

IS 2010 Curriculum Model Adoption in the United States

Completed Research Paper

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Abstract

This study examines the adoption of the most recent Information Systems (IS) curriculum guidelines (also referred to as the IS 2010 curriculum model) across IS programs in American universities. In particular, this study focuses on adherence to the sequence of suggested core courses. Data for this study was collected from 314 IS programs in both AACSB and ABET-accredited institutions in the United States. Majority of the IS programs in the United States are fully compliant with the core course sequence recommended by the IS 2010 guideline. Adherence to the core course curriculum sequence was observed to be higher in public institutions compared to private institutions; and higher in AACSB accredited institutions compared to ABET-accredited institutions. However, no difference was found between institutions that conferred BBA compared to BS degrees for there IS programs. Implications are discussed throughout the paper.

Introduction

With an increase in the media coverage of the outsourcing of information systems (IS) jobs, the outlook for IS occupations in the United States is faster than average. According to the Bureau of Labor Statistics report, a 10-19% projected employment growth rate is anticipated from 2012 to 2022 for entry-level IS-related occupations (e.g., computer and information systems managers, computer system analysts, system administrators) (Statistics 2014). This increase in the need for IS occupations is indicative of growing advancements in technology use among citizens and businesses in the current information age. Academic programs that offer information systems in higher institutions of learning are therefore tasked with properly training the much-needed future IS professionals. As noted by researchers, the design of the core IS curriculum in IS departments is crucial for preparing proficient graduates for the information technology industry (Kung et al. 2010).

According to the Bureau of Labor Statistics, the trending IS career paths for graduates are computer systems analyst, information security analyst, software (applications) developer, computer user support specialist, and computer network architect. In the past decade, there has been significant change in employers' expectations of students' readiness for these jobs. Employers believe and expect that students are taught cutting edge techniques to tackle the fast-paced changes in technologies.

In order to keep up with the unprecedented advancements in technology and need for IS professionals, IS offering academic programs must continually rethink their core concepts and principles with the incorporation of contemporary concepts and specialized technology into the curriculum (Bell et al. 2013). Other researchers have also noted the need to regularly assess undergraduate programs in IS in terms of the curricula (Tatnall and Davey 2004). In addition, since most IS undergraduate programs reside in different colleges or schools across higher institutions in the United States, the need for a structured and standardized curriculum model for IS core courses have been proposed by IS educators and practitioners. The most recent of the model for IS undergraduate curricula is the *IS 2010: Curriculum Guidelines for Undergraduate Degree Programs for Information Systems* (Topi et al. 2010). For simplicity in the rest of the article, this curriculum will be referred to as the *IS 2010 curriculum model*. An important requirement in the latest curriculum is the sequence in which the core courses should be taken.

Using the accreditation mechanism IS curriculum requirements were standardized across institutions offering IS programs. Accreditation is a widely used process to establish standards of quality in

educational institutions and programs cite (Gorgone et al. 2002; Impagliazzo and Gorgone ; Impagliazzo and Gorgone 2002). The Association to Advance Collegiate Schools of Business (AACSB) and the Accreditation Board for Engineering and Technology (ABET) are two recognized accrediting agencies for business colleges worldwide. ABET has long been accrediting engineering programs for over seven decades, and after integrating with Computer Science Accreditation Board, ABET started accrediting computer science programs in 2001 and IS programs in 2002. This development contributed to the extension of IS program offering to colleges other than the college of business.

Echoing prior research, the usefulness of a model curriculum is dependent on the extent to which it is adopted by programs (Bell et al. 2013). The most recent study the authors found that explored this topic was a 2011 study that collected IS adoption data 1.5 years after the latest model (IS 2010 curriculum model) was ratified, and reported in 2013 (Bell et al. 2013). In order to provide the field with a status of the adoption of standard curriculum model, frequent studies are needed to inform practice and create awareness for modifications needed to adjust or maintain the current standards. Research suggests that the attributes of institutions such as the accreditation, region, classification, and degrees offered may influence the quality of academic programs in that institution (Kaiser et al. 2011). Using attributes of institutions offering IS programs as characteristics (e.g., accreditation, public or private institution, degrees offered, and US region), this article argues that such characteristics may explain the extent to which IS 2010 curriculum model is adopted. Hence, this study examines the extent to which the suggested core course sequence in the IS 2010 curriculum model is adopted by IS programs in the United States. Specifically, the objective of this study is to examine characteristics of IS programs in the United States that might be related to their adoption of the IS 2010 curriculum model.

