

# **Examining IS Curriculum Profiles and the IS 2010 Model Curriculum Guidelines in AACSB-Accredited Schools**

**Robert J. Mills**

**Nicole Forsgren Velasquez**

**Kelly J. Fadel**

Management Information Systems

Jon M. Huntsman School of Business

Utah State University

3515 Old Main Hill, Logan, UT 84322-3515

[bob.mills@usu.edu](mailto:bob.mills@usu.edu)

**Corbin C. Bell**

Hill Air Force Base

Hill AFB, UT 84056

## **ABSTRACT**

The IS 2010 Model Curriculum Guidelines were developed to provide recommendations for standardized information systems curricula while simultaneously allowing for customization within individual programs. While some studies have examined program adherence to the IS 2010 Model Curriculum Guidelines, a more detailed analysis of IS curriculum profiles has not yet been conducted. The purpose of this study is to identify and describe IS curriculum profiles that exist among 127 AACSB IS programs using the IS 2010 guidelines as a framework for analysis. A cluster analysis reveals four distinct profiles of IS program structure: Independent, Focused, Adoptive, and Flexible. Prototypes of each profile are described along with significant differences between each profile as revealed by a discriminant analysis. Identifying and describing these curriculum profiles offers a snapshot of the state of the IS curriculum as a whole and provides a resource for programs seeking to examine and modify their respective curriculum models.

**Keywords:** Model Curricula, Cluster Analysis, Careers, Curriculum design & development

## **1. INTRODUCTION**

Innovation, advances in technology, and changing market demands all contribute to the need for information systems (IS) educators to continually review and update their program curriculum (Davis et al., 1997; Gill and Hu, 1999; Gorgone et al., 2002; Gorgone and Gray, 2002; Gorgone et al., 2000; Gorgone et al., 2005; Kesner, 2008; Topi et al., 2010; Topi et al., 2007; Topi et al., 2008). Ongoing curriculum evaluation and development is also required for IS departments within AACSB-accredited business schools (AACSB, 2011b; Mills et al., 2008), and curriculum alignment with regional needs and other stakeholders is critical to maintaining a relevant program where graduates are in demand (Aasheim et al., 2009; Lee et al., 1995; Plice and Reinig, 2007; Stevens et al., 2011; Tesch et al., 2003-2004). To this end, IS model curriculum guidelines have been established to provide direction for departments as they design and revise their curriculum to meet regional, national,

and global employment needs. The most recent curriculum guidelines, the IS 2010 Model Curriculum (hereafter referred to as IS 2010), were initially presented at AMCIS 2008 (Topi et al., 2008) and formally published in 2010 (Topi et al., 2010) to help create a systematic pathway to improve the quality of programs for students graduating in this high-demand field.

Recent research (Bell et al., 2013) indicates that adoption of IS 2010 among IS programs in the United States is mixed, with overall mean adherence level of 48%. Owing to its relative nascence, this result is perhaps not surprising. However, knowing that many IS programs are *not* fully adherent to IS 2010 does not answer the question of what these programs *are* doing in designing their respective curricula. For example, some programs may consciously disregard IS 2010 due to real or perceived lack of resources or the desire to specialize in a niche area that is not compatible with mainstream IS curriculum. Others may adopt a subset of IS 2010 yet innovate in other areas to meet

local employment demands. Even programs that purport to comply fully with IS 2010 have considerable latitude, as the model specifically encourages flexibility in customizing parts of the curriculum based on faculty expertise and specific stakeholder needs, requirements, and conditions. In short, a survey of the IS curriculum landscape would likely reveal an array of unique curriculum implementations that exhibit varying degrees of adherence to IS 2010. Are these variations entirely idiosyncratic, or are there certain “curriculum profiles” that characterize the state of the IS curriculum as a whole? To our knowledge, no study has yet attempted to answer this question.

This study seeks to identify patterns in IS curriculum implementations among AACSB-accredited business schools in the United States by addressing the following objectives:

1. Explore whether IS curriculum profiles exist based on required courses, elective courses, and adherence to the IS 2010 Model Curriculum Guidelines.
2. Describe curriculum profile characteristics, department head/director perceptions, and a sample curriculum for each profile as it relates to the IS 2010 Model Curriculum Guidelines.

