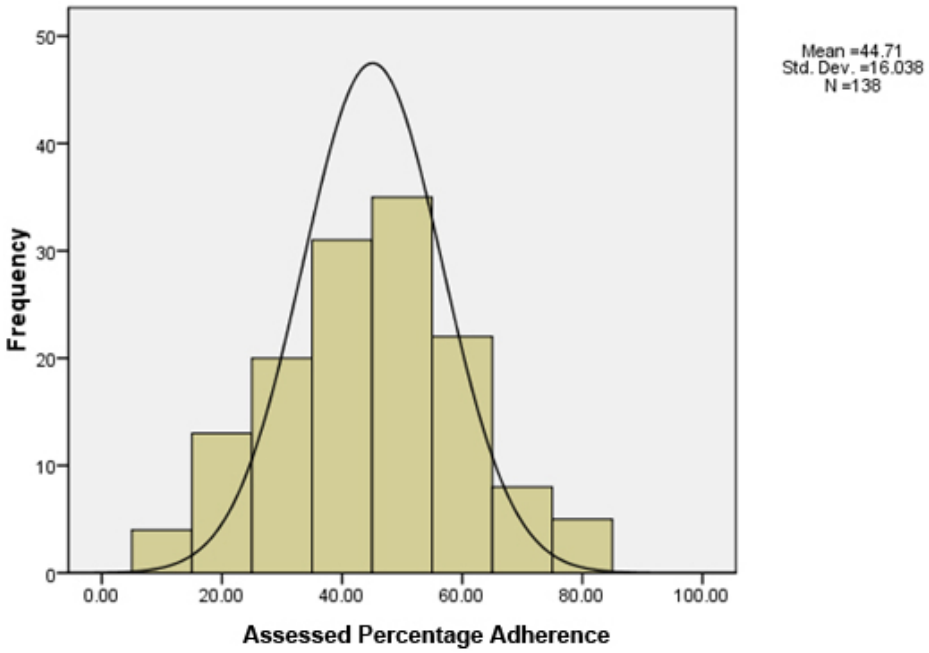


Figure 6. Histogram showing IS programs percent of adherence to the IS 2010 guidelines.

Smith (2003, p. 61), in a considerably popular accounting research methods text, when similar statistical significance values are obtained from a parametric and nonparametric test on the same sample population data, the data are "incredibly robust" to any violations of normality. Later in the analysis this was reconfirmed as Pearson *r* (parametric) and Spearman rho (nonparametric) correlation coefficients were computed and produced similar statistical significance values.

Research Questions and Findings

This study used a cross-sectional descriptive research design with retrospective comparison to past studies to examine the state of IS curriculum to show trend over time in adherence to curriculum standards and for any evolution in IS career track trends.

Finding 1 for Research Question 1. Research question 1 stated, "What is the

current adherence among IS courses and topic areas being offered in IS curriculum across the nation, with those suggested by IS 2010 curriculum guidelines?"

The main elements of the IS 2010 curriculum guidelines consist of seven core topics, a capstone required in the last year of the program, and career track offering. The seven core courses consisted of the following.

1. Foundations of Information Systems (IS 2010.1: Foundations of IS);
2. Data and Information Management (IS 2010.2: Data & Info Mgmt);
3. Enterprise Architecture (IS 2010.3: Enterprise Architecture);
4. IS Project Management (IS 2010.4: IS Project Management);
5. IT Infrastructure (IS 2010.5: IT Infrastructure);
6. Systems Analysis & Design (IS 2010.6: Sys. Analysis/Design); and
7. IS Strategy, Management, & Acquisition (IS 2010.7: IS Strat, Mgmt, & Acq).

The IS 2010 curriculum guidelines requires that all IS curricula must offer sufficient coverage of the seven core topics related to IS specific knowledge and skills. In addition, the curricula for a particular program must cover a selection of elective topics supporting the career track(s) that a given institution has decided to offer (Topi et al., 2010, p. 361).

In our assessment of the 138 IS programs, we verified the presence or lack thereof for 10 key variables giving each IS program 10% credit for the presence of each variable in their program. As shown in Table 1, if an IS program had each of the variables present in irs curriculum program it was deamed 100% adherent to the IS curriculum guidelines. Likewise, if an IS program had 9 of the 10, its program was deamed 90% adherent to the IS curriculum guidelines, and so on, and so forth.

Table 1

Ten Key Variable Assessed for IS Program Adherence to IS 2010 Curriculum Guidelines

Core program requirement by IS 2010 curriculum guidelines	Yes/No (10/0)
IS 2010.1: Foundations of information systems	10
IS 2010.2: Data and information management	10
IS 2010.3: Enterprise architecture	10
IS 2010.4: IS Project management	10
IS 2010.5: IT infrastructure	10
IS 2010.6: Systems analysis and design	10
IS 2010.7: IS strategy, management, and acquisition	10
Capstone course required during a student's final year	10
Emphases that identify a common Career Track	10
Defined career tracks options with the required courses listed	10
Percentage adherence to IS 2010 curriculum guidelines	100%

For each program asessment that took place, the course descriptions for all core courses were reviewed and revised again for pairing with the topic descriptions of the seven IS 2010 guideline topics. These course descriptions were typically obtained from the university and IS program websites and usually confirmed in the university course catalogs. Early on in the data search it was recognized that the university and IS program websites were typically the most up to date. In the rare occasion that the course descriptions and IS program information could not be located in the relevant website, the information was found in the recent version of the university course catalog. All actual IS undergraduate programs randomly sampled as part of the study were able to be sucessfully assessed with the exception of the five programs that offered only graduate programs.

Like the program evaluation for the seven IS 2010 core topics, a similar

assessment was completed to confirm presence of a capstone course taught as part of the core curriculum and required in the last year of the program. Likewise, a similar review was completed for the vetting of any available specifically named IS emphasis in common career track areas listed by the IS 2010 curriculum guidelines, and for the presence of any defined career track offerings. Results from the assessment for the presence of each variable in the separate IS programs were tabulated and each individual IS program received its own respective score for assessed adherence to the IS 2010 curriculum guidelines. Having 10 variables to assess, each with a dichotomous score of 0 or 10 afforded the convenience of summing the scores of the 10 variables and obtaining the resultant percentage of compliance our of a possible total 100%. Later in the analysis, comparing assessed adherence to self-reported adherence, out of 100%, was computed with ease.

As mentioned prior in the test for normality section, when looking at the graphs and charts produced for several variables of the study, the impression is given that the data appear to be normal. This impression can be received from the distribution histogram for assessed percentage of adherence by IS programs to the IS 2010 curriculum guidelines (Figure 6). The histogram illustrates the bulk of IS program adherence percentages fall around the center of the depicted normal curve, with a mean of 44.7% and a standard deviation of 16% for the IS programs adherence percentages of the 138 sampled IS programs.

Of the 138 IS programs assessed, none were scored at zero percentage of adherence, and likewise at 90% or 100% of adherence (Table 2). It may also be noticed

Table 2

IS Program Adherence in United States to IS 2010 Curriculum Guidelines—Descriptive Statistics

Percentage adherence categories	Percentage adherence by frequency (n = 138)	Percentage adherence by percentage (n = 138)	Mean (n = 138)	*SD*	Range
0	0	0.0	--	--	--
10	4	3.0	.030	.17	0 - 1
20	13	9.5	.095	.29	0 - 1
30	20	14.5	.145	.35	0 - 1
40	31	22.5	.225	.42	0 - 1
50	35	25.5	.255	.44	0 - 1
60	22	16.0	.160	.37	0 - 1
70	8	5.5	.055	.24	0 - 1
80	5	3.5	.035	.19	0 - 1
90	0	0.0	--	--	--
100	0	0.0	--	--	--

that highest frequency percentage of adherence occurs at the 50th percentile adherence level with 25.5% of the IS programs scoring at 50% adherence. The next highest frequency of adherence scores occur at the 40th percentile adherence level with 22.5% of the IS programs scoring at 40% adherence. The third highest frequency percentage of adherence occurs at the 60th percentile adherence level with 16% of the IS programs scoring at 60% adherence, and the trend continue outward from the center of the curve. In the IS program evaluations, adherence variables were assessed dichotomously, thus there is a similitude between percentage of adherence by percentage versus the mean for the analogous variables.

Table 3 lists the relevant descriptive statistics for five key continuous variables documented in this study. Later, in the section that presents the findings for Research

Table 3

IS 2010 Curriculum Guidelines Current Adherence—Descriptive Statistics

IS 2010 guideline categories	Mean	Median	Mode	*SD*	Range
# of courses required	6.8	7.0	7.0	2.3	1 - 14
Percentage adherence	44.7	50.0	50.0	16.8	10 - 80
Perceived % adherence	77.9	80.0	80.0	16.0	0 - 100
# of elective courses offered	10.6	9.0	13.0	7.6	0 - 42
# of career tracks offered	0.25	0.0	0.0	0.96	0 - 5

Question 2, a latent class cluster analysis is completed specifically around the five key variables listed in Table 3. These five key variables are continuous in nature, but later when conducting a latent class cluster analysis they are dichotomized in attempt to discover statistically relevant groups or clusters. The coupling or condensing together certain variables will also later afford definition and description of the naturally occurring clusters and their characteristics. Notice the mean of "# of courses required," the value 6.8 can be useful to classify a center category of courses required by the IS program as a "typical" number of courses required in an IS program of study. Similar understanding can be taken from the other numbers representing the variables listed. Notice the mean, median, and mode for "Percentage of Adherence." They help us understand that a typical program is roughly 50% adherent to the IS 2010 curriculum guidelines, which we can use to help us classify specific common categories of adherence. The mean also becomes relevant later in our test for difference between assessed percentage adherence and IS programs self-reported percentage of adherence.

Finding 2 for Research Question 1a. Research question 1a stated, "What percentage of current IS courses and topics being currently offered in IS curriculum programs conforms to the recommendations suggested by IS 2010 curriculum guidelines?

As shown earlier, from a mean score of 44.7% for IS program adherence to IS 2010 curriculum guidelines, one might infer the overall percentage of current IS courses and topics being currently offered in IS curriculum programs would not likely be extensive. However, the variation in which individual topics are covered extensively versus those less covered is quite interesting to see. Table 4 highlights four of the seven IS 2010 core topics covered by most IS programs, where the other three topics are offered less frequently.

Table 4 also shows IS 2010.1—foundations of information systems, IS 2010.2—data and information management IS 2010.5—IT infrastructure, and IS 2010.6—systems analysis and design are among the four most highly covered topics. These four topics

Table 4

IS 2010 Curriculum Guidelines Adherence by Number and Percentage—Descriptive Statistics

IS 2010 guideline categories	Frequency (n = 138)	Percentage (n = 138)	Mean (n = 138)	*SD*	Range
IS 2010.1: Foundations of IS	119	86	.86	.35	0-1
IS 2010.2: Data & information management	128	93	.93	.26	0-1
IS 2010.3: Enterprise architecture	23	17	.17	.37	0-1
IS 2010.4: IS Project management	49	36	.36	.48	0-1
IS 2010.5: IT infrastructure	87	63	.63	.49	0-1
IS 2010.6: Systems analysis & design	109	79	.79	.41	0-1
IS 2010.7: IS strategy, mgmt.., & acquisition	40	29	.29	.46	0-1
Capstone in final year	42	30	.30	.46	0-1
Identified Emphases	12	8.5	.085	.28	0-1
Career Tracks options	10	7	.07	.26	0-1

being the most highly covered topics is not too surprising since they were all present in the IS 2002 model curriculum and have been somewhat of a staple in IS curriculum in the past 10 plus years. Two of the other three IS topics that are taught at a significantly lower percentage are somewhat newer in concept, IS 2010.3—enterprise architecture and IS 2010.7—IS strategy, management, and acquisition, and were not actually present in the IS 2002 model curriculum. The third topic that is generally not taught by most IS programs is IS 2010.4—IS project management. Yet, IS 2010.4—is project management is found in both the IS 2002 model curriculum, IS 97 model curriculum, and IS 95 model curriculum. With only 36% of the IS programs teaching IS project management one might infer that this topic has not been deemed a high priority within IS curriculum over the last 15 years. The capstone course requirement in the final year of the program was also offered at a significantly lower percentage, by 30% of the IS programs across the country. At an even lower percentage, identified emphasis and career tracks are offered by 8.5% and 7%, respectively, of the IS programs across the country.

Later, in the section that presents the findings for Research Question 1c, the percentages of certain IS courses being currently offered will also be used to run a one-sample *t* test for difference in a retrospective comparison between this current state IS curriculum data and the topics taught in the past IS curriculum study of 2006, based on the past known proportion. This difference test will allow us to compare each study's topic adherence percentage examining the overall difference between the two, to show change and trend over time.

A few paragraphs prior in Table 3, it was noted that the mean of "# of courses

required" was 6.8, with a median and mode of 7.0, and standard deviation of 2.3. As is confirmed by the histogram in Figure 7 and the empirical rule, it can be deducted that 68% of IS programs offer between 4.5 and 9.1 required courses. This statistic is what we later classify as a center category of courses required by the IS program, or as a "typical" or a "significant" number of courses required today in IS program of study across the country.

We further delineated from Figure 7, and in the frequency and percentage table (Table 5), some significant kurtosis and steep peak in the curve occurring with the bulk of the IS programs situated quite closely to the mean of 6.8, also identified with a numerically close median and mode. Table 5 shows that 2 of the 13 values scored, values 6 and 7, account for 60 of the IS programs out of 138 assessed, a 43% representation.

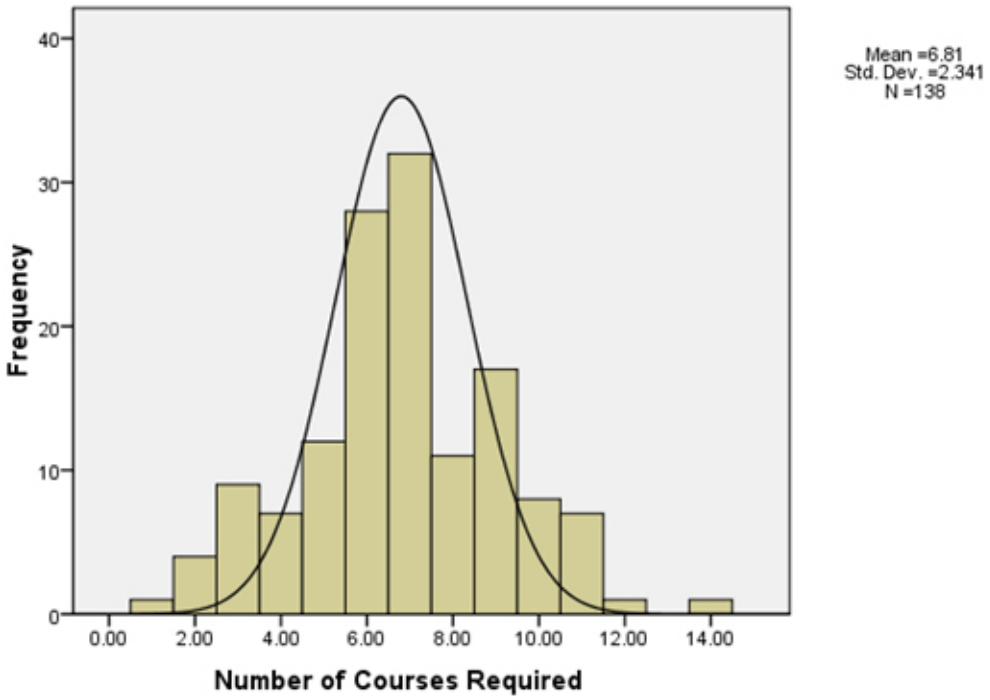


Figure 7. Histogram showing IS programs number of courses required.

Table 5

IS Programs Number of Courses Required—Descriptive Statistics

Number of courses required	Number of IS programs with specified # of courses required (n = 138)	Percentage of IS programs with specified # of courses required (n = 138)
0	0	0
1	1	1
2	4	3
3	9	6
4	7	5
5	12	9
6	28	20
7	32	23
8	11	8
9	17	12
10	8	6
11	7	5
12	1	1
13	0	0
14	1	1

To understand the general picture or current state of IS curriculum across the country common categories have been identified and labeled during a data organization phase. Similar to facts surrounding Table 5 and Figure 7, additional trends can now be further described by organizing the data into certain categories. Table 6 provides the common categories in which the data have been categorized, showing a similar trend in kurtosis and steep peak in the curve occurring with the bulk of the IS programs situated quite closely to the mean. Here we see the number of required courses for one standard deviation (*SD*) from the mean to be between 4.5 and 9.1 required courses. The two middle categories labeled as typical and significant come close to representing one *SD* from the mean. These two categories are later used in our analysis and classified as the

Table 6

IS Programs Current Required Courses—Descriptive Statistics

Courses required	Frequency (n = 138)	Percentage (n = 138)	Mean (n = 138)	*SD*	Range
Few (0—3)	14	10	.10	.30	0 - 1
Typical (4—6)	47	34	.34	.48	0 - 1
Significant (7—9)	60	44	.44	.50	0 - 1
Extensive (10—12)	17	12	.12	.33	0 - 1

center categories of courses required, or as a “typical” or “significant” number of courses required today in IS programs of study across the country. In Table 6, it can be seen that the two middle categories representing 4-9 courses required just slightly vary from our one SD from the mean, or 4.5 and 9.1 required courses. Seventy-eight percent of the IS programs of study are accounted for.

A similar occurrence can be found in Figure 8, where another kurtosis and steep peak in the curve take place with the bulk of the IS programs situated quite closely to the mean of 10.6 with an *SD* of 7.6. Notice the medians and modes (Table 3) are also higher, indicating a greater number of elective courses offered compared to the number of courses required by IS programs. Here we see the number of elective courses offered for one standard deviation from the mean to be between 3 and 18.2 elective courses offered.

The two middle categories in Table 7 are also later merged in our analysis and classified as the center category of elective courses offered, or as a “typical” number of elective courses offered today in IS programs of study across the country. It can be seen in the following table for elective courses offered by IS programs, that the two middle categories representing 7-9 and 10-12 elective courses offered represent 32% of IS

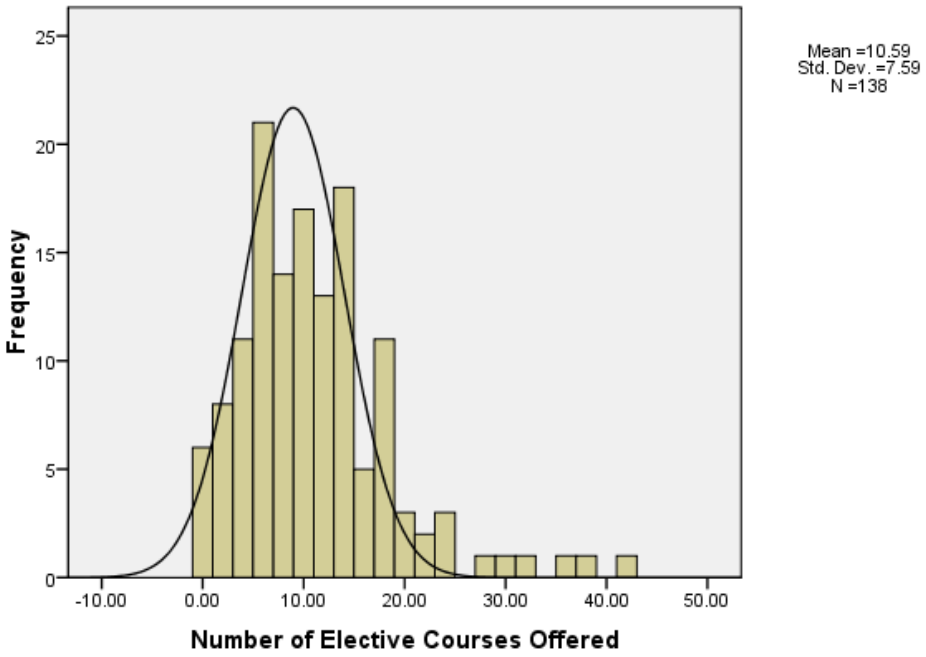


Figure 8. Histogram showing IS programs number of elective courses offered.