Literature Review

IS Curriculum Guideline

Researchers have noted that the current IS curriculum is lacking in its preparation of students for the requirements demanded by the IS industry (Trauth et al. 1993). There are certain skills that IS graduates must possess in order to obtain a job within the IS field (Cheney and Lyons 1980). Due to the constantly changing nature of the IS field, the IS curriculum must also change to meet the demands of the new skills required (Lee et al. 1995). In order to address this issue, IS professors, alongside IS professionals, have designed curriculum guidelines that will address the requirements of employers (Couger et al. 1995). From these job requirements, they were able to determine the appropriate core courses that would prepare IS graduates to meet those requirements. As shown in Table 1, IS 2010 guideline is the most flexible and adaptable to academic programs outside business schools indicating the need for changes in the IS curriculum to adapt to the changing industry.

Curriculum guideline	Motivation for curriculum revision	Recommended elements
IS '95 (Couger et al. 1995)	Appears to be a precursor to the IS'97 Model Curriculum including same motivations	Identifies 10 courses, (95. 1-95. 10)
IS '97 (Davis et al. 1996)	Formally identify attributes (i.e., communications), core curriculum areas, and future curriculum updates	<ul style="list-style-type: none"> • Retains 10 courses from IS'95 Guidelines for Undergraduate Curriculum • Introduces prerequisite (IS'94 .PO) • Changes foundation for business knowledge to communications, quantitative and qualitative analysis, and organization functions
IS 2002 (Gorgone et al.	<ul style="list-style-type: none"> • Advent of the Internet 	Includes 10 specified required classes

2003)	<ul style="list-style-type: none"> • Changes in student computing literacy • Information accreditation movement 	by merging IS'97.00 and IS'97.2 is adding IS 2002.2 Electronic Business Strategy, Architecture and Design
IS 2010 (Topi et al. 2010)	<ul style="list-style-type: none"> • Accommodate IS outside business school context • Address lack of flexibility in IS 2002 – Introduce career tracks to avoid a single career objective • Expand input from the global community • Strong focus on deriving the curriculum from outcome expectations • Importance of serving local needs 	<ul style="list-style-type: none"> • Includes required (7 core) and electives options • Introduces career tracks based on groupings of electives

Table 1. Summary of IS 1995, IS 1997, IS 2002, and IS 2010 Model Curriculum Guidelines Adapted from (Bell et al. 2013)

Course Sequencing

Figure 1 shows the course sequence recommended in the IS 2010 model. A notable difference within the IS 2010 guideline and previous versions is the flexibility in the sequence of courses. An apparent issue with the previous curriculum guidelines is that students could face possible bottlenecks in the course sequencing (Topi et al. 2010). The sequence of courses is not as strict as in previous guidelines so that students can take the courses needed without being obstructed by prerequisites. This sequencing also allows room for electives. The sequence of the model is important because it was designed to help students obtain the required skills while maintaining flexibility within their degree. If the recommended sequence is adopted, then this means that the school is abiding by the guidelines and is fully compliant.