By identifying and describing these curriculum profiles, we hope to create both a stimulus for discussion regarding the state of the IS curriculum as a whole, as well as a guiding framework for programs that wish to modify their respective curriculum models. Furthermore, a better understanding of IS curriculum profiles may be used by IS departments in discussions with advisory boards or accreditation teams as they describe their own strategy of IS curriculum design.

## 2. BACKGROUND AND LITERATURE REVIEW

Since the 1970s, IS model curriculum guidelines have been proposed to guide curriculum design in IS programs (Couger et al., 1995; Davis et al., 1997; Gorgone et al., 2002; Topi et al., 2010). Correspondingly, a number of studies over the years have examined the state of IS curricula and, where applicable, adherence to contemporary curriculum guidelines. These studies are summarized in Table 1. For

example, in the 1990s Maier and Gambill (1996) and Gill and Hu (1999) surveyed the IS curriculum landscape by examining the common courses included in IS curricula, the variety of IS electives offered, and the different programming languages taught at the time. Ten years later, Kung, Yang, and Zhang (2006) examined the same characteristics among AACSB-accredited schools with respect to recommendations suggested by the then-current IS 2002 Model Curriculum Guidelines (Gorgone et al., 2002) and the ABET curriculum standards. Similarly, Lifer, Parsons, and Miller (2009) examined both AACSB and Accreditation Council for Business Programs (ACBSP) schools to determine the most commonly required IS core classes with respect to the IS 2002 Model Curriculum guidelines. Results indicated that several IS programs were not adopting IS 2002 in a comprehensive manner (Lifer et al., 2009).

Most recently, Bell et al. (2013) explored adoption of the latest IS model curriculum guidelines: *IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems* (Topi et al., 2010). These guidelines recommend that an undergraduate IS curriculum offers coverage of seven core topics related to IS-specific knowledge and skills: 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. Moreover, the curriculum should include a capstone course and a selection of elective topics supporting the career track(s) offered by the institution (Topi et al., 2010, p. 361). Bell et al. (2013) surveyed 138 AACSB-accredited institutions to verify the presence (or lack thereof) of ten key IS 2010 variables (seven core topics, capstone course, electives, career tracks), giving each IS program 10% credit for the presence of each variable (see Table 2). These variables were then aggregated to calculate an overall IS 2010 adherence score for each program. Results showed a mean adherence score of 48%, with standard deviation of 14.4%.

Authors/Year	Model Curriculum Examined	Purpose
Maier and Gambill, 1996	No specific Model Curriculum	Examine common course curriculum and programming languages found within information systems curriculum
Gill and Hu, 1999	No Specific Model Curriculum	Examine 1991-1996 course curriculum to identify topic areas with increased or decreased coverage (e.g., Internet)
Kung, Yang, and Zhang 2006	IS 2002 Model Curriculum Guidelines and ABET	Examine core curriculum based on IS 2002 Model Curriculum Guidelines and ABET, and compares related results with Maier and Gambill, 1996
Lifer, J. D., Parsons, K. and Miller, R. E. 2009	IS 2002 Model Curriculum Guidelines	Examine consistency of course coverage between programs of AACSB and ACBSP schools
Bell, Mills, and Fadel, 2013	IS 2010 Model Curriculum Guidelines	Determine adherence to the IS 2010 Curriculum Guidelines, including career tracks, and compare current model curriculum adherence with similar evaluations of prior model curricula

**Table 1. IS Curriculum Review Studies**

Program Requirements 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
Identifies career tracks	10
Defines career track options with the recommended courses listed	10
<b>Percentage adherence to IS 2010 Curriculum Guidelines:</b>	<b>100%</b>