Table 7

IS Programs Current Number of Elective Course Offerings—Descriptive Statistics

Elective courses offered	Frequency (n = 138)	Percentage (n = 138)	Mean (n = 138)	*SD*	Range
Scarce (0-3)	20	14	.15	.35	0 - 1
Few (4-6)	26	19	.19	.39	0 - 1
Typical (7-9)	25	18	.18	.39	0 - 1
Considerable (10-12)	19	14	.14	.35	0 - 1
Significant (13-19)	35	25	.25	.44	0 - 1
Extensive (20+)	13	9	.09	.29	0 - 1

programs of study. Table 8 additionally shows with a range of 0 (6 IS programs having no elective course offerings) up to 42 (one IS programs having 42 elective course offerings), there is a much higher variation in quantity for the number of elective courses offered by IS programs across the country. Notice the difference between the median of

Table 8

IS Program Number of Elective Course Offerings—Descriptive Statistics

Number of elective courses offered	Number of IS programs offering specified # of elective courses (n = 138)	Percentage of IS programs offering specified # of elective courses (n = 138)
0	6	4.0
1	6	4.0
2	2	1.5
3	6	4.0
4	5	3.5
5	11	8.0
6	10	7.0
7	9	6.5
8	5	3.5
9	11	8.0
10	6	4.0
11	7	5.0
12	6	4.0
13	12	9.0
14	6	4.0
15	2	1.5
16	3	2.0
17	5	3.5
18	6	4.0
19	1	1.0
20	2	1.5
21	1	1.0
22	1	1.0
23	2	1.5
24	1	1.0
28	1	1.0
29	1	1.0
32	1	1.0
35	1	1.0
38	1	1.0
42	1	1.0

9 and mode of 13 (Table 3) showing much higher variation in quantity for the number of elective courses offered by IS programs. In fact, the variance for number of courses required is only 5.5, where the variance for the number of elective courses offered is 57.6.

Finding 3 for Research Question 1b. Research Question 1b stated, "What percentage of IS undergraduate programs are offering career tracks options in their curriculum?"

In the review of literature section, the point was made the IS 2010 curriculum guidelines were structured so they separate the core of the curriculum from electives to support the concept of career tracks. Separation of core from electives gives enough flexibility to afford curriculum adoption in a variety of educational systems contexts. Where many institutions did not find IS 2002 to be responsive to their particular needs, these same institutions may now be able to use IS 2010 concepts within a more flexible framework, and apply the guidelines and principles in their IS curriculum. "Finally, by separating the core curriculum from career track electives, we are able to provide the flexibility desired by nontraditional IS programs while also offering exciting options for programs constrained by AACSB or other restrictions" (Topi et al., 2007, p. 735).

In this section, Research Question 1b, we illustrate the percentage of IS undergraduate programs offering career tracks options in their curriculum, and specifically provide the average number of career tracks offered, the different types of career tracks offered, and the most common career tracks offered. In total there are 10 IS programs from the sample of 138 that are offering career track options; 7% of the IS

programs across the country with formalized career tracks. The mean for the number of career tracks offered is .25, with a mode and median of 0, a standard deviation of .96 (Table 3). The range for number of career tracks offered is 0-5 (Table 9).

Finding 4 for Research Question 1bi. Research Question 1bi stated, "Among these, what is the average number of career tracks offered?"

For the 10 IS programs offering career tracks, the average number of career tacks offered is 3.5, with a median and mode of three career tracks offered. Thus, as shown in Table 9, the highest number of career tracks offered is five, by three of the IS programs. The lowest number of career tracks offered is two, by two of the IS programs. One IS program offers four career tracks, and four IS programs offer three career track options. There is currently 93% of the IS programs across the country with no career track offerings for their students consideration. In addition to the 10 IS programs that are offering career track options, there are an additional two IS programs (1.5%) who have identified two separate emphases for their students to choose from, but these programs have not formally organized them into any particular tracks with specific courses

Table 9

IS Program offering Career Track Options

Number of career tracks (CTs) offered	Number of IS programs offering specified # of CTs (n = 138)	Percentage of IS pograms offering specified # of CTs (n = 138)
0	128	93.0
2	2	1.3
3	4	3.0
4	1	0.7
5	3	2.0

assigned to them. These two IS programs with separately identified emphases were given credit for having an identified emphasis or direction for the students, but were not given credit for adherence to the career track option guideline presented by the IS 2010 curriculum guidelines.

Finding 5 for Research Question 1bii. Research Question 1bii stated, "Among the selected sample, what are the different career tracks offered?"

The different career tracks offered by the 10 IS programs offering career track options are listed in Table 10. Listed by the program identifier number, we can see that IS program #5 has three career track offerings, a number we might deem as typical for IS programs offering career tracks options, being the mode and median and a value of .5 from the mean. The three career tracks offered by the first IS program listed in Table 10, IS program #5 are: (a) applications developer, (b) business analyst, and (c) information and communications technology. These career tracks seem to be somewhat standard in name, but generalizing among common career tracks is difficult with only 7% of IS programs offering career track options. In some of the IS program career track options, we do see a few of the more common IS themes in the various career track titles or names (i.e., application developer, systems analyst, networking specialist, etc.). For some of the career track titles or names, various IS programs tend to get somewhat specific or specialized; branching off from the more common IS themes or nomenclature. In all, 19 unique career tracks were identified for a total of 35 career track options from the 10 IS programs offering career tracks. The two IS programs who have identified separate emphases were not included in these figures, because their programs have not formally

Table 10

IS Program Career Track Offerings

Program ID #	IS program career track options
5	Application development Business analysis Information and communications technology
6	Web development / E-commerce Programmer/analyst Global IS/spatial systems Telecommunications and computer networks
19	E-business and multimedia Network and enterprise management Applications development
20	Networking specialist Organizational information systems
35	Applications developer Enterprise resource planning Enterprise systems
37	Computer security PC/LAN support Software engineering/programming Web development specialist Information analyst
41	Web developer DBA (database administrator) Project manager IT consultant / business analyst E-learning manager
43	Systems analysis Business analysis
72	Analyst/project manager Database technologies IT infrastructure IT consulting IT audit and compliance
104	Business application development Information systems management Health informatics (HIT)

organized them into any particular tracks with specific courses assigned to them so they were not deemed qualified as actually offering career track options for their students to choose.

Finding 6 for Research Question 1biii. Research Question 1biii stated, "Among the selected sample, what are the most common career tracks offered?"

Grouping all of the career track titles together by common name identified the most common career tracks offered. In Table 11, the four most common career tracks are shown, each with four IS programs offering that track. Four additional common career tracks are offered, each with three IS programs offering that track. The first eight career tracks seem to be the most common career tracks offered by IS programs.

Table 11

IS Program Common Career Track Options

IS program common career track option	# of program offering specific career track
Application development	4
Business analysis	4
Telecommunications & computer networks management	4
Web development specialist	4
Information systems technology management	3
E-commerce/E-business	3
Software engineering/programmer	3
Information systems analysis	3
IT consultant	2
Project manager	2
Database administrator/technologies	2
E-learning manager	1
Enterprise resource planning	1
Enterprise systems	1
Computer security	1
Global IS/spatial systems	1
IT infrastructure	1
IT audit and compliance	1
Health informatics (HIT)	1

Finding 7 for Research Question 1c. Research Question 1c stated, "How have the percentages of IS courses and topics currently being offered changed over time, as compared to the 2006 state of the IS curriculum article (Kung et al., 2006)?"

In 2003, a survey by Kung and colleagues (2006) assessed undergraduate IS program curriculum for seven core IS courses indicated in the model curriculum. Operating systems was found offered at 16% of the universities, IS capstone course at 47%, introduction to IS at 61%, telecommunications at 71%, programming at 88%, database at 92%, and systems analysis and design was offered by 94% (Kung et al., 2006). Maier and Gambill published an analogous study in 1996 that found very similar results. In their assessment, Maier and Gambill also looked at the exact names of the various IS programs and found that "the most widely reported names for this program of study were Computer Information Systems (CIS) and Management Information Systems (MIS)" (p. 3). Pierson and colleagues (2008) conveyed actual percentages of the common names for IS programs of study for the year 2004 and 2007, and those general numbers are likely applicable today.

This section will answer Research Question 1c, by completing a retrospective comparison with the percentages of IS courses and topics currently being offered to those listed in the 2006 state of the IS curriculum article (Kung et al., 2006), based upon past known proportions. This section will also compare the same current study percentages with those listed in the 1996 state of the IS curriculum article (Maier & Gambill, 1996), and compare the current percentages of common IS programs names assessed in this study with the IS program names listed in the article by Pierson and colleagues (2008).

For the seven IS topics assessed in the 2006 state of the IS curriculum article (Kung et al., 2006), there were five topics that are still relevant to the current IS 2010 curriculum guidelines of today, as assessed in the study. The comparable requirements were IS 2010.1, IS 2010.2, IS 2010.5, IS 2010.6, and the capstone course. In this study the main interest was to conduct a retrospective comparison and examine the overall difference between the topics taught in the 2006 past study from that of the current state of IS curriculum to show change and trend overtime. Thus, for each of the five topics to be compared, a one-sample *t* test was run comparing each studies topic adherence percentage for the respective topics, based on the past known proportion. As seen in the results listed in Table 12, whenever there is a $p < .05$, it implies that there is a statistically significant difference between the 2006 past percent adherence and current percent adherence in the population assessed at the time for the IS 2010.1 topic, IS 2010.6 topic, and the capstone course.

The results listed in Table 12 illustrate from 2006 to the present, there has been a significant increase, 25%, in the percentage of IS programs that now teach IS 2010.1 in

Table 12

*IS 2010 Current Adherence Comparison to 2006 Adherence—*t *Test*

IS topic	2006 study percentage (n = 232)	Current study percentage (n = 138)	Difference (%)	Test statistic (t)	t test (p value)
IS 2010.1: Foundations of IS	61	86	25	8.571	.0001[a]
IS 2010.2: Data & Info Mgmt	92	93	1	0.340	.734
IS 2010.5: IT infrastructure	71	63	-8	-1.929	.056
IS 2010.6: Sys. analysis/design	94	79	-15	-4.314	.0001[a]
Capstone	47	30	-17	-4.214	.0001[a]

[a] Not adjusted for multiple comparisons.

their core curriculum. Table 12 also shows over the past 5 years the percentage of IS programs teaching IS 2010.2 and IS 2010.5 has remained relatively the same. There has also been a significant decrease in the percentage of IS programs teaching IS 2010.6 and a capstone course in their core curriculum, 15% and 17%, respectively.

For the various IS topics assessed in 1996 state of the IS curriculum article (Maier & Gambill, 1996), there were five topics still relevant to current IS 2010 curriculum guidelines, as assessed in the study. The comparable requirements were IS 2010.1, IS 2010.2, IS 2010.5, IS 2010.6, and IS 2010.7. The same retrospective comparison method used to compare the overall difference of the 2006 past study, a one-sample *t* test, was used for the 1996 past study, based on the past known proportion. As seen in Table 13, any $p < .05$ implies a statistically significant difference between the 1996 past percent adherence and current percent adherence in the population assessed at the time for all five topics.

As seen from the results listed in Table 13, from 1996 to the present, there has been a significant increase, 26%, in the percentage of IS programs that now teach IS

Table 13

IS 2010 Current Adherence Comparison to 1996 Adherence—t *Test*

IS Topic	1996 study percentage (n = 108)	Current study percentage (n = 138)	Difference (%)	Test statistic (t)	t test (p value)
IS 2010.1: Foundations of IS	60	86	26	8.911	.0001[a]
IS 2010.2: Data & info mgmt	12	93	81	36.458	.0001[a]
IS 2010.5: IT infrastructure	5	63	58	14.075	.0001[a]
IS 2010.6: Sys. analysis/design	19	79	60	17.233	.0001[a]
IS 2010.7: IS strat, mgmt, & aqc	16	29	13	3.35	.0001[a]

[a] Not adjusted for multiple comparisons.

2010.1 in their core curriculum. There is only a 1% difference for IS programs teaching IS 2010.1 in 1996 to 2006. From 1996 until now, there has been a significant increase in the percentage of IS programs teaching the topics for IS 2010.2 (81%), IS 2010.5 (58%), and IS 2010.6 (60%). There was likewise an increase for IS 2010.7 of 13%. Table 14 shows IS topics 2010.5, and 2010.6 with an increase from 1996 to now (58% and 60%), and a decrease (-8% and -15%) in those two topics occurred from 2006 up to this study. The other IS topics showed an increase from 1996 to 2006 and up to this date as well.

Maier and Gambill's (1996) published study looked at the exact names of the various IS programs and found "the most widely reported names for this program of study were Computer Information Systems (CIS) and Management Information Systems (MIS)" (p. 3). However, their study did not list any percentages. Pierson, Kruck, and Teer (2008), convey actual percentages of the common names for IS programs of study for the year 2004 and 2007, and those general names and percentages seem applicable today. IS program names and percentages were deemed pertinent enough by Topi and colleagues (2010, p. 373) to be included in the IS 2010 curriculum guidelines article, and cites them as:

- Management Information Systems, representing 41% of programs
- Information Systems, representing 21% of programs
- Computer Information Systems, representing 18% of programs

In this study IS program names were also assessed and similar, but not identical, results were found (Table 14).

Table 14

IS Program Names Commonly Found in the United States—Descriptive Statistics

Program names	Program names by frequency (n = 138)	Program names by percentage (n = 138)	Mean (n = 138)	*SD*	Range
Management information systems	44	32	.32	.467	0-1
Information systems	23	17	.17	.374	0-1
Computer information systems	22	16	.16	.367	0-1
Other information systems name	49	35	.35	.480	0-1

Finding 8 for Research Question 2. Research Question 2 stated, "What specific curriculum profiles (clusters) emerge based on data collected including number of: required courses, elective courses, career track offerings, and core courses that adhere to the IS 2010 curriculum guidelines?"

Research Question 2 used the data collected for Research Question 1 and complete a latent class cluster analysis to identify naturally occurring profiles that help describe the state of adherence to curriculum guidelines. The analysis was performed on the number of required courses, number of elective courses offered, capstone course requirements, career track offerings, and core courses adhering to the IS 2010 curriculum guidelines to identify the naturally occurring profiles or clusters.

After the pertinent analysis was complete in SPSS version 17.0, the SPSS data files for the sample population of 138 subjects were imported into Latent Gold version 4.0 to conduct a latent class cluster analysis. According to (Francis, 2010, p. 2):

> A latent class analysis can best be thought of as an improved cluster analysis, which uses statistical (rather than mathematical) methodology to construct the results. It is based on the statistical concept of likelihood.

> Parameters are estimated for class profiles, the description of each class and the size of each class. The main difference between latent class analysis and traditional cluster analysis is that cases are not absolutely assigned to classes, but rather have a probability of membership for each class.

To conduct a latent class cluster analysis, the data is reviewed and assessed at the various cluster numbers to obtain the information on the best number of clusters. To do so, the different number of potential clusters are evaluated, first two clusters, then three clusters, and so on. "Starting values are crucial. It is essential to start the algorithm with a variety of starting values, to ensure…the best solution has been found. This is particularly true of complex models with large numbers of classes" (Francis, 2010, p. 20).

As the clusters are evaluated, special attention is paid to the information criteria. The best number of clusters is found when the Akaike information criterion (AIC) and the Bayasian information criterion (BIC) is minimized (McCutcheon & Hagenaars, 2000). Thus, while evaluating each number of clusters, if the AIC and BIC is growing in number, you are moving away from the best number of clusters. If the AIC and BIC is shrinking in number, you are moving towards the best number of clusters. The common grouping of data must also be watched to verify which groupings seem to be related and at the same time minimize the AIC and BIC. The profiles of these clusters were observed, helping define response patterns for each cluster and to perhaps label it. The probability of membership to a particular cluster is provided for each variable. Finally, attention is paid to which subjects belong to which cluster—looking at the probability of cluster membership for each variable to find the optimal model (Garson, 2008).

In the case of this study, focus was placed specifically on the sample population of 138 because of the larger sample size and because the data set had all variables needed

to run a latent class analysis. The differences between this data set and the one refined from the interviews was a smaller number of subjects and the addition of the self-report adherence scores. These differences were disadvantages, because we desired to have a larger sample population and we believed the self-report adherence scores were not factual. We also desired to perform clustering based on facts, not perceptions as the study was attempting to profile reality rather than what is perceived.

After proceeding through the process just mentioned, AIC and BIC was minimized at four latent class clusters. Table 15 lists the probabilities of the analyzed characteristics pertaining to the four different clusters. From this table we see Cluster One is the second smallest in size representing 12% of the population, and can be characterized as a IS 2010 curriculum guidelines nonconforming IS program. Cluster one has a high probability of requiring between 0-3 core courses, and a moderate probability of offering a typical amount of elective courses, which is one reasons for its assigned classification. There is almost no probability that Cluster One will require a capstone course in the final year of the program, and this cluster is very likely to fall within the poor adherence range to the IS 2010 curriculum guidelines. This cluster also has a very low probability of offering career track options. Based on these characteristics, we labeled Cluster One as the IS guidelines passive cluster.

According to the data listed in Table 15, Cluster Two is the second largest in size representing 37% of the population, and can be characterized as a typical or average IS program. Cluster two has an equally high probability of requiring between 4-9 core courses, right at the mean for courses required for the population. Additionally, cluster

Table 15

IS 2010 Curriculum Guidelines Adherence—Identified Latent Class Clusters

Characteristics	Passive cluster	Aware cluster	Participative cluster	Adoptive cluster
Cluster Size %:	0.1241	0.3687	0.4119	0.0953
Few (0-3) courses required	0.5232	0.0980	0.0004	0.0019
Typical (4-6) courses required	0.3527	0.4309	0.2984	0.1573
Significant (7-9) courses required	0.1222	0.4314	0.4910	0.6120
Extensive (10-12) courses required	0.0018	0.0396	0.2101	0.2287
Few (0-6) elective courses offered	0.2947	0.3333	0.3683	0.2326
Typical (7-12) elective courses offered	0.3524	0.2747	0.3507	0.3078
Significant (13+) elective courses offered	0.2948	0.3919	0.2809	0.4593
Capstone required in final year of program	0.0624	0.0795	0.4555	0.8359
Career tracks options offered	0.0009	0.0003	0.0701	0.3785
Poor adherence to IS 2010 (0-29%)	0.9871	0.0006	0.0005	0.0023
Moderate adherence to IS 2010 (30-49%)	0.0054	0.9969	0.0016	0.0070
Good adherence to IS 2010 (50-69%)	0.0060	0.0020	0.9974	0.0079
Excellent adherence to IS 2010 (70-100%)	0.0013	0.0005	0.0004	0.9826

two is also the most likely to offer significant elective courses, which is one reason for the assigned classification. There is almost no probability that Cluster Two will require a capstone course in the final year of the program, and this cluster is very likely to fall within the moderate adherence range to the IS 2010 curriculum guidelines. This cluster also has a very low probability of offering any career track options. Based on these characteristics, we labeled Cluster Two as the IS guidelines aware cluster.

Referring back to Table 15, Cluster Three is the largest in size representing 41% of the population, and can also be characterized as a typical or average IS program. Cluster three has a moderate probability of requiring 7-9 courses, just slightly above the mean of the population for courses required. Additionally, Cluster Three is also the most

likely to offer few elective courses. There is a moderate probability that Cluster Three will require a capstone course in the final year of the program, and this cluster is very likely to fall within the good adherence range to the IS 2010 curriculum guidelines. However, this cluster has a very low probability of offering career track options. Based on these characteristics, we labeled Cluster Three as the IS guidelines participative cluster.

Cluster Four, listed in Table 15, can be classified as an IS 2010 curriculum guidelines sensitive cluster. All the probabilities for this cluster show this cluster is working to satisfy the main guidelines of the IS 2010 curriculum model. This cluster represents 10% of the population, and the highest probability of requiring 7-9 courses, just slightly above the courses required mean for the population. Additionally, Cluster Four is also the most likely to offer a significant number of elective courses. There is a very high probability Cluster Four will require a capstone course in the final year of the program, and this cluster is very likely to fall within the excellent adherence range to the IS 2010 curriculum guidelines. Additionally, this cluster has a moderate probability of offering career track options, possibly due to the probability this cluster will offer a significant amount of elective courses, with several electives usually needed to support career track options. Based on these characteristics, we labeled Cluster Four as the IS guidelines adoptive cluster.

Finding 9 for Research Question 3. Research Question 3 stated, "How do perceptions of adherence (subjective data collected) by the department heads, or directors of undergraduate programs compare to the assessed adherence (objective data collected)

to IS 2010 curriculum guidelines?"