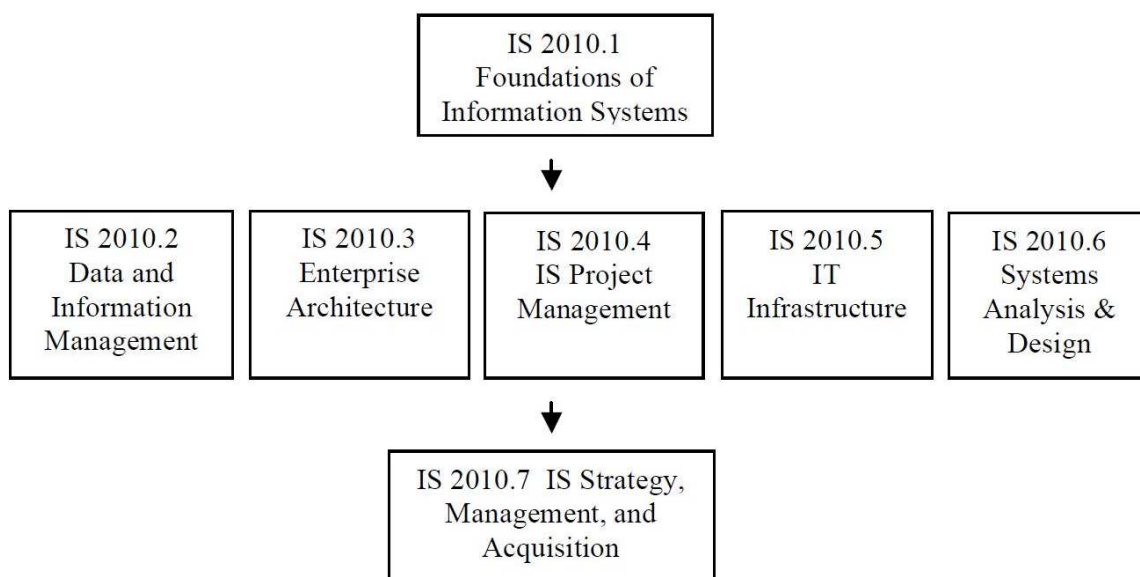


Figure 1. IS 2010 Model Sequence Adapted from (Topi et al. 2010)

In this study, three different sequence types were used to classify the curriculum sequence. Figure 1 depicts the first sequence, which is also referred to as the *fully compliant* sequence mode. Figure 2 depicts the *partially compliant* sequence. This sequence is a more flexible in its sequence compared to the fully compliant sequence. In other words, as long as “Foundations of Information Systems” is taken first, courses afterwards can be taken in any order that best suits the student.

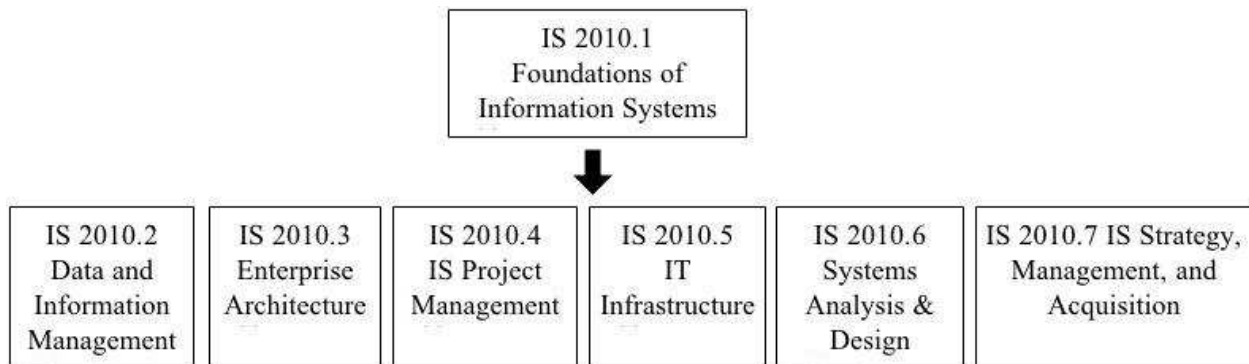
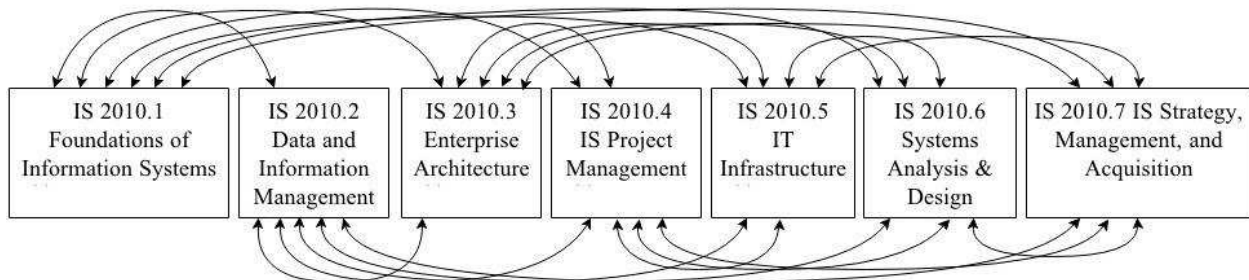
**Figure 2. Partially Compliant Sequence**

Figure 3 shows a third alternative to course sequence. In this sequence mode, courses can be taken in any order, as long as all the core courses are taken at some point. In this study, this sequence is categorized as *flexible* since it allows students in other programs take IS courses without restricting them to prerequisites that may not be useful for them.