**Table 2. Variables Assessed for IS Program Adherence to IS 2010 (Bell et al., 2013)**

Similar to prior curriculum review studies, the findings of Bell et al. (2013) suggest fragmented adoption of current IS curriculum guidelines. However, while these results provide an overall benchmark of IS 2010 adherence, they do not describe the current landscape of IS curricula. The present study seeks to extend prior research on IS curriculum by exploring patterns of curriculum design in contemporary IS programs. Specifically, our objective is to provide a unique perspective on adherence to the IS 2010 model curriculum guidelines by identifying prototypical curriculum profiles that exist across the spectrum of IS programs in AACSB-accredited colleges and schools. Such an analysis is desirable for several reasons. First, by better understanding curriculum profiles and their respective characteristics, IS program administrators can make informed decisions regarding curriculum changes that might affect their strategic position vis-à-vis other programs. In addition, IS programs can conduct a benchmarking analysis to better understand how their curriculum either fits or does not fit into a particular profile/cluster. Finally, from the broader perspective of the IS discipline as a whole, identifying curriculum profiles may partially explain how and why many programs have not strictly adhered to IS 2010 guidelines.

**3. RESEARCH METHODOLOGY AND DATA COLLECTION**

Similar to prior IS curriculum studies (Kung, et al., 2006; Lifer, et al., 2009), the population for this study consisted of undergraduate IS programs at AACSB-accredited institutions across the United States. At the time of data collection, 286 of the 488 AACSB-accredited schools offered accredited programs in information systems (AACSB, 2011a). Yamane's (1967) formula, based on a desired confidence interval of 90% to 95%, was used to determine a minimum sample size of 74 programs for our analysis. To comfortably exceed this minimum threshold, we randomly selected one half (143) of the 286 programs for inclusion in this study.

Data for this study were collected primarily through a direct survey (Datar et al., 2010; Kung et al., 2006; Miller and Crain, 2007) of IS program websites and course catalogs. This direct examination of program web sites and course catalogs was conducted by two researchers, with follow-up data confirmation by a third researcher. The survey instrument (see Appendix) consisted of items measuring the presence of IS 2010 elements, including core

and elective courses taught, prerequisites, and career tracks. Programs that offered IS merely as an emphasis, concentration, or minor were excluded from the study, resulting in a total of 127 programs used in the analysis. To address the first research objective, a cluster analysis was conducted on the survey data using SPSS. This analysis involved executing and comparing multiple clustering methods to identify the optimal method based on fusion coefficients, cluster profile membership, and explanatory power to identify clusters within the data. Details of this analysis are presented in Section 4.1 below.

To address the second research objective, 72 of the 127 programs included in the cluster analysis were randomly selected to participate in follow-up telephone interviews with department heads and/or directors of undergraduate programs. The purpose of these interviews was to collect perceptual data regarding advantages and disadvantages of IS 2010. Fifty of the 72 target schools participated in the follow-up interviews. Selected quotations from these interviews are presented along with cluster profiles and sample curricula in Section 4.2.

**4. DATA ANALYSIS AND RESULTS**

**4.1 Objective 1 – Explore whether IS curriculum profiles exist based on required courses, elective courses, and adherence to the IS 2010 Model Curriculum Guidelines.**

A cluster analysis (Harrigan, 1985; Lorr, 1983) was conducted to address Objective 1. Because cluster analysis works by grouping cases according to responses, we began by translating the actual number of required courses, electives offered, and percentage of IS 2010 adherence for each program into nominal variables that contained a range of values. When categorizing the number of courses required, an analysis of the data suggested four groups would be appropriate: few courses required (0-3), typical number of courses required (4-6), significant number of courses required (7-9), and extensive number of courses required (greater than 9). For the number of electives offered, an analysis of the data suggested three groups: few electives offered (0-6), typical number of electives offered (7-12), and significant number of electives offered (greater than 12). For overall percentage of adherence to IS 2010 (see Table 2), an analysis of the data suggested four categories: poor adherence (less than 30%), moderate adherence (30% - 49%), good adherence (50% - 69%), and excellent adherence

(70% and above). These nominal variable categories were calculated for each program and used as inputs for the cluster analysis.