The section presenting the findings for Research Question 1 shows the IS programs overall assessed adherence to the IS 2010 curriculum guidelines with a mean of 44.7% and an SD of 16%. Those results came from the descriptive statistics produced based on the sample population of the 138 IS programs assessed. In the statistical analysis of the 53 IS programs interviewed, very similar descriptive statistics were produced. This can be seen in comparing Table 16 with Table 2. The IS programs assessed adherence percentage for the 53 IS programs interviewed resulted in a mean of 47.9% and an *SD* of 16.3% (Figure 9). Using the same sample population data set was important to the integrity of our statistical analysis to answer Research Question 3, because the sample population giving their self-report perceived adherence scores did not include all 138 subjects. Nonetheless, the means and standard deviations changed slightly, 44.7% to 47.9% and 16.0% to 16.3%, from the sample population of 138

Table 16

IS Program Adherence to IS 2010 Curriculum Guidelines (Interview Data)

Percentage adherence categories	Percentage adherence by frequency (n = 53)	Percentage adherence by percentage (n = 53)	Mean (n = 53)	*SD*	Range
0	0	0	--	--	--
10	1	2	.02	.14	0 - 1
20	3	6	.06	.23	0 - 1
30	9	17	.17	.38	0 - 1
40	10	19	.19	.40	0 - 1
50	9	17	.17	.38	0 - 1
60	14	26	.26	.45	0 - 1
70	5	9	.09	.30	0 - 1
80	2	4	.04	.19	0 - 1
90	0	0	--	--	--
100	0	0	--	--	--

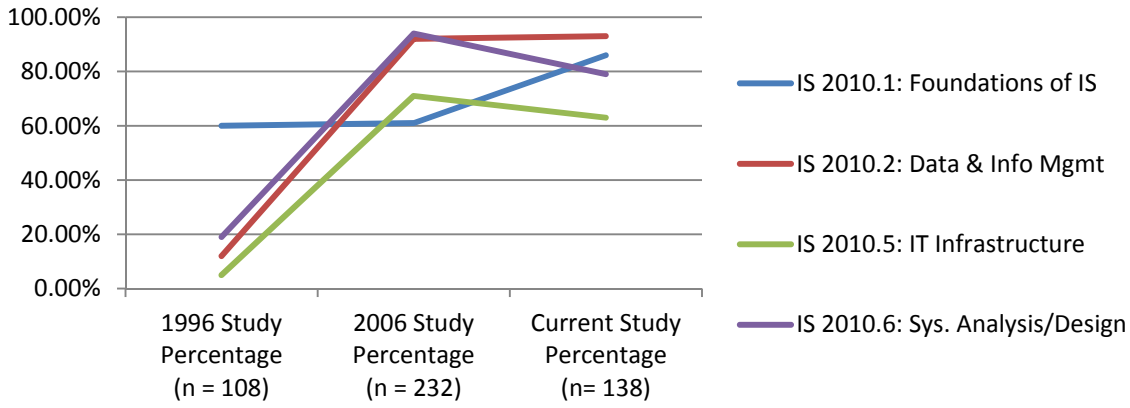


Figure 9. Line graph showing IS 2010 current adherence comparison to 1996 and 2006 adherence.

subjects to the sample population of 53. A slight shift in the scores and percentages of adherence occurred likely due to a few respondents clarifying the presence of an occasional course not previously discovered in the website and course catalog assessment. This accounts for the slight increase in the mean and *SD* percentage scores between the two populations.

Of the 53 IS programs interviewed, none were scored at zero percentage of adherence, and likewise at 90% or 100% of adherence (Table 16). It may also be noticed that highest frequency percentage of adherence occurs at the 60th percentile adherence level with 26% of the IS programs scoring at 60% adherence. The next highest frequency of adherence scores occur at the 40th percentile adherence level with 19% of the IS programs scoring at 40% adherence. The third highest frequency percentage of adherence occurs at the 30th and the 50th percentile adherence level with 17% of the IS programs scoring at 30% and 50% adherence, and so on so forth.

Of the 53 IS programs interviewed, one IS program gave itself a self-report or perceived adherence score of zero percentage of adherence (Table 17). With that exception, no other IS program gave themselves a self-report or perceived adherence score below 50%. It may also be noticed that highest frequency percentage of adherence occurs at the 80th percentile adherence level with 40% of the IS programs scoring themselves at 80% adherence. This is a stark contrast between the numbers seen from the assessed adherence (Table 2) where the highest percentage of adherence occurs at the 50th percentile adherence level with 25.5% of the IS programs scoring at 50% adherence. The IS programs self-report or perceived adherence percentage for the 53 IS programs interviewed resulted in a mean of 77.9% and an SD of 16% adherence to IS 2010 curriculum guidelines (Figure 10).

In the study design, data from the follow-up interviews, specifically the self-reported perceived adherence to the IS 2010 curriculum guidelines would be compared to

Table 17

IS Program Perceived Adherence to IS 2010 Curriculum Guidelines—Descriptive Statistics

Percentage adherence categories	Percentage adherence by frequency (n = 53)	Percentage adherence by percentage (n = 53)	Mean (n = 53)	*SD*	Range
0	1	2	.02	.14	0-1
50	4	8	.08	.27	0-1
60	3	6	.06	.23	0-1
70	11	21	.21	.41	0-1
80	21	40	.40	.49	0-1
90	10	19	.23	.39	0-1
100	3	6	.06	.23	0-1

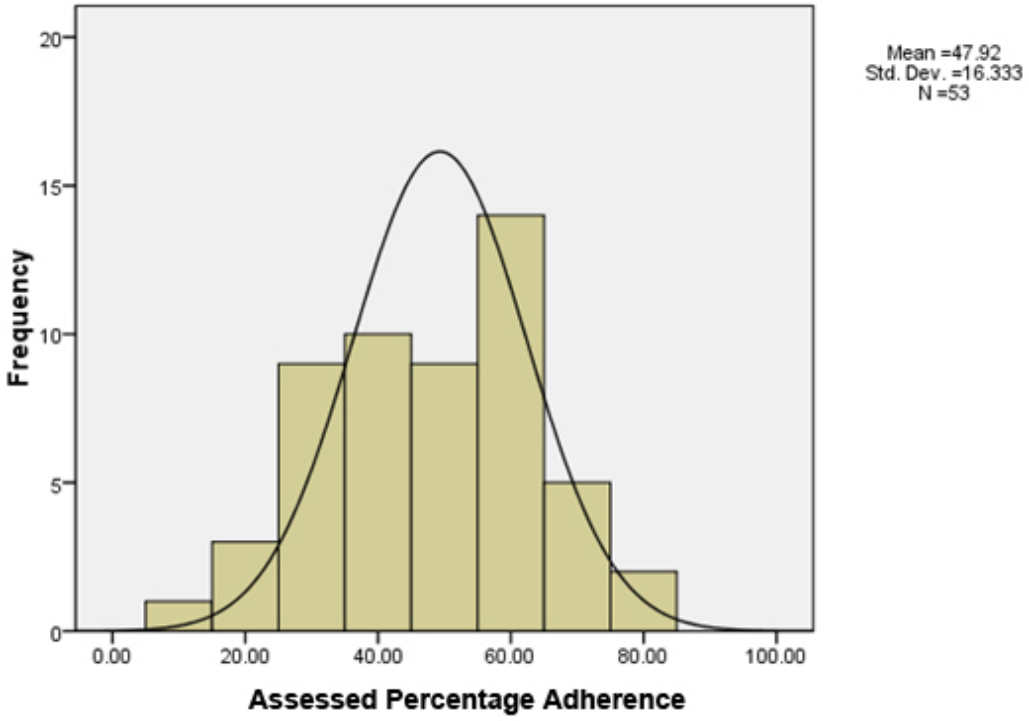


Figure 10. Histogram showing IS programs percent of adherence by interview to IS 2010 guidelines.

the assessed adherence to the guidelines. Meaning, which of the seven core topics does the IS program teach in its core curriculum? Does it require a capstone course in the last year of the program and does it offer career track options? To compare and analyze the data, the respective Pearson *r* correlation statistic between self-reported perceived adherence to the IS 2010 curriculum guidelines and the assessed adherence to the guidelines was first computed. Due to questions of normality, the relevant bivariate correlation statistics were produced for both the Pearson *r* and the Spearman rho both showing a moderate degree of correlation.

The Pearson *r* bivariate correlation statistic (Table 18) showed significance for a moderate positive correlation between the IS programs percentage of adherence and the

Table 18

IS 2010 Curriculum Guidelines Percent Adherence to Self-Report Percent Adherence Correlation (Pearson r*)*

Variable	Mean	*SD*	*N*	*r*	Significance
Self-report % adherence	77.9245	16.03584	53	.460[a]	.0001
Assessed % adherence	47.7358	16.82963			

[a] Correlation is significant at the .01 level (two-tailed).

IS programs self-report percentage of adherence to the IS 2010 curriculum guidelines (r = .460, N = 53, p < .001, two-tailed). The Spearman rho (nonparametric) bivariate correlation statistic (Table 19) showed significance for a slightly less moderate positive correlation between the IS programs percentage of adherence and the IS programs perceived percentage of adherence to the IS 2010 curriculum guidelines (r = .356, N = 53, p < .009, two-tailed).

After the Pearson r (parametric) and Spearman rho (nonparametric) bivariate correlation statistics were computed, similar statistical significance values reconfirmed the sample population data were robust to any violations of normality (Smith, 2003, p. 61).

Both the Pearson r (r = .460, N = 53, p < .001, two-tailed) and the Spearman rho (r = .356, N = 53, p < .009, two-tailed) determined a low to moderate positive correlation between the IS programs assessed percentage of adherence and the IS programs self-reported or perceived percentage of adherence to the IS 2010 curriculum guidelines. Subsequently, as was planned in the research design, the study had more interest in assessing the overall difference in self-report adherence versus assessed adherence of IS

Table 19

IS 2010 Curriculum Guidelines Percent Adherence to Self-Report Percent Adherence Correlation (Spearman)

Variable	Mean	*SD*	*N*	*r*	Significance
Self-report % adherence	77.9245	16.03584	53	.356**	.009
Assessed % adherence	47.7358	16.82963			

** Correlation is significant at the .01 level (two-tailed).

programs to IS 2010 curriculum guidelines, and a *t* test for difference was performed. A paired-samples *t* test (parametric) was run on the IS programs percentage of adherence and the IS programs' self-report percentage of adherence to the IS 2010 curriculum guidelines and found significant difference with statistical significance ($t = 12.855$, $df = 52$, $p < .0001$, two-tailed). The results indicate a mean of 77.9% perceived adherence, and a mean of 47.7% assessed adherence, for a mean difference of 30.2%. Thus showing an extremely large difference between the IS faculty perceived percentage of adherence and assessed percentage of adherence to IS 2010 (Figure 11).

Additionally, given the data were not normal, a nonparametric Wilcoxon signed ranks test was run on the same variables, and also found significant difference with statistical significance ($z = -6.157$, N-Ties = 52, $p = .0001$, two-tailed). The paired-samples *t* test (Table 20), and Wilcoxon signed ranks test both produced similar statistical significance values indicating a significant difference. These same two analyses also substantiated the sample population data are robust to any violations of normality (Smith, 2003, p.61).

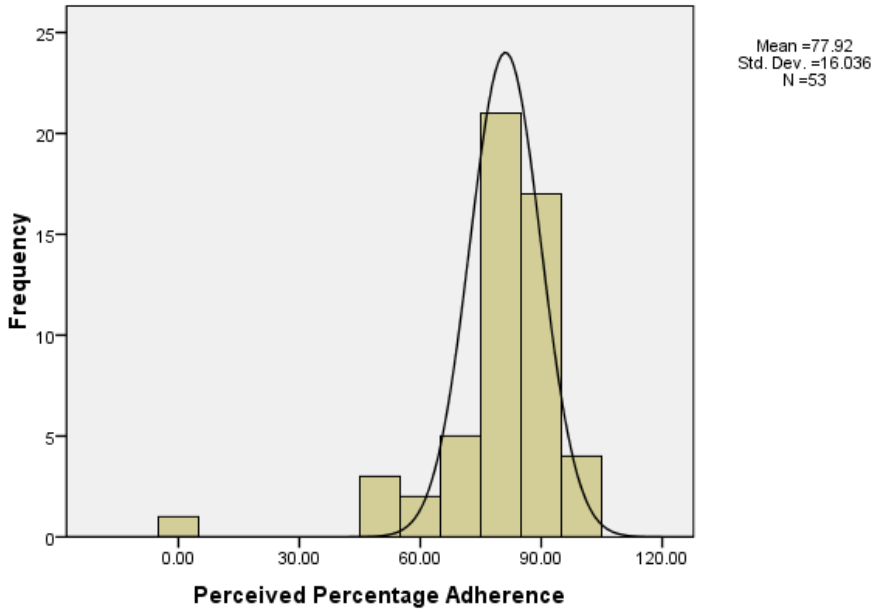


Figure 11. Histogram showing IS programs percent of perceived adherence to IS 2010 guidelines.

Table 20

IS 2010 Curriculum Guidelines Percent Adherence to Self-Report Percent Adherence—Paired-Samples t *Test*

Variable	Mean	*SD*	Test statistic (*t*)	*df*	Significance
Self-report % adherence	77.9245	16.03584	12.855	52	.0001
Assessed % adherence	47.7358	16.82963			

To confirm and show the magnitude of the discovered difference, an *ES* was computed using the paired-samples *t* test difference statistic together with the mean and standard deviation of both assessed percentage of adherence and self-reported perceived percentage of adherence to IS 2010 curriculum guidelines (Table 21). The effect size was extremely large ($d = 1.77$), and according to Cohen's (1988) criteria, the results from the test indicate an extremely large magnitude of difference between the two conditions.

Table 21

IS 2010 Curriculum Guidelines Percent Adherence to Self-Report Percent Adherence—Effect Size

Variable	Mean	*SD*	Mean difference	*r*	*ES*
Self-report % adherence	77.9245	16.03584	30.1887	.460	1.766365
Assessed % adherence	47.7358	16.82963			

Summary

After data analysis, the findings for this study were presented. First, after both phases of the study were complete, data were tabulated into the two separate Excel spreadsheets appertaining to the two parts of the study, and subsequently imported into SPSS version 17.0 for analysis. Response rates were calculated for both phases of the survey. Within the functionality of SPSS, various tests were run to test for normality and goodness of fit, from which the data were shown to be robust to violations of normality. Analyses were also performed on the individual survey data sets to determine differences in the two populations. After the second part of this study or follow-up interviews were conducted, a post hoc statistical sensitivity power analysis was completed to determine the minimal detectable effect size, with "Gpower" for a one-tailed test using the updated post hoc *N*. Descriptive statistics (means, standard deviations, frequencies, and percentages) were run for the study variables of interest to summarize the data as appropriate. The relevant Pearson *r* bivariate correlation statistics were produced and a paired-samples *t* test was run to test for significant difference statistics, allowing an effect size test to be run to determine the magnitude of the difference found. After all pertinent

analyses were complete in SPSS version 17.0, the same two SPSS data files were imported into latent gold version 4.0 to conduct a latent class cluster analysis. The results of these analyses were used to answer the three research questions. Results of these analyses were presented in this chapter.

CHAPTER V

SUMMARY, CONCLUSIONS, AND DISCUSSION

Summary of the Study

This chapter contains a summary of the research study conducted, to include: the statement of the problem, purpose of the Study, research questions addressed, research procedures utilized, data analysis conducted, findings for each research question, conclusion for each research question, future study recommendation, assumptions, delimitations, and a discussion surrounding the findings and conclusions for the study's research questions.

Statement of the Problem

A review of literature in IS curriculum identified various discussions related to curriculum models and IS curriculum reports on the need to develop career tracks unique to the specific IS department. The available reports include a 1996 and 2006 examination of what IS programs are offering in their curriculum. This leaves an important gap in the literature addressing an up-to-date description of what IS programs are teaching, how they are organized, if they are accommodating IS 2010 curriculum guidelines, and if IS programs are implementing any career track options in their programs. To assist faculty in making important curriculum decisions, there is a need to examine IS undergraduate degree programs offered by business schools in the United States, and understand the adherence to and affects of the recently published IS 2010: Curriculum Guidelines for Undergraduate Information Systems Programs.

Additionally, leaders in the IS academic community continue to reference the current model IS 2010 curriculum guidelines, and have done so for many years with the past models; however, there is no modern evidence to support whether or not the guidelines are being followed by IS departments across the nation. Without current data on adherence to IS curriculum guidelines, the IS community has no means to infer if continued investment of time, energy, and resources should be given to support curriculum model development and advancement. An evaluation of undergraduate degree programs in information systems across the country, and the subsequent comprehensive view of the landscape for adherence to IS curriculum guidelines, and listing of emerging IS career track options would be a valuable contribution to the field.

Purpose of the Study

The purpose of this study was to assess, assemble, and analyze data derived from AACSB-accredited undergraduate degrees programs in IS in United States colleges and universities. Also, the study intended to stimulate critical examination of curriculum content, as compared to IS 2010 curriculum guidelines, and explore apparent trends in potential career tracks within IS curricula. The three derivative purposes were as follows.

1. Report the findings from a survey of randomly selected IS undergraduate degrees program, examining the core curriculum based upon the recent and current IS 2010 curriculum guidelines, and describe the current state of AACSB accredited IS undergraduate degrees program curriculum across the nation.

2. Complete a comparative analysis of the current state with prior studies conducted in 1995 (Maier & Gambill, 1996) and 2005 (Kung et al., 2006).

3. Examine the career track trends developing in association with IS 2010 curriculum guidelines adherence and aggregate the common topics.

4. Conduct a cluster analysis to see if specific curriculum performance profiles emerge depicting different relationships among required courses, elective courses, capstone and project courses, career track offerings, and core courses that adhere to the IS 2010 curriculum guidelines, the state of adherence to the IS 2010 curriculum guidelines. A follow-up telephone interview survey with IS department heads was also conducted after the initial examination of data retrieved from a random sample of IS department websites and course catalogues was completed, with the intent to collect undiscovered data in the areas of (a) any required core topics not discovered in the required courses, but possibly offered elsewhere as an elective, (b) any career track offerings not discovered in the curriculum, but possibly labeled outside of evolving nomenclature, (c) the department heads, or directors of undergraduate programs perceptions of adherence to IS 2010 curriculum guidelines, and (d) the subsequent department's point of view on the advantages or disadvantages to following or not following the IS 2010 curriculum guidelines, and to offering career track options in the IS curriculum.

A comparison approach brings forward current-state statistics for compliance and non-compliance to IS 2010 curriculum guidelines, past-state statistics of core curriculum and course offerings, and future-state trends of career track offerings in this field. The findings should provide the community of IS with an up-to-date source on the IS undergraduate programs adherence to the IS 2010 curriculum guidelines and IS specialization and career track trends across the nation. They can also provide current

and future professionals in the field with direction and opportunity to enhance their personal knowledge and skills in IS, making them more effective in their chosen profession and specialization. In addition to future success of IS practitioners, regular evaluation of IS programs can also help provide improvement and growth in curriculum and the profession.

Research Questions

The review of current literature failed to yield any current description of IS program course curriculum offerings and organization, identification of adherence of IS program curriculum to IS 2010 curriculum guidelines, and any trends for career track options in IS program curricula (as suggested by multiple recent authors). The empirical focus of this dissertation was limited to examination of IS undergraduate degree programs offered by AACSB-accredited business schools in the United States, with the intent to provide an up-to-date description of what IS programs are teaching, how they are organized, if they are accommodating IS 2010 curriculum guidelines, and if (with the increased flexibility now present in the IS 2010 curriculum guidelines) IS programs are implementing any career track options in their programs. Specifically, this study intended to explore the following research questions based on information obtained in the review of literature.

1. What is the current adherence among IS courses and topic areas being offered in IS curriculum across the nation, with those suggested by IS 2010 curriculum guidelines?

    a. What percentage of current IS courses and topics being currently offered in IS

curriculum programs conform to the recommendations suggested by IS 2010 curriculum guidelines?

b. What percentage of IS undergraduate programs are offering career tracks options in their curriculum, and:
    i. Among these, what is the average number of career tracks offered?
    ii. Among the selected sample, what are the different career tracks offered?
    iii. Among the selected sample, what are the most common career tracks offered?
c. How have the percentages of IS courses and topics currently being offered changed over time, as compared to the 2006 state of the IS curriculum article (Kung et al., 2006)?

2. What specific curriculum profiles (clusters) emerge based on data collected including number of: required courses, elective courses, career track offerings, and core courses that adhere to the IS 2010 curriculum guidelines?

3. How do perceptions of adherence (subjective data collected) by the department heads, or directors of undergraduate programs compare to the assessed adherence (objective data collected) to IS 2010 curriculum guidelines?

Research Procedures

The academic population for this study and subsequent planned surveys consisted of undergraduate IS program curricula at AACSB-accredited institutions across the United States. This study randomly sampled a portion more than one half (143 IS

curriculum programs) of the 286 schools in the United States offering a major in IS at the baccalaureate level that were either business or business and accounting accredited by AACSB. The instrument formulated to gather data for this study was a survey developed from a review of literature, other research survey instruments concerned with IS curriculum evaluation, and interviews and consultation with Utah State University's Department of Management Information Systems faculty members. The survey instrument was revised and refined through faculty in the MIS department at Utah State University where an evaluation of the survey instrument and indication concerning any questionable or ambiguous items was made.