**Figure 3. Flexible Sequence**

Although this guideline is made available to educational institutions, they are required to adopt the curriculum guidelines in order for them to be effective. Studies examining the adoption of previous models have been conducted (Kung et al. 2010). However, only one study (Bell et al. 2013) conducted in 2011 was found that examined the adoption of IS 2010 curriculum model. This was an early measurement of the adoption since the guidelines had just been released in 2010. While it was effective in providing an initial measurement of the 2010 curriculum model adoption across the nation, it was conducted to soon after the release of the model. In addition, its focus on only AACSB accredited restricts the generalizability especially since the latest model aims to be more flexible and accommodating of IS programs outside the business school context. Also, certain characteristics of the institutions such as the region and institution type (public or private) may have been insightful in explaining adoption. The study described in this article will address some of these limitations. First of all, the current study was conducted in the Fall of 2013, providing a more updated examination of the model adoption. The data set also includes schools

that were accredited by ABET and AACSB. Collecting data from institutions with one or both accreditations was done to generate a more representative sample of the IS program in the United States since a number of IS programs are not necessarily in business schools. In addition, this study explores the relationship of institutions' region and institution type.

Table 2 shows the different characteristics used to classify IS programs. Region depicts the geographic location of the program within the country. Degree type was used to categorize IS programs that confer Bachelor of Business Administration (BBA) or Bachelor of Science (BS) degree. The 2010 Core Sequence Compliance was used to define level of adoption of IS programs to the IS 2010 curriculum model. Accreditation identifies the type of accreditation associated with the IS program. The institution type classifies institutions as being either publicly or privately operated.

Characteristic	Definition	Operationalization
Region	The geographic location of the school according to the four geographic zones.	A school could be located in the West, Midwest, South, or North East.
Degree	The type of degree that is offered.	The IS degree could be a Bachelor in Business Administration degree or a Bachelor of Science degree.
2010 Core Sequence Compliance	The amount of compliance to the IS 2010 model curriculum sequence.	If the program follows the sequence exactly as the 2010 model recommends, then it is fully compliant.
Accreditation	The accreditation the school has from an accrediting institution.	A school can be accredited by the AACSB, ABET, or both.
Institution Type	The type of institution the school can be classified as.	A school can be a public or private school.

Table 2. Characteristics of IS Programs and their Operationalization

Method

Data collection

The population for this study is comprised of undergraduate IS programs at both AACSB and ABET-accredited institutions in the United States. The websites for these accreditation agencies each provided a search engine to find the schools with the corresponding accreditation (AACSB 2014; ABET 2014). Some schools were accredited by both organizations. There were a total of 287 different schools in the US that offered an undergraduate IS degree and that was accredited by either AACSB, ABET, or both. Some schools did offer multiple degrees in the area of IS. There were a total of 314 degrees amongst the schools. In order to gather the IS curriculum, each college's website was visited to find the designated degree plan on the department's page or the school's undergraduate catalog.

This study used the IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems developed by the Association for Computing Machinery and the Association for Information Systems as the framework for this research with a focus on the core courses as stated in the guidelines. Search was conducted for whether or not the degree plans offered by the schools contained these core

courses. The courses include Foundations of Information Systems, Data and Information Management, Enterprise Architecture, IS Project Management, IT Infrastructure, Systems Analysis and Design, and IS Strategy, Management and Acquisition (Topi et al. 2010). The description provided for these courses in the guidelines were then compared to the course descriptions provided by the colleges. If the description given by the college contained a significant amount of coverage that was on the description from the guidelines, then the course was considered to be a valid match with the course recommended in the guidelines.