Cluster analysis was conducted using four common methods (Punj and Stewart, 1983; Ulrich and McKelvey, 1990): Ward's (1963) method, between-groups linkage method, within-groups linkage method, and centroid clustering. The results for cluster solutions with three to seven clusters were compared in terms of (a) change in fusion coefficients relative to the cluster solutions with one greater and one fewer number of clusters, (b) the number of programs in each cluster, and (c) univariate F-statistics (Ulrich and McKelvey, 1990). We examined the fusion coefficients at each agglomerative stage for each clustering method. In each method, major jumps in fusion coefficients occurred for the four cluster solution; therefore, four clusters provided the best solution. However, the between-groups linkage and centroid methods generated solutions with one small cluster containing seven and eight programs, respectively; therefore, these methods were ruled out for our analysis. When investigating the univariate F-statistics, Ward's method provided a clustering solution where each cluster significantly differed from the others. Based on these criteria, the solution with four clusters using Ward's method performed the best and was selected for the taxonomy. This solution includes four clusters that are similar in size. Based on analysis of variance, these four clusters were significantly ( $p < 0.001$ ) different from each other in terms of the number of courses required, the number of electives offered, and the degree of adherence to IS 2010, as shown in Table 3.

To test for differences among the clusters and interpret the four profiles, *post hoc* comparisons of the means of the three categories listed above were conducted using Duncan's Multiple Range Test (Hair et al., 1979). Using this test, pairwise comparisons are done across clusters for each category used in the clustering classification. Significant differences are then used to sort the clusters into groups wherein the means of that variable do not significantly differ across clusters within a group but differ at a predefined statistically significant level ( $p < 0.10$  in this study) across clusters in different groups. With respect to required courses, the test placed the clusters into four distinct groups as seen by the designation of VL, L, M, and H in Table 3. In terms of electives offered, the test placed the clusters into only three groups, as seen by the designation of L, M, and H in Table 3. Here, Clusters 3 and 4 are within the same group (H) because their means do not significantly differ from each

other but do differ from that of Cluster 1, which has a medium number of electives offered, and from that of Cluster 2, which has the lowest number of electives offered. Similarly, IS 2010 adherence resulted in three groups, with Clusters 1 and 4 within the same low adherence group, Cluster 2 in a medium adherence group, and Cluster 3 in the highest adherence group.

The frequency of occurrence for each category of required courses, electives offered, and adherence in each cluster, and the frequency predicted by chance alone, are shown in Table 4.

In order to better understand how each of the IS 2010 guidelines relate to the clusters identified above, we conducted a multiple discriminant analysis with all ten variables (as outlined in Table 2) used as discriminating variables. In general,  $n-1$  discriminant functions are needed to discriminate most effectively among  $n$  clusters (Sabherwal and King, 1995). Therefore, three discriminant functions were used to discriminate among the four clusters identified in the study. The nature of each rotated discriminant function was assessed using its significant correlations with the discriminating variables. The differences among the clusters were then interpreted by examining the values of each discriminant function. When interpreting this analysis, each discriminant function differentiates between two clusters (in bold). For that same discriminant function, its correlations with the discriminating variables (i.e., the components of IS 2010, also in bold) explain how the two clusters are different, as shown in Table 5. For example, Function 1 differentiates between Cluster 1 and Cluster 3. Further, when comparing these two clusters, Cluster 1 is low on IS2010.4 and IS2010.7, meaning that courses in Project Management and IS Strategy are generally not offered, while Cluster 3 tends to offer these courses. This function also indicates that Cluster 1 is less likely to have Identified Career Tracks and Detailed Career Tracks when compared to Cluster 3. Function 2 differentiates between Clusters 1 and 2. When comparing these two clusters, Cluster 1 is less likely to offer Data and Information Management (IS2010.2), Enterprise Architecture (IS2010.3), and require a capstone course, but career tracks are identified; Cluster 2 is the opposite. Finally, Function 3 differentiates between Clusters 3 and 4. When comparing these two clusters, Cluster 3 is more likely to offer IT Infrastructure (IS2010.5) and Systems Analysis & Design (IS2010.6), while Cluster 4 is less likely to offer these courses.