The data survey instrument implemented in the study consisted of two parts. Part one (Appendix B) of the instrument utilized university web sites and course catalogs as the primary source of information for the initial survey of data. The survey gathered data related to variation of specific required and elective courses taught, course curriculum prerequisites and sequencing, and any career track offerings were present. In addition, part two (Appendix C) of the survey instrument, conducted follow-up telephone interviews (six questions) with the department heads, or directors of undergraduate programs for verification, clarification, and confirmation of the data assessed from university web sites and course catalogs. Interviews allowed for obtainment of complete data for a significant portion of the population sampled and subsequent examination of the curricula to be completed.

The follow-up telephone interview survey was conducted after the initial examination of data retrieved from a random sample of IS department websites and

course catalogs was completed, with the intent to collect undiscovered data in the areas of (a) any required core topics not discovered in the required courses, but possibly offered elsewhere, such as an elective, (b) any career track offerings not discovered in the curriculum, but possibly labeled outside of evolving nomenclature, (c) the department heads, or directors of undergraduate programs perceptions of adherence to IS 2010 curriculum guidelines, and (d) the subsequent department's point of view on the advantages or disadvantages of following or not following the IS 2010 curriculum guidelines, and of offering career track options in the IS curriculum.

The follow-up telephone interviews were conducted as semistructured telephone interviews over a regular land-line telephones and recoded via audio cassette tape from the researcher's private work office. Prior to commencement of the interview the interviewer reminded the interviewee of the previously sent email and letter of consent/information from the USU IRB, and requested to record the phone interview. In all, 53 phone interviews were conducted (Appendix E).

Data Analysis

Data analysis was carried out in several steps. First, after both phases of the study were complete, data were tabulated into the two separate Excel spreadsheets appertaining to the two parts of the study, and subsequently inported in to SPSS version 17.0 for analysis. Then, response rates were calculated for both phases of the survey. Within the functionality of SPSS, various tests were run to test for normality and goodness of fit, from which the data were shown to be robust to violations of normality. Analyses were also performed on the individual survey data sets to determine differences in the two

populations. After the second part of this study or follow-up interviews were conducted, a post hoc statistical sensitivity power analysis was completed to determine the minimal detectable effect size, with "Gpower" for a one tailed test using the updated post hoc *N*. Descriptive statistics (means, standard deviations, frequencies, and percentages) were run for the study variables of interest to summarize the data as appropriate. The relevant *Pearson r* bivariate correlation statistics was produced and a paired-samples *t* test was run to test for significant difference statistics, allowing an effect size test to be run to determine the magnitude of the difference found. After all pertinent analyses were complete in SPSS version 17.0, the same SPSS data file was imported into latent gold version 4.0 to conduct a latent class cluster analysis. The results of these analyses were used to answer the three research questions. Detailed results of these analyses are found in Chapter IV.

Findings

Finding 1 for Research Question 1. *What is the current adherence among IS courses and topic areas being offered in IS curriculum across the nation, and those suggested by IS 2010 curriculum guidelines?*

In the histogram for assessed percentage of adherence by IS programs to the IS 2010 curriculum guidelines (Figure 6) it can be seen that the bulk of IS programs adherence percentages falls at about the center of the depicted normal curve, with a mean of 44.7% and an SD of 16% for the IS programs adherence percentages. Of the 138 IS programs assessed, none were scored at zero percentage of adherence, and likewise at 90% or 100% of adherence. The highest frequency percentage of adherence occurs at the

50 percentile adherence level with 25.5% of the IS programs scoring at 50% adherence. The next highest frequency of adherence scores occur at the 40 percentile adherence level with 22.5% of the IS programs scoring at 40% adherence. The third highest frequency percentage of adherence occurs at the 60 percentile adherence level with 16% of the IS programs scoring at 60% adherence.

Finding 2 for Research Question 1a. *What percentage of current IS courses and topics being currently offered in IS curriculum programs conform to the recommendations suggested by IS 2010 curriculum guidelines?*

Four of the seven core topics are covered by most IS programs, where the other three are not (Table 4). IS 2010.1, IS 2010.2, IS 2010.5, and IS 2010.6 are among the four most highly covered topics at 86%, 93%, 63%, and 79%, respectively. These four topics were represented in the IS 2002 Model Curriculum. IS 2010.3, and IS 2010.7 are taught at a significantly lower percentage, 17% and 29%, respectively, for which these topics were not specifically present in the IS 2002 Model Curriculum. The third topic IS 2010.4, taught at 36% of the IS programs across the country, is found in both the IS 2002 model curriculum, IS 97 model curriculum, and IS 95 model curriculum. With only 36% of the IS programs teaching IS project management one might infer that this topic has not been deemed a high priority within IS curriculum over the last 15 years. The capstone course requirement in the final year of the program was also offered at a significantly lower percentage, by 30% of the IS programs across the country. At an even lower percentage, identified emphasis and career tracks are offered by 8.5% and 7%, respectively, of the IS programs across the country.

In all, the "# of courses required" in IS programs across the country shows a mean of 6.8, with a median and mode of 7.0, and standard deviation of 2.3. The "# of elective courses offered" in IS programs across the country shows a mean of 10.6, with a median 9 and mode of 13 (Table 3), and standard deviation of 7.6. To understand the general picture or current state of IS curriculum across the country one might use these descriptive statistics to characterize a typical IS program. One such program would have seven core course as part of their required curriculum, would maintain a rotational schedule of about 10-11 elective course offerings, and teach a "foundations of information systems" course (86%), a "data and information management" course (93%), some kind of "IT infrastructure" course (63%), and a "systems analysis and design" course (79%). This same program would not likely teach any type of "enterprise architecture" course (17%), or an "IS strategy, management, and acquisition" course (29%), and might, but would not typically, teach an "IS project management" course (36%). A capstone course may be offered (30%), but it is not likely to be a required course, or required to be taken in the final year of the program. Also, one would not very likely see any identified emphasis (8.5%) or career tracks are offered (7%) by this typical IS programs somewhere across the country.

Finding 3 for Research Question 1b. *What percentage of IS undergraduate programs are offering career tracks options in their curriculum?*

Of the AACSB-accredited IS programs across the country, 7% were offering formalized career track options for their students to consider. Among those, there are between two and five career tracks that are offered with the average number of career

tacks offered is 3.5, with a median and mode of 3 career tracks offered in the respective programs. There is currently 93% of the IS programs across the country that do not have career track offering for their students. By grouping the various career track offerings together by common name, the most common career tracks offered were identified. Details for common career track offering can be found in Table 11. In total, there were eight most common career track options offered by the IS Programs.

Finding 4 for Research Question 1bi. *Among these, what is the average number of career tracks offered?*

In total there are 10 IS programs from the sample of 138 that are offering career track options. For the 7% of IS programs that have formalized career tracks for their students to consider, there is a mean number 0.25, with a mode and median of 0, a standard deviation of .96 (Table 3). The range for number of career tracks offered is 0-5 (Table 9). For these 10 IS programs offering career tracks, the average number of career tacks offered is 3.5, with a median and mode of 3 career tracks offered.

Thus, as shown in table 9, the highest number of career track offered is five, by three of the IS programs. The lowest number of career tracks offered is two, by two of the IS programs. One IS program offers four career tracks, and four IS programs offer three career track options. There is currently 93% of the IS programs across the country that do not have career track offering for their students. In addition to the 10 IS programs that offer career track options, there are an additional two IS programs (1.5%) who have identified two separate emphasis areas for their student to choose from, but have not organized them into any specified tracks with specific courses assigned to them.

Finding 5 for Research Question 1bii. *Among the selected sample, what are the different career tracks offered?*

The different career tracks offered by the 10 IS programs offering career tracks are listed in Table 10. Listed by the program identifier number, we can see that IS program #5 has three career track offerings, what we might deem as a typical in number for IS programs offering career tracks options. The three career tracks offered by the first IS program listed in Table 10, IS program #5 were: (a) applications developer, (b) business analyst, and (c) information and communications technology. These career tracks seem to be somewhat standard in name, but generalizing among common career tracks is difficult with only 7% of IS programs offering career track options. In some of the IS program career track options, we do see a few of the more common IS themes in the various career track titles or names (i.e., application developer, systems analyst, networking specialist, etc.). For some of the career track titles or names, various IS programs tend to get somewhat specific or specialized; branching off from the more common IS themes or nomenclature. In all, 19 unique career tracks were identified for a total of 35 career track options from the 10 IS programs offering career tracks. The two IS programs who have identified separate emphases were not included in these figures, because their programs have not formally organized them into any particular tracks with specific courses assigned to them and so they were not deemed qualified as actual career track options for their students to choose.

Finding 6 for Research Question 1biii. *Among the selected sample, what are the most common career tracks offered?*

By taking all of the career track titles, and grouping each of them together by common name, the most common career tracks offered were identified. In Table 11, one can see the four most common career track offerings, each with 4 career tracks in their group. There are also four additional common career tracks offered, each with three career tracks in their group. The first eight career tracks listed in Table 11 (application development , business analysis, telecommunications and computer networks management, web development specialist, information systems technology management, e-commerce/e-business, software engineering/programmer, information systems analysis) seem to be the most common career tracks offered by the IS programs offering career track options.

Finding 7 for Research Question 1c. *How have the percentages of IS courses and topics currently being offered changed over time, as compared to the 2006 state of the IS curriculum article (Kung et al., 2006)?*

There are five IS topics assessed in the 2006 state of the IS curriculum article (Kung et al., 2006), that are comparable to five of the seven IS 2010 topics, as assessed in this study. The comparable requirements were IS 2010.1, IS 2010.2, IS 2010.5, IS 2010.6, and the capstone course. In this study, each of the five topics were tested for overall difference using a one-sample *t* test comparing each studies topic adherence percentage for the respective topics, based on the past known proportion.

Of the five topics tested for difference, a statistically significant difference was found between the 2006 past percent adherence and current percent adherence in the population assessed at the time for the IS 2010.1 topic, the IS 2010.6 topic, and a

capstone course in their core curriculum. Evidenced by the statistically significant difference, from the 2006 study up to the present, there has been a significant increase, 25%, in the percentage of IS programs that now teach IS 2010.1 in their core curriculum. There has been a significant decrease in the percentage of IS programs that teach IS 2010.6 and a capstone course in their core curriculum, 15% and 17% respectively.

Also compared were the Maier and Gambill topics reported on in 1996. For the various IS topics assessed in 1996 state of the IS curriculum article (Maier & Gambill, 1996), there were also five topics that are still suggested by the current IS 2010 curriculum guidelines of today, as assessed in the study. The comparable requirements were IS 2010.1, IS 2010.2, IS 2010.5, IS 2010.6, and IS 2010.7. The same retrospective comparison method used to compare the overall difference of the 2006 past study, a one-sample *t* test, was used for the 1996 past study, based on the past known proportion. Of the five topics tested for difference, a statistically significant difference was found between the 1996 past percent adherence and current percent adherence in the population assessed at the time for all five topics. Evidenced by the statistically significant difference, from the 1996 study up to the present, there has been a significant increase, in the percentage of IS programs that teach the topics for IS 2010.1 (26%), IS 2010.2 (81%), IS 2010.5 (58%), IS 2010.6 (60%), and IS 2010.7 (13%).

Finding 8 for Research Question 2. *What specific curriculum profiles (clusters) emerge based on data collected including number of: required courses, elective courses, career track offerings, and core courses that adhere to the IS 2010 curriculum guidelines?*

In Table 15, a representation of the naturally occurring profiles or clusters identified in the latent class analysis is provided. From the analysis, four IS program cluster profiles were delineated. Cluster One is the second smallest in size representing 12% of the population, and can be characterized as an average in size, but non-conforming IS program. We labeled Cluster One as the IS guidelines passive cluster. Cluster two is the second largest in size representing 37% of the population, and can be characterized as a typical, but larger than average IS program. We labeled Cluster Two as the IS guidelines aware cluster. Cluster three is the largest in size representing 41% of the population, and can be characterized as a typical, but smaller than average IS program. We labeled Cluster Three as the IS guidelines participative cluster. Cluster four can be classified as an IS 2010 curriculum guidelines responsive cluster. Unlike the other three clusters, the various category probabilities for this cluster show that this cluster is working to satisfy the guidelines of the IS 2010 curriculum model. This cluster represents 10% of the population and has the highest probability for offering a significant number of elective courses, requiring a capstone course in the final year of the program, offering career track options, and falling within the excellent adherence range to the IS 2010 curriculum guidelines. We labeled Cluster Four as the IS guidelines adoptive cluster.

Finding 9 for Research Question 3. *How do perceptions of adherence (subjective data collected) by the department heads, or directors of undergraduate programs compare to the assessed adherence (objective data collected) to IS 2010 curriculum guidelines?*

In Research Question 3 of the analysis, several statistical tests took place that compared IS programs self-reported perceived adherence to the assessed adherence to the IS 2010 curriculum guidelines. The respective Pearson *r* correlation statistic was first computed and showed significance for a moderate positive correlation between the two variables in question ($r = .460$, N = 53, $p < .001$, two-tailed).

Subsequently, a paired-samples *t* test was run on the two variables in question and found significant difference with statistical significance ($t = 12.855$, $df = 52$, $p < .0001$, two-tailed). Next, to show the magnitude of the difference, *ES* was computed using the paired-samples *t* test for difference from the mean and standard deviation of both the two variables in question. According to Cohen's (1988) criteria, the results indicate an extremely large magnitude of the difference between the IS faculty perceived percentage of adherence and assessed percentage of adherence to IS 2010 curriculum guidelines.

In other words, with an IS faculty self-reports of perceived adherence mean of 77.9%, and assessed adherence mean of 47.7%, and a mean difference of 30.2% one might infer that IS program faculty describe a higher perceived adherence to IS curriculum guidelines than what is actually assessed in this study.

Conclusions

Based upon the findings of the research questions addressed, the following conclusions were made.

1. As evidenced by a current adherence mean of 44.7% among IS courses and topic areas being offered (Finding 1), the conclusion is made that there is a wide range of

adherence to the IS curriculum guidelines. In addition, none of the IS program assessed were either entirely compliant or not compliant at all.

2. As evidenced by identified percentages of current IS courses and topics being offered in IS curriculum programs conforming to the recommendations suggested by IS 2010 curriculum guidelines (Finding 2), the conclusion is made that some courses (IS 2010.1, IS 2010.2, IS 2010.5, and IS 2010.6) are widely offered (over half) as core curriculum while other classes (IS 2010.3, IS 2010.4, and IS 2010.7) are offered as core curriculum in less than half of IS programs.

3. As evidenced by a mean of 7% of IS programs offering career track options in their curriculum (Finding 3), the conclusion is made that very few IS programs have formally implemented the IS 2010 career track guideline recommendations.

4. As evidenced by a mean of 3.5 career tracks offered among the programs offering them (Finding 4), the conclusion is made that IS programs implementing formal career tracks specify a reasonably small number of track options for students to consider. The range of career track offerings among IS programs that include career track options was between two and five offerings.

5. As evidenced by 19 uniquely identified career tracks (Finding 5), the conclusion is made that IS programs that include career tracks provide unique offerings beyond the proposed sample tracks depicted in the IS 2010 curriculum guidelines.

6. As evidenced by application development, business analysis, telecommunications and computer networks management, and web development specialist being listed as the most common career tracks (Finding 6), the conclusion is

made that while there is some degree of consistency among career track offerings, a larger percentage of IS programs that include career tracks have chosen to provide unique career tracks.

7. As evidenced by changes in curriculum adherence comparisons from 2006 and 2012 (Finding 7), the conclusion is made that other than IS topic 2010.1 (25% increase), the other required IS topics have either remained steady (IS 2010.2) or declined (IS 2010.5, IS 2010.6, Capstone).

8. As evidenced by the four identified clusters in the latent class cluster analysis (Finding 8), the conclusion is made that there appears to be reasonably well-defined categories of IS programs as related to IS 2010 curriculum guideline adherence. The two largest clusters account for moderate to good adherence to the IS 2010 curriculum guidelines while the two smallest clusters represent poor and excellent adherence.

9. As evidenced by finding a statistically significant difference between perceived adherence (mean of 77.9%), and assessed adherence (mean of 47.7%; Finding 9), the conclusion is made that IS program faculty describe a higher perceived adherence to IS curriculum guidelines than what is actually assessed in this study.

Recommendations

The following recommendations were based on the findings and conclusions of this study.

1. With current adherence of 44.7% among IS courses and topic areas being offered, and only 7% of IS programs offering career track, future research is recommended to further examine why adherence levels are low. An expanded

qualitative extension to this study may help to provide additional insights to help determine why current adherence is low (Finding 1, 3; Conclusion 1, 3).

2. The current investigation did not examine adherence based on different regions of the country or school profiles (i.e., private/public, teaching/research). Examining these factors may provide additional insight into issues related to adherence, career tracks, and required IS curriculum among IS programs (Finding 1, 2, 3, 8; Conclusion 1, 2, 3, 8).

3. The current investigation specifically examined IS programs located within AACSB accredited institutions. Further research examining programs that are not AACSB accredited or located outside business schools may help provide a better understanding of IS 2010 curriculum guidelines adherence, career tracks, and required IS curriculum among programs (Finding 1, 2, 3, 8, Conclusion 1, 2, 3, 8).

4. With 19 unique career tracks being offered by IS programs, future research is recommended to specifically examine the decision making process for determining these career tracks. For instance, are career tracks primarily determined based on faculty skills, student interest, or industry demands (Finding 6; Conclusion 6)?

5. The current research study focused on the IS 2010 curriculum guidelines, further research is recommended to examine other curriculum models such as the MSIS 2006: Curriculum Guidelines for Graduate Information Systems Programs.

Assumptions

To facilitate completion of this study the following assumptions were made.

1. AACSB institutions are the leaders in curriculum development, and other

universities can be expected to follow in their paths.

2. There is a relationship between adherence to IS 2010 curriculum guidelines and quality standards in IS curriculum and programs.

3. IS knowledge and competencies can be learned (therefore, the question of what curriculum content should be included in preparation programs is justifiable).

4. Examination of current practice is a viable means to determine future courses of action.

5. Current practice and the IS program perception of IS business trends and needs should be included in the designing of the curriculum for the preparation of IS practitioners.

6. The IS academic departments, institutional websites and course catalogs contain adequate veracity and disclosure in electronic information and documentation necessary to evaluate IS programs adherence to IS 2010 curriculum guidelines and respective development and offerings of career tracks. This assumption is predicated upon the proof of concept from other recent studies: Datar and colleagues (2010), Kung and colleagues (2006), and Miller and Crain (2007), and based upon the current academic institution technological and communications standard of today—affording anticipation of a consistent presence of department websites, and institutional course catalogs.

7. The interviews with IS academic department faculty will provide insights that contain adequate veracity and disclosure necessary to evaluate IS programs adherence to IS 2010 curriculum guidelines and respective development and offerings of career tracks.

8. The technical curricula categories utilized in the study are representative of

four-year baccalaureate degree programs in IS, based upon a recent history of IS model curriculum guidelines (Couger et al., 1995; Davis et al., 1997; Gorgone et al., 2002; Topi et al., 2010).

Delimitations

As with all social science research, this study has limitations that should be taken into consideration when interpreting and generalizing findings. Some delimitations involve the target population, the nature of the relevance of findings over time, and the research methodology. To make the study feasible in terms of time, cost, and availability of data, the study is delimited to a survey of AACSB-accredited domestic educational institutions offering undergraduate degree programs in IS. Only undergraduate degree programs in IS identified through AACSB are included. There are 286 public and private domestic educational institutions accredited by the AACSB offering undergraduate degree programs in IS (AACSB, 2011b). This study may be delimited because the sample, drawn from the AACSB membership directory, does not directly represent educational institutions not accredited by AACSB, nor does this study represent international educational institutions. Certain implications and generalizations of the study should be considered in relation to any influence resulting from restriction in the sample.

The time stamp of this research is another delimitation to consider when inferring from the results of this study; the information gathered in this study may change over time. Curriculum standards and programs and IS educators perception of IS business trends and needs change over time. Thus a descriptive study such as this provides only

current status data as a reference point for analysis and subsequent conclusions. Additionally, the investigation is based on self-reporting electronic information and documentation researched in the IS program websites and course catalogs. Hence, the study is delimited to the veracity and disclosure available from the department and institution websites and course catalogs. The data available on program structure and adherence to IS 2010 curriculum guidelines may not, in some website cases, contain the specificity necessary to determine the operational aspects of these programs. It is anticipated that few IS programs would not have a department website, let alone an institutional course catalog; some however, may not publish adequate data to assess the required variables for inclusion in the study. Similar to nonrespondents in a questionnaire method research study, certain IS programs may have chosen not to participate due to lack of electronic documentation or information available through a department website and course catalog. Therefore, the researcher may conclude some respondents did not meet selection criteria set forth by the study parameters, and certain arbitrary decisions in classification of data will be made.