For the purpose of this study, consideration for core classes was made on the basis that the class had to be taken or that there was one other substitute for that class. For example, if a school allows students choose between Project Management and another course, then this was still counted since students end up taking that Project Management course before graduating from the program. There are some cases where the degree plans were classified into different degree specializations for the IS degree. For these instances, common classes shared amongst these specializations were considered as the core for the degree.

Some schools did offer classes that covered the general area of a core class but were not IS specific. For example, a school may have offered a Project Management course, which did not solely focus on IS but rather the topic of Project Management as applied to projects from any area. These classes were included as well since we believe that if a student learns the foundations of an area, then they can apply this learning to other specific areas. This was mostly seen with the Project Management and IS Strategy, Management and Acquisition courses.

Courses that focused solely on the teaching of microcomputer applications were not considered to be a part of the Foundations of Information Systems since, according to the IS 2010 guidelines, this would be more of a productivity tools course which most colleges require their schools to take in their early years of their degree (Topi et al. 2010). A focus of this study was on the sequence of these courses. If the school provided a road map of the courses, then this was used to determine the sequence. Otherwise, the course number was used to determine the order in which the student would take the courses.

Data Preparation

Institutions were first classified by their geographic region, as shown in Table 3, to include West, Midwest, North East, and South. The West was coded as a 0, the Midwest as 1, the North East a 2, and the South a 3. Degree type was coded as a zero (0) if it the program conferred Bachelor of Science degree and one (1) if it conferred Bachelor in Business Administration or Bachelor of Science in Business. The degrees that were just Bachelor of Science, tended to have a computer science core that was required by the IS majors. The business degrees include classes that were also required to fulfill the business core. Course sequencing (Sequence) was coded as a zero (0) if the program was fully compliant, meaning it starts with course 1, had courses 2 through 6 in between and ends with course 7; if the IS program starts with course 1 and followed by any other course, sequence was coded as a one (1), meaning the IS program is partially compliant; otherwise, if the IS program allowed courses to be taken in any sequence, sequence was coded as two (2), meaning the course sequence is flexible. Coding for accreditation was done by assigning a zero (0) for IS programs that are AACSB accredited, one (1) for IS programs that are ABET accredited, and two (2) for IS programs that are both AACSB and ABET accredited. Lastly, institution type of each school was coded as zero (0) is it is a public school and one (1) if it is a private school. A summary of the coding is presented in table 3.

Characteristic	Definition	Coding
Region	The geographic location of the school according to the four geographic zones.	West - 0 Midwest - 1 North East - 2 South - 3

Degree	The type of degree that is offered.	BS - 0 BBA - 1
2010 Core Sequence Compliance	The amount of compliance to the IS 2010 model curriculum sequence.	Fully Compliant – 0 Partially Compliant – 1 Non-Compliant - 2
Accreditation	The accreditation the school has from an accrediting institution.	AACSB - 0 ABET - 1 BOTH - 2
Institution Type	The type of institution the school can be classified as.	Public - 0 Private - 1

Table 3. Summary of Characteristics Coding

Results

Descriptive Results

To begin to examine IS 2010 curriculum adoption across IS programs in the United States, Table 4 provides a breakdown of IS programs by characteristics identified in this study. As shown in Table 4, there is a higher number of IS programs in the southern region of the United States compared to other regions. As expected, there was a higher number of IS programs that conferred BBA degrees compared to BS degrees. Concerning the sequence of core courses recommended by the IS curriculum model, the result shows that 65.9% of IS programs in the United States are in compliance with the recommendation. 75.5% of the IS programs in the dataset were AACSB accredited, 13.1% were ABET accredited, and the rest were both AACSB and ABET accredited. The number of public institutions with IS programs are almost about four times more than their private counterparts.