	F-values <sup>a</sup>	Cluster 1	Cluster 2	Cluster 3	Cluster 4
<b>Required courses</b>	49.632***	3.00 M <sup>b</sup>	2.77 L	3.25 H	1.91 VL
<b>Electives offered</b>	54.175***	2.08 M	1.00 L	2.50 H	2.49 H
<b>Adherence to 2010 IS Curriculum Guidelines</b>	42.780***	1.92 L	2.90 M	3.25 H	2.14 L
<sup>a</sup> The significance levels of F-values are: *** 0.001 level <sup>b</sup> H, M, L, and VL indicate that the mean for the cluster was High, Medium, Low, or Very Low, respectively, based on Duncan's Multiple Range test					

Table 3. A Comparison of the IS Curriculum Profiles

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Total
Few courses required (0-3)	0 (0.61)	0 (0.71)	0 (0.85)	3 (0.83)	3
Typical courses required (4-6)	0 (9.42)	14 (10.87)	0 (13.04)	32 (12.68)	46
Significant courses required (7-9)	26 (12.69)	9 (14.65)	27 (17.57)	0 (17.09)	62
Extensive courses required (10+)	0 (3.28)	7 (3.78)	9 (4.54)	0 (4.41)	16
Few electives offered (0-6)	8 (7.78)	30 (8.98)	0 (10.77)	0 (10.47)	38
Typical electives offered (7-12)	8 (9.01)	0 (10.39)	18 (12.47)	18 (12.13)	44
Significant electives offered (13+)	10 (9.21)	0 (10.63)	18 (12.76)	17 (12.40)	45
Poor adherence (< 30%)	2 (1.64)	0 (1.89)	0 (2.27)	6 (2.20)	8
Moderate adherence (30% - 49%)	24 (10.03)	6 (11.57)	1 (13.89)	18 (13.50)	49
Good adherence (50% - 69%)	0 (11.67)	21 (13.46)	25 (16.16)	11 (15.71)	57
Excellent adherence (70%+)	0 (2.66)	3 (3.07)	10 (3.69)	0 (3.58)	13
Total	78	90	108	105	381

\*This table provides actual frequencies and expected (chance) frequencies (in parenthesis). For any given cell, the frequency predicted by chance alone can be found by multiplying the corresponding row and column totals and dividing by the total frequency of the matrix.

**Table 4. Frequencies of Courses Required\*, Electives Offered, and Adherence for each Cluster**

Correlations between rotated discriminant functions and discriminating variables <sup>a</sup>			
Discriminating variables	FUNC 1	FUNC 2	FUNC 3
IS2010.1	0.220	0.096	-0.218
IS2010.2	-0.130	<b>0.325</b>	0.142
IS2010.3	-0.006	<b>0.430</b>	-0.057
IS2010.4	<b>0.608</b>	0.052	-0.039
IS2010.5	-0.030	0.185	<b>0.662</b>
IS2010.6	0.029	-0.136	<b>0.755</b>
IS2010.7	<b>0.350</b>	0.055	0.101
Capstone Required	0.138	<b>0.514</b>	-0.059
Identify Career Tracks	<b>0.457</b>	<b>-0.372</b>	-0.072
Detailed Career Tracks	<b>0.401</b>	-0.152	-0.149

  

Values of the rotated discriminant functions at cluster centroids <sup>b</sup>			
Profile	1	2	3
Cluster 1	<b>-1.087</b>	<b>-0.598</b>	0.089
Cluster 2	0.164	<b>0.588</b>	0.066
Cluster 3	<b>1.196</b>	0.372	<b>0.397</b>
Cluster 4	-0.563	-0.443	<b>-0.531</b>

<sup>a</sup> Correlations above 0.35 are in bold  
<sup>b</sup> The highest and lowest centroid values are in bold

**Table 5. IS 2010 Curriculum Guidelines and Effect on Profiles**

**4.2 Objective 2 - Describe curriculum profile characteristics, department head/director perceptions, and a sample curriculum for each profile as it relates to the IS 2010 Model Curriculum Guidelines.**

The purpose of this section is to describe the curriculum profiles (clusters) identified from Objective 1. Each cluster is described by the number of AACSB programs that fall within it, adherence percentage to IS 2010 guidelines, average required courses, average elective courses, inclusion of career tracks, requirement of a capstone class in the students' final semester, and relative cluster comparisons. In addition, select quotations from department heads/directors are also included to portray the perspective of decision makers for each cluster. Finally, a sample curriculum is provided to illustrate each cluster.