Also, a primary concern in utilizing ex post facto methods is the inability to control for confounding variables accounting for the reasons why departments choose to adhere or not to adhere to IS 2010 guidelines, or offer certain career tracks, if at all. Hence, a myriad of explanations may account for such long-term outcomes, as the type of career tracks developed over the recent past at the respective institutions that may not be solely related to demographic variables. However, this study employs random sampling and this type of sampling is the best method for supporting generalizations from the

findings. Hence, results of this study may be generalized to AACSB-accredited IS undergraduate degree programs in across the nation.

Several other variables are likely to have the capacity to predict career track development within IS programs, besides the demographic variables investigated in this research study—such as variables that are not fixed. First, geographical variables such as whether the departmental participants reside in a metropolitan or urban environment, or in certain regional locations across the nation could possibly assist in the motivation for decisions about curriculum and specific career track development. Second, industry preference or demand may also influence a department's likelihood to offer certain career tracks. Third, the department, school, or institution's academic measures and requirements such as high school grade point average, and standardized achievement scores (i.e., ACT and SAT) may have influence on the participating student population, and be indirectly related to felt needs and curriculum or career track development decisions within the department. However, this research study did not include these variables in the analysis. Variables influencing students decision in selecting a "major" area of study within IS, such as occupational earnings, career aspirations, experience in the workforce, employment history, and work-based learning internship programs is of interest, but not examined in this study. The items included in the survey were representative of variables included in three past related and similar, yet not extensive, studies: Maier and Gambill (1996), Gill and Hu (1999), and Kung and colleagues (2006). Inclusions of variables from these associated studies were delimited by the academic advisory committee to this research study. Specifics of the research methods used in this

study were discussed in the Methodology chapter of this dissertation.

Discussion

This study followed a confirmatory research design, but was also somewhat exploratory toward assessing recent development in IS curriculum across the country. The mixed methods nature of the mentioned follow-up telephone interview afforded confirmation of the results of the quantitative research, and the qualitative research questions were able to give a more in-depth understanding of current opinions and trend in the current state of the IS discipline in academic institutions throughout the Unites States.

In this study, integration of data occurred logically at the most common junctures: data collection, data analysis, and interpretation of findings. To an informal extent, triangulation of data occurred as the follow-up qualitative interview questions were conducted to confirm the quantitative data collected, as was anticipated. The results of the interview questions were integrated with the quantitative data, allowing for the data to be sorted into categories (clusters) and for a more complete story to develop from the interconnections of the developed categories (clusters) and the original quantitative data. This research method allowed for enhanced interpretation of the findings from the qualitative questions in the interview conducted. However, one point of concern regarding the interviews is the response rate obtained from the original 143 programs assessed. Only 53 follow-up telephone interviews took place, giving a response rate of 37%. This response rate opens up the possibility of a potential undiscovered bias.

In the review of literature section, several trends arose that were found to be common in the recent and current literature and discussions in the IS field. The debate between the need to provide a more managerial versus technical foundation to the IS undergraduate majors has been discussed at length over the past two decades. The early discussions of this debate may have been the beginnings of a more recent trend in this past decade towards the suggested need to provide IS undergraduate majors with specializations or career tracks. The managerial versus technical debate and the trend towards career tracks are found common to the IS field and seem to be present in the debates and discussions that may have partly given direction to the current IS 2010 curriculum guidelines. They may also have had an effect on the informal development of four categories or clusters of IS program curriculum offerings.

Common Themes in Current State of IS Programs Curricula

From the follow-up interviews and specifically the open-ended questions, more insight into various opinions on these common issues was obtained. When one department head was asked his point of view on the advantages or disadvantages to offering IS career track options. His response was as follows:

> Career track options apply to the students. If there is some variation in the degree, then that would imply that you have looked at your faculty and can align them with certain recruiting companies. Companies in our area all say they want more technical in the curriculum. I think that is a general trend, to that extent, that is where I have some discomfort with the guidelines. The people who worked on the revisions took a similar approach. I've observed in many programs, when the dot.com bust happened, they panicked saying all the students are leaving our programs are too technical—apparently you are looking at curriculum now. If you go to the 90s, many IS programs had two required programming languages. Many of those same universities took that out, now only

> needing one. Trying to understand the data but not how to model and build the database. From my perspective that is a misdirected response by the MIS academic community to a problem misdiagnosed. So there has been some debate in the last 10 years on managerial versus technical and industry still saying we need technical. But, programs keep moving away from it in their curriculum.

While this is only one IS faculty's opinion, the debate on these concepts may have assisted the field in arriving to where it is today. Recent debates in the IS field are relevant to this study as a view of the IS field currently and relating to adherence to the IS 2010 curriculum guidelines. Another respondent to the question regarding advantages or disadvantages to offering IS career track options, stated:

> Actually we did have different tracks, three major ones. One was in the area of General Information Technology Information System Development, one in E-commerce, and one in Computer Networks, but considering our shrinkage over the past several years we had to eliminate the track systems because we don't have enough majors for separate tracks. However, we advise our students in selecting their courses so they can choose or customize towards a particular area including Healthcare Technology.

Healthcare Technology happens to be one of the regional needs or demands in their area utilizing some of the graduates from the IS program in question.

To maintain some semblance of an IS program, some departments felt the need to cater first and foremost to the local employer requirements over the suggested IS 2010 curriculum guidelines. In many ways, in choosing the hand that feeds the mouth, a survival of the fittest methodology has surfaced, and can you blame them? The common attitude from the interviews is that IS faculty love the IS field and are trying to provide the best IS program they can with what they have. This conclusion is of relatively little debate, what constitutes the best IS program however is still of great debate. Hence, the frustration on the part of many with some of the changes in the IS 2010 curriculum

guidelines.

Maier and Gambill (1996), suggested students and their choice of IS as a "major" area of study are influenced by the perception of a disconnect between the expressed needs of the business community and the design of IS curriculum. Gupta and Watcher (1998) identified the business need to include more managerial experience in IS curriculum about 14 years ago. Literature review confirmed many authors of current literature identified this need, as well as the inconsistency arisen between the expressed needs of the business community and the design of IS curriculum. Specifically, a technical focus prevails in many IS management programs, whereas business and industry has expressed the need to integrate an additional managerial point of view (Abraham et al., 2006; Bullen et al., 2009; Ehie, 2002; Gupta & Wachter, 1998; Kesner, 2008; Kung et al., 2006; Plice & Reinig, 2007, 2009; Sutcliffe et al., 2005).

In the follow-up interviews, one department head, when asked, "Out of 100%, how compliant is your IS curriculum with the IS 2010 curriculum guidelines?", responded:

> Well you guys took programming out of it, didn't you, which upsets me to no end. Well, it upsets me because I teach it. We would certainly make it an elective, if we took it out, but one of the things that people talk about is programming. Even though it is a difficult subject, and I can see why it was taken out, we're sending students out who know nothing about programming and who can avoid programming, and that's all about problem solving, and it is still a relevant skill. We've had companies asking for people with programming language skills. When you've learned one language you can pretty much learn another. So that's my feelings on it.

Another faculty member expressed a similar frustration in answer to the same question, stating:

> Actually we have been renewing our curriculum. We offer the same courses as the 2010 model but not all are required, some are electives. We have six courses required and two programming courses, which is no longer in IS 2010. We're probably offering about 80% because we are reluctant to remove the programming courses, which is my biggest frustration with the changes in the curriculum guidelines from 2003 or whenever to the recent model.

These comments address the managerial versus technical debate going on for almost two decades.

In the review of literature section, the debate between the need to provide a more managerial versus technical foundation to the IS undergraduate majors was discussed at length. In one IS faculty interview, one side was presented in the comments:

> The individuals that wrote the Information Systems 2010 Curriculum Guidelines were out to lunch. Those guidelines are a bunch of crap. If we just taught what they recommend our students wouldn't be able to get jobs. Companies want to hire people with builder, or technical skills, not just management skills, they hire grad students for that. Virtually all of the technical skills were removed from the guidelines in the 2010 versions, not just programming skills, but any kind of technical skills; it is purely a managerial curriculum model.

On the other end of the debate, a different IS faculty stated the following about his program:

> Our IS program is primarily meant to have a student start as a managerial or business analyst for a large organization. Sixty percent of our students are most typically hired in the role of a Managerial or Business Analyst. Forty percent of the students chose to get a strong programming component—mostly in web development. Those interested in more Managerial or Business Analyst courses pick up more business courses.

It appears as though this debate may continue, perhaps for yet another decade or two. One conclusion to be drawn from these comments falls in line with the prior conclusion: IS faculty structure their programs based upon local industry demands and try to provide the best program they can with what they have. The early discussions of the managerial

versus technical debate may have been the beginnings of a more recent trend towards the suggested need to provide IS undergraduate majors with career track options.

Career Tracks and Suggested Specialization

In the review of current literature, various authors have suggested that today, more than ever, educators need to monitor the attitudes of practitioners in the field, gain a clearer understanding of the business community's needs and concerns, and respond accordingly. Also suggested is that the IS field is beginning to see the need to impart technical skills in a proliferating set of subspecialties, competencies, career orientations, career paths, or career tracks (Boyle, 2007; Carey et al., 2004; Carlsson et al., 2010; Chand, 2004; Conger et al., 2007; Gorgone et al., 2006; Igbaria et al., 1991; Kung et al., 2006; Peslak, 2005; Ramakrishna & Potosky, 2001; Sutcliffe et al., 2005; Topi et al., 2007, 2010; Trimmer et al., 2007).

In a follow-up interview, when asked: "From your point of view, can you share the advantages and disadvantages of offering IS career tracks options?", one IS faculty responded:

> It gives the students a way to focus, a way to articulate. For internship recruiters and also industry employment recruiters; it is a way for them to bring things together and firms come looking for a business analyst for example, so it gives them a way to articulate the curriculum related to that area; to meet regional demands, yeah, that would probably be a good way to say it.

To that same question, another IS faculty stated, "Well they allow the students to be more specialized and technically oriented within these specific skill sets; at least that is what the intent is with our tracks." But others do not agree with the career track option

suggested guideline, stating, to that same question:

> We do not plan to develop any career tracks; there is no room in curriculum for them. By the time you pile on the entire undergraduate core, and business required core, and what we consider as core classes to get a job in MIS, you don't have anything left. There is no room for tracks per se like that. I don't know what kind of assumptions were made by the IS 2010 development committee, but most undergraduate required education is a lot bigger than it used to be; ours is 50 hours. And our school of business core is bigger than the typical school of business core, so it doesn't allow you a lot of extra courses.

And another IS faculty representing her program said:

> Before, we had four tracks and every track required six courses. It was such chaos, and sometimes two tracks differed by only one or two courses. So eventually we sat down and determined the core requirements for IS students. So, we had four tracks: An Application Development track, a Business Telecom track, Electronic Commerce track, and a Decision Technologies track. But, we canceled all that about one to two years ago, and we went to just one MIS major concentration.

From these quotes, several trends are found to be common in recent and current discussion in the IS field, to include: (a) the debate between the need to provide a more managerial versus technical foundation to the IS undergraduate majors; (b) the suggested need to provide IS undergraduate majors with specializations or career tracks, but still a small number of IS programs able to provide career tracks options; (c) the inaccurate perception of adherence to IS 2010 curriculum guidelines by IS faculty; (d) IS program curriculum development efforts catering to local industry and other relevant demands; and (e) a low percentage of IS programs that actually adhere to the IS 2010 curriculum guidelines at higher levels. From the discussion of these trends surrounding IS curriculum guidelines, the conclusion could be made that significant debate is present and persists over how a typical IS program curriculum should look. These trends may have influenced the informal categorization of four latent class clusters of IS program

curricula, the characteristics around which they are organized, and the current state of the IS curriculum across the country identified in this study.

The Four Identified Clusters and Their Contributing Characteristics

The variables contributing to the characterization of the four identified clusters are the "# of courses required," "# of elective courses offered," a capstone course required in final year of program, career track options offered, and assessed adherence percentages of the IS program curricula to the IS 2010 curriculum guidelines. We see from the findings of the study that in all, the "# of courses required" in IS programs across the country showed a mean of 6.8, with a median and mode of 7.0, and standard deviation of 2.3. The core topics widely offered (in over half of the IS programs curriculum) are IS 2010.1, IS 2010.2, IS 2010.5, and IS 2010.6, while IS 2010.3, IS 2010.4, and IS 2010.7 are offered as core curriculum in less than half of IS programs.

As seen from the results listed in Table 13, from 1996 to the present, there has been a significant increase, 26%, in the percentage of IS programs that now teach IS 2010.1 in their core curriculum. There is only a 1% difference for IS programs teaching IS 2010.1 in 1996 to 2006. From 1996 until now, there has been a significant increase in the percentage of IS programs teaching the topics for IS 2010.2 (81%), IS 2010.5 (58%), and IS 2010.6 (60%). There was likewise an increase for IS 2010.7 of 13%. These findings are not too surprising since as time elapses and technology changes, certain core topics can tend to be taught in higher percentages. Of interest, possibly due to the same issue, IS topics 2010.5, and 2010.6 showed an increase from 1996 up to now (58% and

60%), but an actual decrease (-8% and -15%) in those two topics has occurred from 2006 up to this study. The other IS topics showed an increase from 1996 to 2006 and up to this date as well. The "# of elective courses offered" in IS programs across the country showed a mean of 10.6, with a median 9 and mode of 13, and standard deviation of 7.6.

To understand the general picture or current state of IS curriculum across the country one might use these descriptive statistics to characterize a typical IS program. One such program would have seven core courses as part of its required curriculum, would maintain a rotational schedule of about 10-11 elective course offerings, and teach a foundations of information systems course, a data and information management course, some kind of IT Infrastructure course, as well as a systems analysis and design course . This same program would not likely teach any type of enterprise architecture course, or an IS strategy, management, and acquisition course, and might, but would not typically teach an IS project management course. A capstone course may be offered, but it is not likely be a required course, or required to be taken in the final year of the program. Also, one would not very likely see any identified emphasis or career tracks offered by this typical IS programs somewhere across the country.

With a mean of 7% of IS programs offering career track options in their curriculum, it appears very few IS programs have formally implemented the IS 2010 career track guideline recommendations. With a mean of 3.5 career tracks offered among the programs tracks, it seems IS programs implementing formal career tracks specify a reasonably small number of track options for students to consider. The range of career track offerings among IS programs that include career track options was between two and

five. Based upon the four identified clusters in the latent class cluster analysis, there appears to be reasonably well-defined categories of IS programs as related to IS 2010 curriculum guideline adherence. The four identified clusters have been classified or labeled as follows:

Cluster One: IS Guidelines Passive Cluster

Cluster Two: IS Guidelines Aware Cluster

Cluster Three: IS Guidelines Participative Cluster

Cluster Four: IS Guidelines Adoptive Cluster

The two largest clusters account for moderate to good adherence to the IS 2010 curriculum guidelines while the two smallest clusters represent poor and excellent adherence. Table 15 in Chapter IV lists the probabilities of the analyzed characteristics pertaining to four different clusters. In this table we see Cluster One is the largest in size representing 41% of the population, and can be characterized as a typical, but smaller than average IS program. Cluster one is the second smallest in size representing 12% of the population, and can be characterized as an average in size but nonconforming IS program. Cluster one has a high probability of requiring between 0-3 courses, and a moderate probability of offering a typical amount of elective courses, which is one reason for its assigned classification. There is almost no probability that Cluster One will require a capstone course in the final year of the program, and this cluster is very likely to fall within the poor adherence range to the IS 2010 curriculum guidelines, possibly due to the probability this cluster will offer a few required courses, and a typical number of elective courses which do not meet the requirements of the IS 2010 curriculum guidelines

to satisfy appropriate coverage of a topic. This cluster also has a very low probability of offering career track options. Based on these characteristics, we labeled Cluster One as the IS guidelines passive cluster.

According to the data listed in Table 15, Cluster Two is the second largest in size representing 37% of the population, and can be characterized as a typical but larger than average IS program. Cluster two has an equally high probability of requiring between 4-9 courses, right at the mean for courses required for the population. Additionally, Cluster Two is also the most likely to offer significant elective courses, which is one reason for its assigned classification. There is almost no probability that Cluster Two will require a capstone course in the final year of the program, and this cluster is very likely to fall within the moderate adherence range to the IS 2010 curriculum guidelines, possibly due to the probability this cluster will offer a slightly less number of required courses, and a significant number of elective courses which do not meet the requirements of the IS 2010 curriculum guidelines to satisfy appropriate coverage of a topic. This cluster also has a very low probability of offering career track options. Based on these characteristics, we labeled Cluster Two as the IS guidelines aware cluster.

Referring back to Table 15, Cluster Three has a moderate probability of requiring 7-9 courses, just slightly above the mean of the courses required for the population. Additionally, Cluster Three is also the most likely to offer few elective courses. There is a moderate probability that Cluster Three will require a capstone course in the final year of the program, and this cluster is very likely to fall within the good adherence range to the IS 2010 curriculum guidelines, possibly due to the probability this cluster will offer

significant number of required courses, one requirement to meet the IS 2010 curriculum guidelines. However, this cluster has a very low probability of offering career track options, possibly due to the probability this cluster will offer a few amount of elective courses, with several electives usually needed to support career track options. Based on these characteristics, we labeled Cluster Three as the IS guidelines participative cluster.

Cluster four, listed in Table 15, can be classified as an IS 2010 curriculum guidelines sensitive cluster. All the probabilities for this cluster show that this cluster is working to satisfy the main guidelines of the IS 2010 curriculum model. This cluster represents 10% of the population, and the highest probability of requiring 7-9 courses, just slightly above the courses required mean for the population. Additionally, Cluster Four is also the most likely to offer a significant number of elective courses. There is a very high probability Cluster Four will require a capstone course in the final year of the program, and this cluster is very likely to fall within the excellent adherence range to the IS 2010 curriculum guidelines, possibly due to the decent probability this cluster will offer significant number of required courses, one requirement to meet the IS 2010 curriculum guidelines. Additionally, this cluster has a moderate probability of offering career track options, possibly due to the probability this cluster will offer a significant amount of elective courses, with several electives usually needed to support career track options. Based on these characteristics, we labeled Cluster Four as the IS guidelines adoptive cluster.

Summary

The following summations are condensed from the discussion section in this

dissertation of the study.

There are several themes found commonly throughout the findings of this study complicit to the current literature. They are: (a) the debate between the need to provide a more managerial versus technical foundation to the IS undergraduate majors, (b) although believed to be beneficial to IS undergraduate majors, there are minimal IS programs offering IS specializations or career track options, (c) IS programs typically structure their curriculum in a way that serves their best interests (i.e., local industry demands, attracting greater amount of students, catering courseware and teaching objectives to faculty skill set, etc.), (d) most IS programs believe themselves to be much more adherent to the IS 2010 curriculum guidelines than is actually the case, and (e) there definite categories or clusters of IS programs and their relevant distinct characteristics.

Of significant interest is the unique categories or clusters of IS programs and their distinct characteristics. An understanding of the four identified clusters (Cluster One: IS guidelines passive cluster; Cluster Two: IS guidelines aware cluster; Cluster Three: IS guidelines participative cluster; and Cluster Four: IS guidelines adoptive cluster) and the ostensible advantages can afford individual IS programs the ability to assess and move there IS program curriculum towards a specifically desired cluster. Also of significant interest is the discrepancy between IS programs perceived adherence and assessed adherence; it is therefore supposed that, as a first priority, IS faculty structure their programs based upon local industry demands trying to provide the best program possible with their given resources.

The fact that level of adherence is lower than what is assessedly perceived is not

necessarily a bad thing. As one IS faculty said it, in a follow-up interview, when asked: "From your point of view, can you share the advantages and disadvantages of following the IS 2010 curriculum guidelines?"

> I'll be honest with you, what drives our curriculum is what our employers tell us they want. The curriculum guidelines are just that, guidelines, and I think the old 80/20 rule is a good rule. It is not a good thing for everyone to look the same, when we all have our individual strengths and areas of expertise, and areas of no expertise. As I mentioned before we are a technical program, and by choice that is one of our areas of expertise.

As stated by Topi and colleagues (2010), "the IS model curriculum is intended to provide flexibility in designing IS curricula to satisfy various local requirements" (p. 366). In the end, this study discussion finds this attitude completely appropriate, and encourages IS faculty across the country to continue to enhance their curriculum and provide the best IS programs possible to their IS undergraduate majors; a suitable ending conclusion to this discussion and dissertation.