Characteristic	N = 314	Frequency	Percent
Region	West	47	15.0%
	Midwest	76	24.2%
	North East	61	19.4%
	South	130	41.4%
Degree	BS	129	41.1%
	BBA	185	58.9%
IS 2010 Core Sequence Compliance	Fully Compliant	207	65.9%
	Partially Compliant	48	15.3%
	Flexible	59	18.8%
Accreditation	AACSB	237	75.5%

	ABET	41	13.1%
	BOTH	36	11.5%
Institution Type	Public	246	78.3%
	Private	68	21.7%

Table 4. Descriptive Results

Exploratory Analysis Results

Due to the unequal number of groups within the study variables categories, Kruskal-Wallis test was conducted to examine differences in IS core curriculum model adoption across institutional characteristics. Kruskal-Wallis test indicated that the mean rank score for the adoption of the core course sequence recommended by the IS 2010 curriculum model was indifferent for IS programs in the West ($Mdn = 161.18$), MidWest ($Mdn = 150.66$), North East ($Mdn = 142.11$), and those in the South ($Mdn = 167.39$), $\chi^2(3, N = 314) = 4.14$, $p = .246$, $r = .01$. A second Kruskal-Wallis test indicated that the mean rank score for the adoption of the core course sequence recommended by the IS 2010 model was indifferent for IS programs that grant BS degree ($Mdn = 148.30$) compared to those that grant BBA degree ($Mdn = 163.92$), $\chi^2(1, N = 314) = 2.45$, $p = .118$, $r = .008$. A Kruskal-Wallis test indicated that the mean rank score for the adoption of the core course sequence recommended by the IS 2010 model was greater for IS programs that are fully compliant ($Mdn = 185.32$) compared to those that are partially compliant ($Mdn = 132.98$), and those that are flexible ($Mdn = 79.85$), $\chi^2(1, N = 314) = 72.01$, $p = .000$, $r = .23$. Exploring flexible IS programs revealed that across regions, 39% of the programs were in the south, 28.8% from the Midwest, 18.6% from the northeast, and the remaining 13.6% were in the western region of the United States; across degrees offered, 62.7% offered BS degrees and the rest offered BBA degrees; across accreditation, 54.2% were in AACSB accredited programs, 35.6% were in ABET accredited programs, and the rest were in programs that has both accreditations; across institution type, 78% of the programs were in public institutions and the rest in private institutions. The Kruskal-Wallis test indicated that the mean rank score for the adoption of the core course sequence recommended by the IS 2010 curriculum model was greater for IS programs that are AACSB accredited ($Mdn = 165.88$), compared to those that are ABET accredited ($Mdn = 104.29$) and those have both accreditations ($Mdn = 162.90$), $\chi^2(2, N = 314) = 17.68$, $p = .000$, $r = .06$. Finally, the Kruskal-Wallis test indicated that the mean rank score for the adoption of the core course sequence recommended by the IS 2010 curriculum model was greater for IS programs in public institutions ($Mdn = 163.11$) compared to those in private institutions ($Mdn = 137.21$), $\chi^2(1, N = 314) = 4.73$, $p = .030$, $r = .02$.

Discussion

This study examined adoption of the core course sequence recommended by the IS 2010 curriculum model across institutions that offer IS programs in the United States. Using characteristics such as region, degrees offered, compliance to the recommended sequence, accreditation, and institution type, this study explored how these characteristics may be related to the IS programs' adoption of the core course sequence recommended by the IS 2010 curriculum model. From the perspective of the US region in which the IS program is located, the results show that there are more IS programs in the southern corridor of the United States compared to other regions. Interestingly, no significant differences were observed in the adoption of the core course sequence recommended by the IS 2010 curriculum across regions. This suggests that the accreditation process was successful in maintaining a uniform standard in the IS programs across the nation. A high congregation of IS programs in the Southern region of the United States may be indicative of the thriving IS industry in that region requiring surrounding schools to focus on heavily IS education. The location quotient¹ of IS-related occupations by region confirms the result

¹ From the Bureau of Statistics Web page, <http://www.bls.gov/oes/current/oes113021.htm>

that a higher proportion of IS-related employments are documented in the southern region of the United States compared to other regions.

Similarly from the perspective of the degrees offered in IS programs, results from this study suggests that conferring BBA or BS degrees is not suggestive of their need to comply with the core course sequence recommended in the IS 2010 curriculum model. As mentioned in a previous section, the location of IS programs in computer science colleges or departments where BS degree is granted explains why some IS graduates earn a BS degree in the stead of a BBA degree. This result also suggests that IS programs, regardless of where they are located, are responsive to the call to modify and adapt their curriculum to better prepare graduates for the technologically volatile workforce.