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APPENDICES

Appendix A

Data Collected from Information Systems Department Websites and Course Catalogs

Data Collected from Information Systems Department Websites and Course Catalogs

Identifier Code	N1
University Name	
School Name	
School Address	
School City Location	
School State Location	
School Zip Code	
Geographic (Censes) Locations: (West, Midwest, Northeast, and South)	West
Quarters (Q) or Semesters (S)	S
Public (1) Private (2)	Public
Department/Program Name:	Management Information Systems
# of IS Courses required?	5
Required IS Courses	
Required Course #C1 -	MIS 2100 - Principles of MIS (Business Acumen)
Required Course #C2 -	MIS 2200 - Business Comm. (Business Acumen CI)
Required Course #C3 -	MIS 3330 - Database Management
Required Course #C4 -	MIS 3800 - Info Technology Hardware and Systems
Required Course #C5 -	MIS 5900 - Systems Design and Implementation
Required Course #C6 -	MIS 5910 - Systems Design Laboratory
Required Course #C7 -	BUS 4250 - Advanced Internship
Required Course #C8 -	MIS 3500 - Intro to Bus Applications
Required Course #C9 -	
Required Course #C10 -	

IS 2010 Core Topics coverage assessment	
IS 2010.1—Foundations of Information Systems—F1	C1: MIS 2100 - Principles of MIS (3-Business Acumen)
IS 2010.2—Data and Information Management—F2	C3: MIS 3330 - Database Management
IS 2010.3—Enterprise Architecture—F3	C8: MIS 3500 - Intro to Bus Applications
IS 2010.4—IS Project Management—F4	C6: MIS 5910 - Systems Design Laboratory
IS 2010.5—IT Infrastructure—F5	C4: MIS 3800 - Info Technology Hardware and Systems
IS 2010.6—Systems Analysis and Design—F6	C5: MIS 5900 - Systems Design and Implementation
IS 2010.7—IS Strategy, Management & Acquisitions— F7	None
Is IS 2010.7 a Capstone course?	No
Capstone required in last year of program?	No
Other Capstone course title?	None
Other capstone required in last year of program?	No
# of Electives Courses offered?	10
Elective Courses that meet IS 2010 core topic guidelines	
Elective Course #E1:	MIS 3450 - Designing Graphical User Interfaces for Electronic Commerce
Elective Course #E2:	MIS 4330 - Database Implementation
Elective Course #E3:	MIS 4350 - Introduction to Performance Improvement Projects
Elective Course #E4:	MIS 4800 - Security of Business Information Systems
Elective Course #E5:	MIS 5050 - Advanced Web-Based Management Information Systems Development
Elective Course #E6:	MIS 5300 - Advanced Data Communications
Elective Course #E7:	MIS 5350 - Quantitative Financial Modeling and Applications

Elective Course #E8:	MIS 5650 - Advanced Website Development
Elective Course #E9:	
Career Tracks offered:	
# of Career Tracks offered?	5
Career Track #T1:	Business Analyst/ IT Consultant
Career Track #T2:	Database Administrator
Career Track #T3:	Project Manager
Career Track #T4:	Web Developer
Career Track #T5:	E-learning
Career Track #T6:	
Career Track #T7:	
Career Track #T8:	
Career Track Courses	
Career Track #T1—Business Analyst/ IT Consultant—Courses	C1, C3, C4, C5, C6, C7, C8, E3, E4, E6, E7
Career Track #T2—IT Operations Manager—Courses:	C1, C3, C4, C5, C6, C7, C9, C10, E2, E4, E6
Career Track #T3—Project Manager—Courses:	C1, C3, C4, C5, C6, C7, C8, E3, E4
Career Track #T4—Web Developer—Courses:	C1, C3, C4, C5, C6, C7 , C9, C10, E1, E2, E5, E8
Career Track #T5—E-learning—Courses:	C1, C3, C4, C5, C6, C7, C8, E1, E3
Career Track #T6— —Courses:	
Career Track #T7— —Courses:	
Career Track #T8— —Courses:	

Appendix B

IS 2010 Curriculum Evaluation Template

IS 2010 Curriculum Evaluation Template

This template was used to evaluate each individual Information Systems department curriculum. Upon beginning the evaluation a copy for the department being assessed was saved (UniversityName.docx) with the University name as the document title. The information collected below was required for the department to be classified as a respondent; if certain datum was not present in the curriculum, the corresponding field was left blank to communicate not available. A blank field was also used for a "No" response in some cases. Please reference criteria definitions and clarification in the Data Collection Key in the following pages.

Section I: General Information

Identifier Code (from random sample spreadsheet): Enter the Univ. identifier code.

Information Systems (IS) Department's general information

University Name:	
Business School Name:	
School City Location:	
School State Location:	
School Zip Code:	
Department/Program Name:	
Is the IS Program currently offered?:	Yes/No (1 or 0)
Department/Program URL:	
Department/Program Head Name:	
Department/Program Head Phone#:	

Related URLs to understand data further: Enter any IS program related URLs that further explain the data collected in the assessment:

Summary of general findings (qualitative info): Enter a summary of your general findings after you have completed the IS department website and course catalog research.

Section II: IS Courses Required

Information for each course required by the respective IS department was included here, with the relevant IS 2010 required topic they adhere to (match up with).

Identifier Code (from random sample spreadsheet): Enter the Univ. identifier code.

IS Department's core courses (required)

Core Course #C1	List course number, and course name (i.e. MIS 2100, Principles of MIS)
Core Course #C2	
Core Course #C3	
Core Course #C4	
Core Course #C5	
Core Course #C6	
Core Course #C7	

IS2010 core topics (7) matched to the courses where covered

IS 2010.1 - Foundations of Information Systems	List corresponding courses from above that meet IS 2010 topic guidelines for each topic, or elective course from list documented below.
IS 2010.2 - Data and Information Management	
IS 2010.3 - Enterprise Architecture	
IS 2010.4 - IS Project Management	
IS 2010.5 - IT Infrastructure	
IS 2010.6 - Systems Analysis and Design	
IS 2010.7 - IS Strategy, Management & Acquisitions	
Is the IS 2010.7 course a Capstone Course?	Yes/No (1 or 0)
If so, is it required to be taken during the student's final year?	Yes/No (1 or 0)
What different Capstone Course is required, that doesn't match up with the IS 2010.7 topic?	
Is the differing capstone course required in the last year of the program?	Yes/No (1 or 0)

IS Department's elective courses that meet IS 2010 core topic requirements.

Elective Course #E1	List course number and course name (i.e. MIS 2700, Business Intelligence)
Elective Course #E2	
Number of Program Elective Courses required (not general education elective requirements (i.e. Bowling):	List the # of elective courses offered

Enter all core or related elective course descriptions below:

Section III: Career Tracks

Common career tracks offerings and any other career tracks present in the IS departments Curriculum are documented. Include it only as a career track if named as a career track. Include any emphasis names (page top), where similar to a common career track name.
Identifier Code (from random sample spreadsheet): Enter the Univ. identifier code.

IS Department's Emphasis or Concentrations similar to common career track options

Concentration Name -	List only emphasis or concentration names where similar to a common career track names.
Concentration Name -	
Concentration Name -	
Concentration Name -	

IS Department's <u>Career Track</u> offerings

Career Track #T1	List Career Track name where identified as a "Career Track"	List all courses required by the specific Career Track
Career Track #T2		
Career Track #T3		
Career Track #T4		

Section IV: Common Career Tracks

Common career tracks offerings as identified by Topi, et al. (2010) are listed below.

Career Track #T1 - Application Developer
Career Track #T2 - Business Analyst
Career Track #T3 - Business Process Analyst
Career Track #T4 - Database Administrator
Career Track #T5 - Database Analyst
Career Track #T6 - E-Business Manager
Career Track #T7 - ERP Specialist
Career Track #T8—Information Auditing and Compliance Specialist
Career Track #T9 - IT Architect
Career Track #T10 - IT Asses Manager
Career Track #T11 - IT Consultant
Career Track #T12 - IT Operations Manager
Career Track #T13 - IT Security and Risk Manager
Career Track #T14 - Network Administrator
Career Track #T15 - Project Manager
Career Track #T16 - User Interface Designer
Career Track #T17- Web Content Manager
Career Track #T18- Web Developer
Career Track #T19 - E-learning

Data Collection Key

Foundational IS 2010 curriculum guidelines are comprised of the following core requirements:
The seven core topics, career track options, and sequencing, or as we define it the capstone course should be required in the last year of the students program scholarship studies.

1) For each of the 7 courses we will codify each topic criteria as satisfied with a 1, and not satisfied with a 0. For example, IS2010.1—Foundations of Information Systems

A. Required as a course (1)
B. Required as an objective/module/topic in a course (1)
C. Elective Course (0)
D. Elective as an objective/module/topic in a course (0)
E. Not Covered (0)

2) Any emphasis offered is codified with a 1, and no emphasis is codified with a 0. Full Career Tracks offered are codified with a 1, and no career tracks offered will be codified with a 0.

A. Emphases that identify a common career track (1)
B. No Emphases (0)
C. Identified Career Tracks (1)
D. No Career Track (0)

3) Capstone course sequencing = capstone course required during a student's final year is codified as a 1, and if not required during a student's final year it is codified as a 0.

Cluster Groups to analyze:
Career Track offerings (Yes/No), Course compliance (%), Capstone sequencing (Yes/No), number of required IS courses, and number of electives IS courses offered.

Appendix C

Additional Information Collected

Identifier Code (from random sample spreadsheet): 3
Department/Program Name*:* Information Systems and Operations Management

IS Department's core courses (required)

Core Course #C1	**IS 300, Introduction to Information Systems**
Core Course #C2	**IS 310, Fundamentals of Business Information Technologies**
Core Course #C3	**IS 320, Fundamentals of Application Programming**
Core Course #C4	**IS 410, Business Data Communications**
Core Course #C5	**IS 445, Database Management**
Core Course #C6	**IS 460, Systems Analysis and Design**

IS2010 core topics (7) matched to the courses where covered

IS 2010.1 - Foundations of Information Systems	**IS 300, Introduction to Information Systems**
IS 2010.2 - Data and Information Management	**IS 310, Fundamentals of Business Information Technologies** **IS 445, Database Management**
IS 2010.3 - Enterprise Architecture	
IS 2010.4 - IS Project Management	
IS 2010.5 - IT Infrastructure	**IS 410, Business Data Communications**
IS 2010.6 - Systems Analysis and Design	**IS 460, Systems Analysis and Design**
IS 2010.7 - IS Strategy, Management & Acquisitions	
Is the IS 2010.7 course a Capstone Course?	
If so, is it required to be taken during the student's final year?	
What different Capstone Course is required, that doesn't match up with the IS 2010.7 topic?	
Is the differing capstone course required in the last year of the program?	

IS Department's elective courses that meet IS 2010 core topic requirements, if any.

Elective Course #E1	
Number of Program Elective Courses offered (not general education elective requirements (i.e. Bowling)):	5

Identifier Code (from random sample spreadsheet): 5
Department/Program Name*:* Information Systems

IS Department's core courses (required)

Core Course #C1	INFO 300, Information Technology Infrastructure
Core Course #C2	INFO 350, Intermediate Programming
Core Course #C3	INFO 361, Systems Analysis and Design
Core Course #C4	INFO 364, Database Systems
Core Course #C5	INFO 370, Fundamentals of Data Communications
Core Course #C6	INFO 461, Information Systems Planning and Project
Core Course #C7	INFO 465, Projects in Information Systems
Core Course #C8	INFO 360, Business Information Systems
Core Course #C9	Info 202, Introduction to E-Business Technologies
Core Course #C10	CSMS 245/255, Intro to Programming (C/C++)

IS2010 core topics (7) matched to the courses where covered

IS 2010.1 - Foundations of Information Systems	INFO 360, Business Information Systems
IS 2010.2 - Data and Information Management	Info 364, Database Systems
IS 2010.3 - Enterprise Architecture	
IS 2010.4 - IS Project Management	INFO 461, Info Systems Planning and Project
IS 2010.5 - IT Infrastructure	INFO 300, Information Technology Infrastructure INFO 472, LAN Administration—E1 INFO 474, Internetworking and TCP/IP—E1
IS 2010.6 - Systems Analysis and Design	INFO 361, Systems Analysis and Design
IS 2010.7 - IS Strategy, Management & Acquisitions	

Is the IS 2010.7 course a Capstone Course?	
If so, is it required to be taken during the student's final year?	
If so, is it required to be taken during the student's final semester?	
What different Capstone Course is required, that doesn't match up with the IS 2010.7 topic?	INFO 465, Projects in Information Systems
Is differing capstone course required in the last year of program?	Yes

IS Department's elective courses that meet IS 2010 core topic requirements, if any.

Elective Course #E1	**INFO 472, LAN Administration**
Elective Course #E2	**INFO 474, Internetworking and TCP/IP**
Number of Program Elective Courses offered (not general education elective requirements (i.e. Bowling)):	9

Identifier Code (from random sample spreadsheet): 5
IS Department's Emphasis or Concentrations similar to common career track options

Concentration Name -	Application Development
Concentration Name -	Business Analysis
Concentration Name -	Information and Communications Technology

IS Department's Career Track offerings

Career Track #T1	Applications Developer:	INFO 450 Advanced Programming
		INFO 451 Java Support for E-business
Career Track #T2	Business Analyst:	INFO 463 Business Process Engineering
		INFO 468 Information Engineering
Career Track #T3	Information and Communications Technologist:	INFO 472 LAN Administration
		INFO 474 Internetworking and TCP/IP

Identifier Code (from random sample spreadsheet): 6

Department/Program Name*:* Management Information Systems

IS Department's core courses (required)

Core Course #C1	MIS 1370, Introduction to Computer Architecture and Programming
Core Course #C2	MIS 2343, Desktop Support Technologies
Core Course #C3	MIS 3321, Managing Systems and Technology
Core Course #C4	MIS 3328, System Analysis and Design
Core Course #C5	MIS 3363, Telecommunications and Computer Networks
Core Course #C6	MIS 3365, Database Applications

IS2010 core topics (7) matched to the courses where covered

IS 2010.1 - Foundations of Information Systems	MIS 3321, Managing Systems and Technology
IS 2010.2 - Data and Information Management	MIS 3365, Database Applications MIS 4329, Database Management Systems—E2
IS 2010.3 - Enterprise Architecture	
IS 2010.4 - IS Project Management	MIS 3350, Project Management—E1
IS 2010.5 - IT Infrastructure	MIS 3363, Telecommunications and Computer Networks
IS 2010.6 - Systems Analysis and Design	MIS 3328, Systems Analysis and Design
IS 2010.7 - IS Strategy, Management & Acquisitions	
Is the IS 2010.7 course a Capstone Course?	
If so, is it required to be taken during the student's final year?	
What different Capstone Course is required, that doesn't match up with the IS 2010.7 topic?	MIS 4350, Information Systems Technology - E3
Is the differing capstone course required in the last year of the program?	No

IS Department's elective courses that meet IS 2010 core topic requirements, if any.

Elective Course #E1	MIS 3350, Project Management
Elective Course #E2	MIS 4329, Database Management Systems
Elective Course #E3	MIS 4350, Information Systems Technology
Number of Program Elective Courses offered (not general education elective requirements (i.e. Bowling)):	17

Identifier Code (from random sample spreadsheet): 6

IS Department's Emphasis or Concentrations similar to common career track options

Concentration Name -	Web Development / E-Commerce
Concentration Name -	Programmer/Analyst
Concentration Name -	Global IS/Spatial Systems
Concentration Name -	Telecommunications & Computer Networks

IS Department's Career Track offerings

Career Track #T1	Web Development / E-Commerce:	MIS 3366 Website Development
		MIS 4339 Programming for Website Applications
		MIS 4366 E-commerce and Advanced Website Development
		MIS Elective
Career Track #T2	Programmer/Analyst:	MIS 3301 COBOL I
		MIS 4329 Database Management Systems
		2 CSCI or MIS Electives
Career Track #T3	Global IS/Spatial Systems:	MIS 3362 Programming Visual Basic
		GEOG 2375 Cartography
		GEOG 3303 Geographic Information Systems
		GEOG 4330 GIS Analysis
Career Track #T4	Telecommunications & Computer Networks	MIS 3362 Programming in Visual Basic
		CSCI 3335 Networking I
		MIS 3366 Website Development
		MIS 4363 Wireline and Wireless Telecommunications

Identifier Code (from random sample spreadsheet): 139

Department/Program Name*:* Computer Information Systems

IS Department's core courses (required)

Core Course #C1	CIS 201, Fundamentals of Computer Information Systems
Core Course #C2	CIS 305, Using Technology for Effective Management
Core Course #C3	CIS 341, Database Management System Principles
Core Course #C4	CIS 441, System Analysis and Design

IS2010 core topics (7) matched to the courses where covered

IS 2010.1 - Foundations of Information Systems	CIS 201, Fundamentals of Computer Information Systems
IS 2010.2 - Data and Information Management	CIS 341, Database Management System Principles
IS 2010.3 - Enterprise Architecture	CIS 470, Managing Global Information Recourses—E1
IS 2010.4 - IS Project Management	IT 442, Project Management and Practice—E2
IS 2010.5 - IT Infrastructure	
IS 2010.6 - Systems Analysis and Design	CIS 441, System Analysis and Design
IS 2010.7 - IS Strategy, Management & Acquisitions	CIS 305, Using Technology for Effective Management

Is the IS 2010.7 course a Capstone Course?	No
If so, is it required to be taken during the student's final year?	No
What different Capstone Course is required, that doesn't match up with the IS 2010.7 topic?	
Is the differing capstone course required in the last year of the program?	

IS Department's elective courses that meet IS 2010 core topic requirements, if any.

Elective Course #E1	IT 442, Project Management and Practice
Elective Course #E2	CIS 470, Managing Global Information Recourses
Elective Course #E3	

Number of Program Elective Courses offered (not general education elective requirements (i.e. Bowling)):	17

Identifier Code (from random sample spreadsheet): 140
Department/Program Name*:* Information Systems
IS Department's core courses (required)

Core Course #C1	IS 250, Application Program Development I
Core Course #C2	IS 251, Application Program Development II
Core Course #C3	IS 340, Management Information Systems
Core Course #C4	IS 350, System Analysis and Design I
Core Course #C5	IS 351, System Design and Analysis Design II
Core Course #C6	IS 443, Data modeling with Database Implementation
Core Course #C7	IS 451, Telecommunications and Networking

IS2010 core topics (7) matched to the courses where covered

IS 2010.1 - Foundations of Information Systems	IS 340, Management Information Systems
IS 2010.2 - Data and Information Management	IS 443, Data Modeling with Database Implementation
IS 2010.3 - Enterprise Architecture	
IS 2010.4 - IS Project Management	IS 460, Project Management—E3
IS 2010.5 - IT Infrastructure	IS 255, Computer Interfaces with Business applications—E1 IS 451, Telecommunications and Networking
IS 2010.6 - Systems Analysis and Design	IS 350, System Analysis and Design I IS 351 IS 351, System and Analysis Design II
IS 2010.7 - IS Strategy, Management & Acquisitions	IS 450, Information Technology Strategy and Management—E2
Is the IS 2010.7 course a Capstone Course?	No
If so, is it required to be taken during the student's final year?	No
What different Capstone Course is required, that doesn't match up with the IS 2010.7 topic?	
Is the differing capstone course required in the last year of the program?	

IS Department's elective courses that meet IS 2010 core topic requirements, if any.

Elective Course #E1	IS 255, Computer Interfaces with Business Applications
Elective Course #E2	IS 450, Information Technology Strategy and Management
Elective Course #E3	IS 460, Project Management
Number of Program Elective Courses offered (not general education elective requirements (i.e. Bowling)):	18

Identifier Code (from random sample spreadsheet): 141
Department/Program Name*:* Management Information Systems
IS Department's core courses (required)

Core Course #C1	MIS 3720, Business Data Management
Core Course #C2	MIS 3740, Organizational Applications of Telecommunications
Core Course #C3	MIS 4720, Systems Analysis and Design
Core Course #C4	MIS 4740, Business Strategy, Architecture and Design
Core Course #C5	MIS 4781, Information Systems and Technology Policy and Strategy
Core Course #C6	MS 2118, Object-Oriented Design Concepts for Business Applications

IS2010 core topics (7) matched to the courses where covered

IS 2010.1 - Foundations of Information Systems	MIS 3700, Information Systems Management—E1
IS 2010.2 - Data and Information Management	MIS 3720, Business Data Management MS 2118, Object-Oriented Design concepts for Business Applications
IS 2010.3 - Enterprise Architecture	MIS 4740, Business Strategy, Architecture and Design
IS 2010.4 - IS Project Management	
IS 2010.5 - IT Infrastructure	MIS 3740, Organizational Applications of Telecommunications
IS 2010.6 - Systems Analysis and Design	MIS 4720, Systems Analysis and Design
IS 2010.7 - IS Strategy, Management & Acquisitions	MIS 4781, Information Systems and Technology Policy and Strategy
Is the IS 2010.7 course a Capstone Course?	No
If so, is it required to be taken during the student's final year?	No
What different Capstone Course is required, that doesn't match up with the IS 2010.7 topic?	
Is the differing capstone course required in the last year of the program?	

IS Department's elective courses that meet IS 2010 core topic requirements, if any.

Elective Course #E1	MIS 3700, Information Systems Management
Number of Program Elective Courses offered (not general education elective requirements (i.e. Bowling)):	5

Identifier Code (from random sample spreadsheet): 142
Department/Program Name*:* Management Information Systems
IS Department's core courses (required)

Core Course #C1	MIS 3003, Management Information Systems
Core Course #C2	MIS 3113, Business Programming Language
Core Course #C3	MIS 3123, Database Design and management
Core Course #C4	MIS 3133, Business System Analysis
Core Course #C5	MIS 3303, Networking and Telecommunications
Core Course #C6	MIS 4143, Business System Design and Implementations
Core Course #C7	MIS 4153, Decision Making and Support Systems
Core course #C8	MIS 2003, Information Technology and Concepts for Business

IS2010 core topics (7) matched to the courses where covered

IS 2010.1 - Foundations of Information Systems	3003, Management Information Systems
IS 2010.2 - Data and Information Management	3123, Database Design and Management 4333, Advanced Database Design—E3
IS 2010.3 - Enterprise Architecture	3133, Business System Analysis
IS 2010.4 - IS Project Management	3163, Project Management—E1
IS 2010.5 - IT Infrastructure	3303, Networking and Telecommunications 4323, Business Network Design—E2
IS 2010.6 - Systems Analysis and Design	4143, Business System Design and Implementations
IS 2010.7 - IS Strategy, Management & Acquisitions	
Is the IS 2010.7 course a Capstone Course?	
If so, is it required to be taken during the student's final year?	
What different Capstone Course is required, that doesn't match up with the IS 2010.7 topic?	
Is the differing capstone course required in the last year of the program?	

IS Department's elective courses that meet IS 2010 core topic requirements, if any.

Elective Course #E1	3163, Project Management
Elective Course #E2	4323, Business Network Design
Elective Course #E3	4333, Advanced Database Design
Number of Program Elective Courses offered (not general education elective requirements (i.e. Bowling)):	9

Appendix D

Undergraduate Program Director Interview Request Email

Undergraduate Program Director Interview Request Email

The **Principle Investigators (PIs)** sent out an email request to the desired schools, requesting a short interview with either the department head or the director of undergraduate studies. The follow-up telephone interviews intended to collect undiscovered data in the areas of course curriculum offerings, required core topics not discovered in the required courses (but possibly offered as an elective or elsewhere), current career tracks that couldn't be confirmed present in the program curriculum, and the department perceived adherence to IS 2010 curriculum guidelines.

Dr. _____,

I would like to call you in the next several days for a brief 5-10 minute phone conversation to understand some details regarding your Information Systems Program/Major. Additional information regarding the phone interview inquiry is listed below in the Letter of Information, also found in the attachment. Kindly accept a phone call to your office line in the next several days, or email back a time and number of convenience to entertain this 5—10 minute phone conversation. Thank you so much for your assistance.

Kind Regards,
Graduate Research Assistant
Management Information Systems
Utah State University

Corbin Bell

USU IRB Certificate of Exemption: August 25, 2011
Exemption Expires: 08/24/2014
Protocol #3015
IRB Password Protected per IRB Administrator

Jon M. Huntsman School of Business
Management Information System Dept.
3515 Old Main Hill
Logan, UT 84322-3515

INFORMED CONSENT

IS Department Perception of Curriculum Guideline Adherence

Department Curriculum Interview Questions

Introduction/ Purpose: Corbin Bell, Ph.D Candidate under the direction of Dr. Robert Mills in the Management Information Systems Department at Utah State University (USU) is conducting a research study to find out more about current state and perceptions of value for IS programs adherence to IS 2010 curriculum guidelines. You have been asked to take part as one to represent your department relevant to the subject study. There will be approximately 72 in this research, and possibly up to one half of the defined population (143 participants).

Procedures: It is estimated that this telephone interview may take on average 10 minutes, and no longer than 15 minutes to complete. By accepting a telephone interview, you indicate that you have freely chosen to participate in USU's voluntary, anonymous research interview designed to provide information and perception about the characteristics of your departments Information Systems curriculum. This interview will be conducted over the phone and the interviewer will record your responses to an interview response template. I agree to permit the Utah State University's Principle Investigators, Collaborators, and Staff, to obtain, use, and disclose the anonymous information provided as described below.

Risks: There is minimal risk in participating in this research study.

Benefits: There may or may not be any direct benefit to you from these procedures. The investigator, however, may learn more about the current state IS curriculum, adherence to, and/or value of IS 2010 curriculum guidelines. This may result in enhanced knowledge of IS curriculum improvement and development implementations.

Explanation & offer to answer questions: If you have other questions or research-related problems, you may reach Dr. Robert Mills at 435-797-7480 or bob.mills@usu.edu.

Voluntary nature of participation and right to withdraw without consequence: Participation in research is entirely voluntary. You may refuse to participate or withdraw at any time without consequence or loss of benefits. You may be withdrawn from this study without your consent by the investigator if an insufficient number of questions are answered.

Confidentiality: Research records will be kept confidential, consistent with federal and state regulations. Only you and the investigator will have access to the data. Individual or personal identifiable information will not be kept by the investigator or USU, and the interview will remain anonymous.

IRB Approval Statement: The Institutional Review Board for the protection of human participants at USU has approved this research study. If you have any pertinent questions or concerns about your rights or a research-related injury, you may contact the IRB Administrator at (435) 797-0567 or email irb@usu.edu. If you have a concern or complaint about the research and you would like to contact someone other than the research team, you may contact the IRB Administrator to obtain information or to offer input.

Robert Mills, Ph.D.
Principle Investigator
(435) 797-7480
Bob.mills@emailaddress

Corbin Bell
Student Researcher
(801) 529-2999
Corbinbell@gmail.com

Appendix E

Undergraduate Program Director Interview Introduction Script

Undergraduate Program Director Interview Introduction Script

The **Principle Investigators (PIs)** conducted a short interview with either the department head or the director of undergraduate studies and filled in the answers to the relevant questions below. The follow-up introductory message and questions were verbalized. On a rare occasion a question was not asked or skipped for one of a few reasons: The question had already been answered in the conversation, the information was clearly present and answered in the website assessment phase, or the interviewee was not able to finish the interview.

The phone interview commenced with the following:

Dr. _____,

"My name is Corbin Bell; I am a Doctoral student at Utah State University and I am calling in follow-up to a recent email I sent you about a week ago, to conduct a short telephone interview regarding some details of your Information Systems Program Major. Based on pilot averages, this conversation is estimated to take between 5 to 10 minutes of your time. As part of this study, we have assessed information from your department website and university course catalog and would like to ask 3 to 6 follow-up questions. Do you have a few minutes for a few follow-up questions about your Information Systems undergraduate program?"

If yes: Is it Ok if I record this phone conversation?

- If yes, the 3-6 relevant follow-up questions were asked and recorded.
- If no, transcriptions were taken as best as possible during the conversation. (Two respondents preferred no recording.)

At the end of the phone conversation: "Thank you so much for your time. We will be preparing our findings for publication over the next several months. We will send you a copy of the results at that time."

The interview questions are listed in the following:

Undergraduate Program Director Interview Question Set

Identifier Code (from random sample spreadsheet): University identifier code here

Question 1: Out of 100%, how compliant is your IS curriculum with the IS 2010 curriculum guidelines in terms of the 7 required topics, identified career tracks, and the capstone course taken during a student's final semester?

Transcribe the answer to Question 1 here.

Question 2: We were unable to locate the following (core) topics within your department's program of study ____________________. Can you confirm that these topics are not included in your IS program, or provide the title and how they are included (such as an elective)?

Transcribe the answer to Question 2 here.

Question 3: We were unable to locate the IS Strategy, Management and Acquisitions topic (IS 2010.7) taught by your department's program of study. Can you confirm if this course topic is included in your IS program, and if so, the title and how it is included (such as an elective), and whether it is a capstone course, meaning it is taken during a student's final semester? (Asked the question pertinent to what is included in the program to determine sequencing.)

Transcribe the answer to Question 3 here.

Question 4: We were unable to locate any career tracks within your department's program of study. Can you confirm that currently there are no career tracks, or if there are, what are they and where can that information be found?

Transcribe the answer to Question 4 here.

Question 5: From your point of view, can you share the advantages and disadvantages of offering IS career track options (and specifically why your department offers the following career tracks ____________________________)?

Transcribe the answer to Question 5 here.

Question 6: From your point of view, what are the advantages and disadvantages of following the IS 2010 curriculum guidelines?

Transcribe the answer to Question 6 here.

The results from each interview are listed in the following:

***Identifier Code (from random sample spreadsheet)*: 1** Date: 10/21/2011

Corbin Bell (Question 1): Out of 100%, how compliant is your IS curriculum with the IS 2010 curriculum guidelines in terms of the 7 required topics, identified career tracks, and the capstone course taken during a student's final semester?

Faculty: I'd say 55%.

Corbin Bell (Question 2): We were unable to locate the following (core) topics within your department's program of study _____. Can you confirm that these topics are not included in your IS program, or provide the title and how they are included (such as an elective)?

- IS 2010.3 - Enterprise Architecture

Faculty: No, unless it's Software Engineering; we have Software Engineering courses.

Corbin Bell: I was looking at that as matching up with the Systems Analysis and Design.

Faculty: Oh yeah, definitely.

Corbin Bell (Question 3): We were unable to locate the IS Strategy, Management and Acquisitions topic (IS 2010.7) taught by your department's program of study. Can you confirm if this course topic is included in your IS program, and if so, the title and how it is included (such as an elective), and whether it is a capstone course, meaning it is taken during a student's final semester?

Faculty: No.

Corbin Bell: Senior seminars. Is that a capstone course?

Faculty: No not really. It's a research course. They do a research paper and presentations.

Corbin Bell: Required?

Faculty: Yes.

Corbin Bell (Question 4): We were unable to locate any career tracks within your department's program of study. Can you confirm that currently there are no career tracks, or if there are, what are they and where can that information be found?

Faculty: Actually, our program has been deleted. Next year is the last year of our program. Our college canceled us. We're gone after next year. They're idiots. Our administrators are idiots.
Corbin Bell: Do you know the reasons they're cancelling the program?
Faculty: Budget cuts. Enrollment was down.

Corbin Bell (Question 5): From your point of view, can you share the advantages and disadvantages of offering IS career track options (and specifically why your department offers the following career tracks _____)?
Faculty: I think they're great; we're just too small to offer any specializations. We're really a small program. We were four faculty at our height a couple years ago.

Corbin Bell (Question 6): From your point of view, what are the advantages and disadvantages of following the IS 2010 curriculum guidelines?
Faculty: I think they are fine. When we set the program up, we followed the guidelines at that time. Things have just deteriorated through the years and we haven't kept up.

***Identifier Code (from random sample spreadsheet)*: 3** Date: 10/24/2011

Corbin Bell (Question 1): Out of 100%, how compliant is your IS curriculum with the IS 2010 curriculum guidelines in terms of the 7 required topics, identified career tracks, and the capstone course taken during a student's final semester?
Faculty: 80-85%.

Corbin Bell (Question 2): We were unable to locate the following (core) topics within your department's program of study _____. Can you confirm that these topics are not included in your IS program, or provide the title and how they are included (such as an elective)?
Faculty: You're talking about the undergraduate right? Yes, we have actually five topics covered, or courses that are required for the undergraduates. They are required to take five core classes.
Corbin Bell (Question 2 repeated for): IS 2010.3 - Enterprise Architecture
Faculty: I don't think we have that in the curriculum.
Corbin Bell (Question 2 repeated for): IS 2010.4 - IS Project Management
Faculty: That is covered in our System Analysis and Design class, so we do both Analysis and Project Management as well.

Corbin Bell (Question 3): We were unable to locate the IS Strategy, Management and Acquisitions topic (IS 2010.7) taught by your department's program of study. Can you confirm if this course topic is included in your IS program, and if so, the title and how it is included (such as an elective), and whether it is a capstone course, meaning it is taken during a student's final semester?
Faculty: No we don't have such a thing. We talk about strategy at the introductory level in our core class.
Corbin Bell: Do you have a capstone course?
Faculty: Capstone is the Analysis Design class where the student would be involved in developing an Information System from scratch, including aspects of Databases, and System Analysis Design. This isn't necessarily required in their last year, but usually falls

in that time frame.

Corbin Bell (Question 4): We were unable to locate any career tracks within your department's program of study. Can you confirm that currently there are no career tracks, or if there are, what are they and where can that information be found?
Faculty: We don't have that; our program is relatively small, so we are thinking about that in the future, but now we don't have that.

Corbin Bell (Question 5): From your point of view, can you share the advantages and disadvantages of offering IS career track options (and specifically why your department offers the following career tracks _____)?
Faculty: My belief is that it is actually valuable for students to have those tracks; practical considerations right now don't allow it.

Corbin Bell (Question 6): From your point of view, what are the advantages and disadvantages of following the IS 2010 curriculum guidelines?
Faculty: I think it is a good thing to know; I think on our next curriculum we will take that into consideration.

***Identifier Code (from random sample spreadsheet)*: 7** Date: 10/24/2011

Corbin Bell (Question 1): Out of 100%, how compliant is your IS curriculum with the IS 2010 curriculum guidelines in terms of the 7 required topics, identified career tracks, and the capstone course taken during a student's final semester?

Faculty: 90%. Well, you guys took programming out of it, didn't you? Which upsets me to no end. Well, it upsets me because I teach it. We would certainly make it an elective, if we took it out, but one of the things that people talk about is programming. Even though it is a difficult subject, and I can see why it was taken out, we're sending students out who know nothing about programming and who can avoid programming, and that's all about problem solving, and it is still a relevant skill. We've had companies asking for people with programming language skills. When you've learned one language you can pretty much learn another. So that's my feelings on it.

Corbin Bell (Question 2): We were unable to locate the following (core) topics within department's program of study _____. Can you confirm that these topics are not included in your IS program, or provide the title and how they are included (such as an elective)?

- IS 2010.3 - Enterprise Architecture.

Faculty: No, we don't. We touch a bit about it in the MIR class, the capstone class.

Corbin Bell: Do you feel it is sufficiently covered as a core topic in the ISM 4300 Managing Information Resources course?

Faculty: Yes.

Corbin Bell (Question 2 repeated for): IS 2010.4 - IS Project Management.

Faculty: We're talking about adding that course to the curriculum, but right now we don't have it there.

Corbin Bell (Question 3): We were unable to locate the IS Strategy, Management and Acquisitions topic (IS 2010.7) taught by your department's program of study. Can you confirm if this course topic is included in your IS program, and if so, the title and how it is included (such as an elective), and whether it is a capstone course, meaning it is taken during a student's final semester?

Faculty: 4300 Managing Resources; it covers the higher level IS Management topic.

Corbin Bell: Is that a Capstone course?

Faculty: Yes.

Corbin Bell: Is it required in the last semester?

Faculty: It is because it is the prerequisite to the classes they would have taken up to then; so yes it is the last class.

Corbin Bell (Question 4): We were unable to locate any career tracks within your department's program of study. Can you confirm that currently there are no career tracks, or if there are, what are they and where can that information be found?

Faculty: Our program just isn't big enough to start splitting off into specific tracks at the moment.

Corbin Bell (Question 5): From your point of view, can you share the advantages and disadvantages of offering IS career track options (and specifically why your department offers the following career tracks _____)?

Faculty: There are certainly advantages to offering career tracks to them. I guess the question comes as to how much we become like a trade school to them though, as opposed to a university.

Corbin Bell (Question 6): From your point of view, what are the advantages and disadvantages of following the IS 2010 curriculum guidelines?

Faculty: I can't see any real disadvantages; no need to reinvent the wheel.

***Identifier Code (from random sample spreadsheet)*: 141** Date: 10/13/2011

Corbin Bell (Question 1): Out of 100%, how compliant do you feel your IS curriculum with the IS 2010 curriculum guidelines in terms of the 7 required topics, identified career tracks, and the capstone course taken during a student's final semester?

Faculty: There has to be a capstone in the last semester, I missed that part.

Corbin Bell: According to the guidelines, a capstone course is suggested in the last semester of the students program.

Faculty: To the spirit of the curriculum, we are 90%.

Corbin Bell (Question 2): We were unable to locate the following (core) topics within department's program of study _____. Can you confirm that these topics are not included in your IS program, or provide the title and how they are included (such as an elective)?

- IS 2010.1 - Foundations of Information Systems

Faculty: MIS 3700 Information Systems Management meets the need for that core topic essentially, but they do not take it as part of the MIS core, they take it as part of the Business core.

Corbin Bell: Is it an elective course?

Faculty: No, it is required for all business students.

Corbin Bell (Question 2 repeated for): IS 2010.4 - IS Project Management

Faculty: In our curriculum we have a three-course equivalent project which every student is required to take. So Project Management is done in the context of that course. So, it's not a course, but project throughout three courses. The three-course equivalent is something we call the MQP, Major Qualifying Project. All students take it, doing in small groups, equivalent of three courses, September through March. And, we treat that as our capstone and also as Project Management.

Corbin Bell: Is that capstone in the last [semester]?

Faculty: Yes, they do it as a senior. So yes, that would meet the requirement of IS 2010, and in the spirit, we are probably doing better, but we don't have it blocked out in that

certain way.

Corbin Bell (Question 4): We were unable to locate any career tracks within your department's program of study. Can you confirm that currently there are no career tracks, or if there are, what are they and where can that information be found?
Faculty: Pretty much everyone is on the same career track. It's the only thing mapped out on career tracks. I haven't looked at it recently. Each time we have a curriculum revision, I look for compliance. Our students typically pick up a minor, so if they are interested in Application Development, they'll pick up computer science courses or minor. Those interested in Managerial or Business Analyst they pick up more business courses. Essentially, we have more of a developer emphasis through CPU Science and Business Analyst emphasis through business electives. Not formally laid out, but people go one way or another.

Corbin Bell (Question 5): From your point of view, can you share the advantages and disadvantages of offering IS career tracks options (and specifically why your department offers the following career tracks _____)?
Faculty: We encourage students to find their way themselves. Example, we do not have pre-requisites, they take whatever they want. We encourage and recommend background courses but no requirements. For us to be prescriptive is not how it is around here. We feel that being too prescriptive limits them and it just doesn't fit with our culture.
Corbin Bell: So you consider it a disadvantage for your culture?
Faculty: Yes it doesn't mesh that well and we spend a great amount of time with our students making sure they are taking courses that fit with what they think they want to do. One advantage to career tracks is they provide information to students and guidelines to them, so if you provided that they would say, "Oh, I am that versus that" instead of a little this and a little of that.

Corbin Bell (Question 6): From your point of view, what are the advantages and disadvantages of following the IS 2010 curriculum guidelines?

Faculty: Useful to have them there for curriculum revision. I don't follow them directly, but they give me a sense of where the field thinks it is and what we should be teaching students. So the down side would be that as they tie the guidelines to accreditation they no longer are guidelines. As they stay guidelines I am happy with them.

Corbin Bell: As they tie them to accreditation they become more requirements?

Faculty: As long as accreditation for IS programs is optional, then they are guidelines. If in order to attract students we need IS accreditation, and we would need to follow curriculum guidelines—then that would be a problem.

***Identifier Code (from random sample spreadsheet)*: 142** Date: 10/24/2011

Corbin Bell (Question 1): Out of 100%, how compliant do you feel your IS curriculum with the IS 2010 curriculum guidelines in terms of the 7 required topics, identified career tracks, and the capstone course taken during a student's final semester?

Faculty: 75%. We have not used it as a benchmark for ours. We typically have benchmarked ours by other schools in our area with similar types of curriculum. As they are benchmarking on that, it would make sense that a lot of ours are the same.

Corbin Bell (Question 2): We were unable to locate the following (core) topics within department's program of study _____. Can you confirm that these topics are not included in your IS program, or provide the title and how they are included (such as an elective)?

- IS 2010.3 - Enterprise Architecture

Faculty: No, I don't know that we have anything like that.

Corbin Bell (Question 2 repeated for): IS 2010.4 - IS Project Management

Faculty: 3163 Project Management

Corbin Bell: Is that required or an elective course?

Faculty: That is an elective.

Corbin Bell (Question 3): We were unable to locate the IS Strategy, Management and Acquisitions topic (IS 2010.7) taught by your department's program of study. Can you confirm if this course topic is included in you IS program, and if so, the title and how it is included (such as an elective), and whether it is a capstone course, meaning it is taken during a student's final semester?

Faculty: No, no course like that.

Corbin Bell: Any capstone course that you require of the students?

Faculty: Yes, we do, but not that topic. Our capstone course is Strategic Management, 4853.

Corbin Bell: Is it required in last semester?

Faculty: It's actually an elective. Most take it, and usually in the last semester, at least in

the last year.

Corbin Bell (Question 4): We were unable to locate any career tracks within your department's program of study. Can you confirm that currently there are no career tracks, or if there are, what are they and where can that information be found?
Faculty: No. We're really too small. There's been discussion about that through the years, but we really don't have the numbers to support that.