The analysis that sought to explore compliance of IS programs to the recommended core course sequence found that a significant number of programs in the nation were in compliance. This result also supports findings from previous studies (Bell et al. 2013) that there is wide range of adherence to the IS 2010 core curriculum guidelines. A further analysis of the IS programs that are either not in full or partial compliance surprisingly indicates that more than half of those programs are in AACSB accredited institutions. Given that business schools are the flagship of the IS programs and are mostly accredited by AACSB in the United States, they should continue to take the lead in aligning their curriculum to the suggested sequence recommended in the IS 2010 curriculum model. Taking such a lead might encourage IS programs in other schools or colleges to follow in their steps and to consequently prepare graduates to be better equipped for the labor market. On the other hand, not going by the recommended sequence in the IS 2010 curriculum model means the programs are completing the core courses with a more flexible approach that the programs believe best suits the needs of their student body.

This study found that IS programs in AACSB accredited institutions are significantly more compliant with the course sequencing based on the IS 2010 curriculum model than those in ABET accredited institutions. This can be attributable to the level of awareness available in colleges of business compared to engineering colleges. Also, as noted in prior studies (Bell et al. 2013), compatibility between the guidelines and realities of IS programs may be responsible for the slow adoption of the latest curriculum model.

Lastly, given that majority of the IS programs are in public institutions, it is not surprising that there was a significantly higher rate of adoption of the new curriculum model in public institutions compared to private institutions. Surprisingly however, about 75% of the IS programs in both public and private institutions are AACSB accredited suggesting that the difference in adoption rates across both types of institutions might not be as a result of the number of observations. Rather, private institutions may have other operational reasons why the adoption is slow.

Overall results from this study echoes Topi et al.'s claim that the IS 2010 curriculum model is rapidly beginning to achieve its simultaneous objectives of representing "consensus from the information systems community" while being "flexible and adaptable to most information systems programs" (Topi et al. 2010, p. 368). Hence, continuous adoption is needed to prepare students.

Implications for Practice

The results in this study have the following implications for IS programs in the United States. As a field, the results from this study are useful for program directors to assess compliance of their program with the mainstream expectations in the field. Also, these results suggest that the adoption of the IS 2010 curriculum model is required to prepare students for the competitive and high demand for IS skills and professionals in the job market for the next decade. As a strategy therefore, adoption of the IS 2010 curriculum model might be useful for the successful placement of graduating students and consequently improving recruitment and retention rates. Lastly, the extent of the adoption of the current IS 2010 curriculum model presents additional evidence that IS programs are increasingly adjusting the curriculum to accommodate employers' expectation of graduates produced.

Implications for Theory

Findings from this initial exploratory study provide a good foundation for future studies to inform the relationship between the adoption of a standardized curriculum and student preparedness for their careers. Specifically, the results show that factors such as accreditation, public or private institution,

degrees offered, and US region significantly influence the adoption of a standardized curriculum expected to better prepare students for their career. These findings provide empirical evidence for the relationship between curriculum adoption and student preparedness. The next section details future studies that may be developed based on these initial findings.

Limitations and Future Studies

As with every research study, this study is not without limitations. First, the data used for analysis was collected from the online catalog of the universities without contacting the universities to confirm the gathered information. Given that this is the first phase of the research program, the next phase will confirm the information gathered from the online catalog in addition to the collection of key performance indicators that are pertinent to the research program. Future research in this program seeks to gather outcome measures such as student graduation rates and placement rates in order to explore relationships developed in this study and those measures. These performance measures are not currently available to most IS programs. In fact, majority of IS and non-IS programs find the compilation of the program's performance measures to be challenging. As such, the next phase of this study will report on approaches to gather these performance indicators. Second, method of degree delivery (i.e., completely online institutions versus traditional or hybrid institutions) was not considered as a characteristic of the IS program in this study since only two completely online program were identified in the data. Third, this study only examined universities in the United States thereby limiting the generalizability of the findings to the United States region. Given the prevalence of Information Systems research in Europe and increasing participation from other regions including Asia and Australia, future studies should consider taking a global perspective to generate a more representative finding. Lastly, IS programs sampled in future studies may include those that offer both undergraduate and graduate degrees.

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