Corbin Bell (Question 5): From your point of view, can you share the advantages and disadvantages of offering IS career tracks options (and specifically why your department offers the following career tracks _____)?
Faculty: You can target your students to some specific employers or industries. The disadvantages are you have to have the specialized curriculum and the faculty to support it.

Corbin Bell (Question 6): From your point of view, what are the advantages and disadvantages of following the IS 2010 curriculum guidelines?
Faculty: I'd have a hard time coming up with pros or cons. We have not used it as a benchmark for our curriculum.

Appendix F

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Date of Article:

To Be Published in: Doctoral Dissertation: Undergraduate Information Systems (IS) Curriculum and Career Track Development in United States Colleges and Universities.

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Contact name: Corbin C. Bell

Email address: corbin.bell@hill.af.mil

Fax number:

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VITA

CORBIN C. BELL

Organizational Training Program Director
Organizational Communications and Development Consultant
Software Organizational Development Office
Software Maintenance Group (SMXG)
Hill Air Force Base—United States Air Force

6022 Fir Avenue
Hill AFB, UT 84056
corbin.bell@hill.af.mil
(801/DSN) 777-0605
Cellular: 801-529-2999

Education

Ph.D. Management Information Systems, Training & Development Specialization, Utah State University, May 2012.
Dissertation: *Undergraduate Information Systems (IS) Curriculum and Career Track Development in United States Colleges and Universities: Assessment of Adherence to IS 2010 Curriculum Guidelines*

M.S. Instructional Technology, Utah State University, May 2002

B.S. Sales & Service Technology—Honors, Weber State University, May 2000
Honors Thesis: *A Comparison Between "The DISCover Model" and "The Color Code"*

A.S. General Education, Spanish Minor, Weber State University, May 1998

Summary

Dr. Bell is a highly efficient and results-driven individual offering over sixteen years of experience in individual and organizational training and development, fourteen years experience in web and computer-based courseware development efforts, twelve years experience in various web and computer utility development, and 10 years experience in organizational training, communication, and program management. He has developed many objective-based, results-oriented products, technology-based solutions, web-based courseware utilities, and computer-based training programs. He uses systematic design and development processes to ensure products meet client goals. Currently, he is the Organizational Training Program Director and Team Lead for the Software Organizational Development Office (SODO) within Software Maintenance Group (SMXG), and the SODO Organizational Communications and Training Functional Lead. Dr. Bell is the team lead of two instructional designers, two process development (electrical) engineers, and three program managers, all of which function as organizational development consultants and workshop facilitators. Dr. Bell has led the efforts on various developments their respective functional leads in the five functional areas of the SODO: Organizational Development, Courseware Development, Process Consultation, Organizational Training, and Organizational Communications. Dr. Bell is one of three lead workshop facilitator at SMXG, providing personnel development for the 1200 plus group team-members in various

areas to include: Government Interviewing Skills, High Performing Team Dynamics, Coaching Dynamics, Presentation Skills, Customer Service Techniques, Introduction to Project Management, Applied/Advanced Project Management, Organizational Transformation, "The Seven Habits of Highly Effective People," "The Seven Habits Maximizer," "The Leadership Challenge," "Leadership and Self-Deception," "Crucial Conversations, "Crucial Confrontations," Coaching Essentials, the Choice in Leadership, etc.

Dr. Bell as a recent contractor was the Supervisor and Program Manager of the Expert Knowledge Transformation (EKT) contract, which captures experiential knowledge from veteran employees (Experts) and fabricates computer-based knowledge objects, by and large working through web development processes. The subsequent product is housed in a knowledge object repository database (also being developed and managed as part of the contract deliverables). Dr. Bell is primarily responsible for planning, working with clients, defining and interpreting documentation and product agreements, budgeting and budget execution, conducting Expert Knowledge content research/analysis and design, collaborating with Subject Matter Experts (SMEs), managing client expectations and perspectives, affording problem analysis and resolution plans, providing status accounting, maintaining a current and relevant change control strategy, maintaining a current and relevant version control plan, developing and revising project management plans and timelines, managing all product testing phases (including formative and summative testing), and all other contract oversight issues. Dr. Bell participated in the development of these extensions and is responsible for their continued use as EKT content continues to be developed and loaded into the Training Object Repository (TOR) database, also under development as part of this contract/effort.

Dr. Bell has demonstrated significant breadth of knowledge, skill, and ability with various organizational communication and program management principles, concepts, and practices as well as his excellent interpersonal skills uniquely qualify him to interface with developers working on a variety of projects, as well as handle the added responsibilities of interfacing with clients and others less familiar with the programming jargon. His Emphasis in Computer Based Instructional Development within his Masters in Science in Instructional Technology, coupled with his Ph.D. in Management Information Systems, and his extensive background in org. training, communication, and development supports his success in his profession as a multi-faceted, well-rounded organizational communications, training, and development specialist.

In his occupation over the last several years, and in a holistic fashion in his recent position, he has utilized superior management skill in implementing various templates, score cards, and checklists required for critical quality reviews. He is adept at conducting content research, analysis, design, and development; and managing internal and external client expectations and perspectives. He has been successful in planning, defining and interpreting documentation and product agreements, maintaining a current and relevant change control strategy and version control plan. He is experienced at developing and revising project management plans and timelines, managing all product testing phases, and other project and program oversight issues. He is proficient at software development problem analysis and resolution, providing status accounting, identifying key development metrics aligned to business needs, and at measuring and tracking base metrics like schedule, cost, and quality. He instituted a monitoring process at the project level, looking at key metrics aligned to business needs; and maintained superior project management through a consistent, repeatable and measurable development life cycle.

In addition to the skills stated previously, Dr. Bell has had significant organizational development

and project management experience in the field of instructor-led and web-based training development, and has enhanced his abilities from the transfer of knowledge from similar contextual disciplines. Disciplines such as: Qualitative Research, Quantitative Research, Evaluation Methods and Techniques, Instructional Systems Design, Courseware Development (Instructor-led and Web-based), Multi-faceted Project Management, Communications in Instruction, Strategic Planning, Team Leadership, Motivation Techniques, Goal Accomplishment Orientation, Team Member Mentoring and Development, Problem Identification and Analysis, Problem Solving Techniques, Technical Sales Proposals/Writing, Public Speaking, Classroom Facilitation, Internal and External Client Communication, Customer Service Techniques, Sales and Service Techniques, and Negotiation and Persuasion Techniques.

Teaching Experience

Software Maintenance Group, Hill AFB, Air Force, DoD **August 2010—Present**
Organizational Training Program Director, Team Lead, and Organizational Training & Communications Functional Lead—Software Organizational Development Office

One of three lead workshop facilitators in Interviewing Skills, High Performing Team Dynamics, Coaching Dynamics, Presentation Skills, Customer Service Techniques, Introduction to Project Management, Applied Project Management, Organizational Transformation, "The Seven Habits of Highly Effective People," "The Seven Habits Maximizer," "The Leadership Challenge," "Leadership and Self-Deception," "Crucial Conversations, "Crucial Confrontations," Coaching Essentials, the Choice in Leadership, Personality Profiles, Organizational Communication, etc.

Weber State University **Spring Semester 2004—Spring Semester 2010**
Adjunct Professor

Dr. Bell has valuable experience in organizational communication and leadership education and until recently served as an adjunct professor instructing 1 to 2 courses per semester on "Developing Team Leadership Skills" (SS&T 4102) and "Project Management" (MGMT 2400) at Weber State University (WSU)—Davis Campus, Layton - Utah. He was an adjunct professor for WSU from spring semester 2004 thru spring semester 2010, when he shifted focus toward completion of his doctoral dissertation.

Parker Hannifin Corp. **May 2001—September 2003**
Human Performance & Learning Technologist / Instructional Designer

One of five corporate trainers facilitating workshops in High Performance Teams, Customer Service Techniques, "The Leadership Challenge," "Crucial Conversations," Mentoring Essentials, Personality Profiles, Organizational Communications, Presentation Strategies, Persuasion and Negotiation, etc.

Self Management Systems, Inc. **October 2000—May 2001**
Instructional Design and Workshop/Training Facilitation Internship

One of three corporate trainers facilitating workshops in Team Leadership Dynamics, Interviewing Skills, Presentation Skills, Persuasion and Negotiation, Effective Communication, etc.

Porter Brown Sales, Inc. **October 1999—October 2000**
Outside Sales Representative/Distributor Training Design and Delivery Specialist

One of four distributor sales trainers facilitating workshops in Sales Personality Profiles, Distribution Principles, Sales Engineering Techniques, Customer Service Techniques, Sales Negotiations, Sales Presentation Strategies, Sales Negotiation Skills, Sales Communication, etc.

The Wasatch Group, Inc. **December 1997—October 2000**
Sales Manager, Sales and Installation Trainer—Sales Representatives

One of three corporate sales trainers facilitating workshops in Sales Personality Profiles, Distribution Principles, Sales Engineering Techniques, Customer Service Techniques, Sales Communications, Sales Negotiations, Sales Presentation Skills, Persuasive Selling, etc.

Professional Experience

Software Maintenance Group, Hill AFB, Air Force, DoD **August 2010—Present**
Organizational Training Program Director, Team Lead, and Organizational Training & Communications Functional Lead—Software Organizational Development Office

Currently the Organizational Training Program Director and Team Lead for the Software Organizational Development Office (SODO) within Software Maintenance Group (SMXG), and the SODO Organizational Communications and Training Functional Lead. Dr. Bell is the team lead of two instructional designers, two process development (electrical) engineers, and three program managers, all of which function as organizational development consultants and workshop facilitators. Dr. Bell has led the efforts on various developments their respective functional leads in the five functional areas of the SODO: Organizational Development, Courseware Development, Process Consultation, Organizational Training, and Organizational Communications. Dr. Bell is one of three lead workshop facilitator at SMXG, providing personnel development for the 1200 plus group team-members in various areas to include: Government Interviewing Skills, High Performing Team Dynamics, Coaching Dynamics, Presentation Skills, Customer Service Techniques, Introduction to Project Management, Applied/Advanced Project Management, Organizational Transformation, "The Seven Habits of Highly Effective People," "The Seven Habits Maximizer," "The Leadership Challenge," "Leadership and Self-Deception," "Crucial Conversations, "Crucial Confrontations," Coaching Essentials, Choice in Leadership, etc.

Southwest Research Institute **October 2007—July 2010**
Supervisor/Program Manager—Expert Knowledge Capture and Configuration Management

Supervisor and Program Manager of the Expert Knowledge Transformation (EKT) contract, which captures experiential knowledge from veteran employees (Experts) and fabricates computer-based knowledge objects, by and large working through web development processes. The subsequent product is housed in a knowledge object repository database (also being developed and managed as part of the contract deliverables). Dr. Bell is primarily responsible for planning, working with clients, defining and interpreting documentation and product agreements, budgeting and budget execution, conducting Expert Knowledge content research/analysis and

design, collaborating with Subject Matter Experts (SMEs), managing client expectations and perspectives, affording problem analysis and resolution plans, providing status accounting, maintaining a current and relevant change control strategy, maintaining a current and relevant version control plan, developing and revising project management plans and timelines, managing all product testing phases, and all other contract oversight issues.

Karta Technologies, Inc. **May 2004—October 2007**
Instructional Designer /Courseware Developer

Managed various web and computer-based development projects from the design stage through final development, and validation; responsible for the design and development of web-based training applications into a tangible web and computer-based product that can be disseminated to other coworkers when and where needed. Primarily responsible for working with internal and external clients, defining and documenting product agreements, conducting Expert Knowledge content research/analysis and design, Subject Matter Expert (SME) collaboration, management of client expectations and perspectives, development of learning objectives, lesson plans, storyboards, version control plans, and development of project management plans and timelines for courseware and web-based training products. Some project work at OO-ALC includes a web-based training utility for the Familiarization of Civilian Training Plans. Other project work includes web-based lesson design for the U.S. Army—Petroleum Supply Specialist Advanced Non-commissioned Officer (NCO) course, and Animal Care Specialist Basic NCO course.

Weber State University **Spring Semester 2004—Spring Semester 2010**
Adjunct Professor

Instruct 1 to 2 Courses per semester on "Developing Team Leadership Skills" (SS&T 4102) and "Project Management" (MGMT 2400) at Weber State University—Davis Campus, Layton - Utah.

Utah State University **Fall Semester 2003—Summer Semester 2004**
Volunteer Management Information Systems Research Internship

Conducted literature reviews the areas of requirements analysis, system design, architecture design, module design, test design for all phases, unit testing, and how to maximize usage, and facilitate information systems practices in corporate training systems and web development initiatives.

Parker Hannifin Corp. **May 2001—October 2003**
Human Performance & Learning Technologist/Instructional Designer

Within a teaming environment, was responsible for the design of instruction for employee technical skill acquisition and development, including the development of web and computer-based training utilities and other e-learning instructional activities in order to support the attainment of organizational goals and objectives. Proactively involved in the program management of computer based development for: skill assessments, training workshop materials, individual and leadership training, high performing teams, and 35+ multi-media centric training programs. Designed, developed, and implemented audio/video enhanced stand-alone training in the following mediums: CBT, WBT, VHS Video, DVD-Video, CD-Rom tutorials, and DVD-

Rom tutorials. Co-facilitated numerous instructor-led, classroom based and computer assisted trainings in high performance teaming, negotiations, interpersonal/business communications, leadership development, and gap analysis. Responsible for managing various program development efforts, conducting task analysis, target audience analysis, staff and resource studies, researched and accumulated data on specific content, analyzing and interpret data, developing metrics, and designing action plans.

Self Management Systems, Inc. **October 2000—May 2001**
Instructional Design and Training Internship

Responsible for the instructional design of workshop instructional materials, simple "principle utility" CBT programs, skills assessment exercises, leadership training, and high performance teaming. Facilitated leadership professional skills training at various local Clearfield Job Core Centers for youth.

Porter Brown Sales, Inc. **October 1999—October 2000**
Outside Sales Representative/Distributor Training Design and Delivery Specialist

Responsibilities included: 1) designing and developing product training; 2) calling on, developing relationships with, delivering product training to, and obtaining additional orders from 30+ existing accounts; 3) increasing sales volume by new business development with end users; and 4) training distributors on vendor sales promotions, and business building programs.

The Wasatch Group, Inc. **December 1997—October 2000**
Sales Manager, Sales and Installation Training—Sales Representatives

Responsibilities included design, development, and delivery of instructor-led technical sales training, and product installation training for recruited sales representatives. Training consisting of: technical product knowledge, security system configuration and installation, troubleshooting techniques, customer needs consultation, concerns resolution, continued customer satisfaction, and business augmentation through customer referrals.

Technical Skills

Microsoft Office	Macromedia Authorware
Adobe/Macromedia Captivate	Adobe/Macromedia Fireworks
Adobe/Macromedia Flash	Adobe/Macromedia Dreamweaver
Adobe Photoshop	Adobe Premiere
Adobe PageMaker	Adobe Illustrator
Adobe Encore DVD	Various DVD Authoring Tools
Adobe Acrobat Professional	Adobe Distiller
Sony Vegas	Database (SQL) Management
Microsoft Visio	Microsoft Project
HTML	ActionScript 3.0
XHTML	XML

Professional Skills

Public Speaking	Classroom Facilitation
Qualitative Research	Quantitative Research
Organizational Change Management	Gap Analysis Facilitation
Conflict Resolution	Program Management
Proposal Writing	Courseware Development
Persuasive Communication	Effective Negotiation
Social Media / Electronic Communication	Organization Communication
Presentation Design	DVD Authoring
Problem Solving	Oral/Verbal Communication
Needs Elicitation	Written Communication
Persuasive Communication	Personnel Motivation
Instructional Systems Design	Project Management
Technical Writing	Multimedia Development
Web Design	Videography
Graphic Design	DVD Authoring

Digital Video and Digital Audio Editing & Compression

Government Contracting Experience

- Designed and developed *Introduction to Special Skills Qualification* course (with segments of PACSS - Production Acceptance Certification Standard System) for AFMC.
- Designed and developed the Web Based Training application for the *Familiarization of Civilian Training Plans* for AFMC.
- Designed and developed *Diminishing Manufacturing Sources and Material Shortages (DMSMS) Fundamentals* course for DLA.
- Designed and developed *Diminishing Manufacturing Sources and Material Shortages (DMSMS) for Executives* course for DLA.
- Assisted in the Design and Developed the Web Based Training application *System & Operation Safety* in conjunction with the University of Dayton Research Institute for the Air Force.
- Assisted in the Revision of the Material Turn-in Procedures (WSSC) course for AFMC.
- Designed and developed *Introduction to D200H—Initial Requirements Determination (IRD) System* course for AFMC.
- Designed and developed *Introduction to D200A—Requirements Management System* course for AFMC.
- Designed/developed the *E046B Labor Standards Data System* course for AFMC.
- Designed and developed *Inventory Tracking System (ITS) for Planners* course for AFMC.
- Created various computer aided training simulation for Air Force maintenance management computer systems E046B and ITS.
- Designed a web-based lesson for the Army Medical Department Center and School, Department of Veterinary Science—Animal Care Specialist Basic Noncommissioned Officer course.
- Designed various web-based lessons, activities, and assessments for the U.S. Army—Petroleum Supply Specialist Advanced Noncommissioned Officer course.

- Designed and developed *Time and Attendance (TAA) for Mechanics* course and simulation for AFMC.
- Designed and developed *Time and Attendance (TAA) for Supervisors* course and simulation for AFMC.
- Designed and developed the *Hydraulic Cargo Winch Overhaul* Expert Knowledge Capture (EKC) for HILL AFB - AFMC.
- Designed and developed the *LTI 9000 Shearography NDI System* Expert Knowledge Capture (EKC) for HILL AFB - AFMC.
- Designed and developed the *Autoclaves Operation Software* Expert Knowledge Capture (EKC) for HILL AFB - AFMC.
- Designed and developed the *Laser Automated De-coating System (LADS)* Expert Knowledge Capture (EKC) for HILL AFB - AFMC.
- Designed and developed the *LADS Rofin Laser Operation Software* Expert Knowledge Capture (EKC) for HILL AFB - AFMC.
- Designed and developed the *5 Access Router/Core Mill Operation* Expert Knowledge Capture (EKC) for HILL AFB - AFMC.
- Designed and developed the *Real Time X-ray System Operation* Expert Knowledge Capture (EKC) for HILL AFB - AFMC.
- Designed and developed the *NDI Eddy Current Scanner Operations* Expert Knowledge Capture (EKC) for HILL AFB - AFMC.
- Designed and developed the *ESOH Handling of Mishap—Preparation and Response, Investigation, and Reporting* Expert Knowledge Capture (EKC) for HILL AFB - AFMC.
- Designed and developed multiple other Expert Knowledge Captures for HILL AFB-AFMC.

Commercial Experience

For the various companies listed in the professional experience section, I:

- Determined through analysis the technical abilities required to use equipment, machinery, and/or products.
- Developed web/computer based training programs within a manufacturing environment in the areas of Part Machining Techniques, Part Cleaning Methods, Machine Maintenance Procedures, and various others to help employees develop new technical skills and abilities.
- Created templates and training program structural skeletons that support duplication and development of future computer based and e-learning training.
- Completed the graphic design of the necessary graphics to support the templates, backgrounds and contents of the computer based training programs and other paper based training supplies, handouts, presentations and materials.
- Monitored and evaluated all computer based training programs for effectiveness.
- Trained and developed new skills in current team members to enable them to remain productive despite changes in technology, equipment, procedures, techniques, or products.
- Managed features and capabilities of all training material production equipment, such as the capturing, encoding, editing, compressing, streaming, storing and delivering of digital audio and video in the various mediums of VHS, streaming video, Video-CD, and DVD.
- Designed and developed web/computer based training for specific company suppliers to standardized product manufacturing methods and aid in supplier development initiatives.
- Populated and maintained Learning Content Management System (LCMS) and database to track and record team members' skill development, also developing specific skill based

tutorials within the LCMS authoring application.
- Traveled and consulted with Parker Aerospace sister organizations and Parker Hannifin Corporate, on the previous mentioned responsibilities.

Presentations, Memberships, Honors & Awards

- Presented White Paper "A Knowledge Management Paradigm—Moving Toward Improving Organizational Training and Learning"—SALT Conference, August 2006.
- Presented White Paper "From Training to Learning to Knowledge Management and Back Again" –GITMA Conference, June 2004.
- Member: American Society of Training & Development (ASTD).
- Member: International Society of Performance Improvement (ISPI).
- Member: Society for Applied Learning and Technology (SALT).
- Recipient, Eagle Scout award, Boy Scouts of America.
- Senior Honors Thesis evaluated and compared various personality assessment models.
- Delta Epsilon Chi - National Sales and Marketing Competition Finalist, Sales Rep. Division.
- Trained for and completed the St. George - Utah Marathon, Oct. 2001.

Clearance Information

- Federal Government Security Clearance: Secret (SF86).