*Cluster 1 – Independent.* The Independent cluster includes 26 of the sampled AACSB programs (20.5%) and ranges between 20% and 40% adherence to IS 2010 guidelines. This represents the lowest level of adherence among the four clusters identified. In spite of the low

adherence, the Independent cluster includes an average of eight (medium) required courses and twelve (medium) elective offerings. A capstone class is generally not required and career tracks have not been specifically identified.

An illustration of a sample curriculum is provided in Table 6. Sample curricula are selected from programs that fall within the cluster. In this example, the program includes seven required courses, several which are two-semester sequences of topics (e.g., systems analysis). This example includes several recommended IS 2010 classes as electives such as project management and IS strategy, although moving IS 2010 courses from required to elective does reduce the overall IS 2010 adherence score, which in this case is only 40%.

*Cluster 2 – Focused.* The Focused cluster includes 30 of the sampled AACSB programs (23.6%) and ranges between 30% and 70% adherence to IS 2010 guidelines. Cluster 2 includes an average of seven (medium) required courses and only four (low) elective offerings. A capstone class is generally not required and career tracks have not been specifically identified.

<b>Profile</b>	<ul style="list-style-type: none"> <li>● Name of Cluster: <b>INDEPENDENT</b></li> <li>● # of Programs: 26 (20.5%)</li> <li>● IS 2010 Adherence: mean 36.9%, range 20% - 40% (Low)</li> <li>● Average Required Courses 8 (Medium)</li> <li>● Average Elective Courses: 12 (Medium)</li> <li>● Career Tracks: None</li> <li>● Capstone: Not Required</li> <li>● Relative to Cluster 3: less likely to offer IS2010.4 (Project Management), IS2010.7 (IS Strategy), career tracks</li> <li>● Relative to Cluster 2: less likely to offer IS2010.2 (Data Management), IS2010.3 (Enterprise Architecture); capstone required; more likely to offer career tracks</li> </ul>
<b>Selected Quotations</b>	<p>“I think [the guidelines] 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.”</p> <p>“The individuals that wrote the Information Systems 2010 Curriculum Guidelines were out to lunch.”</p>
<b>Sample Curriculum</b>	<ul style="list-style-type: none"> <li>● IS 2010 Adherence: 40%</li> <li>● Required Courses: 7</li> <li>● Elective Offerings: 18</li> <li>● Career Tracks: None</li> <li>● Capstone: Not Required</li> </ul> <p>Required Courses:</p> <ol style="list-style-type: none"> <li>1. Application Programming Development</li> <li>2. Application Programming Development II</li> <li>3. Systems Analysis &amp; Design</li> <li>4. Systems Analysis &amp; Design II</li> <li>5. Data Modeling &amp; Implementation</li> <li>6. Telecommunications and Networking</li> <li>7. Management Information Systems</li> </ol> <p>Notable Electives: Project Management, IT Strategy</p>

**Table 6. Profile Summary & Selected Quotations - Cluster 1**

An illustration of a sample curriculum for the Focused cluster is provided in Table 7. This example includes a data-driven curriculum focusing on analytics as a core area of concentration. Other Cluster 2 programs often included core courses with a focus on a particular area that is not part of IS 2010 (e.g., security). Although Cluster 2 was not likely to offer career tracks, the core required courses often created a focused track that all students would take as part of the program. For example, a core curriculum may have included several security courses that created an implied track in security, though no formal career track was listed on the program website. This may partially explain why this cluster had so few electives (4) compared to the other clusters (12-14). It appears that at least some programs from Cluster 2 have intentionally decided to focus on one main IS area in which all students are required to take classes.

*Cluster 3 – Adoptive.* The Adoptive cluster includes 36 of the sampled AACSB programs (28.3%) and ranges between 40% and 80% adherence to IS 2010 guidelines. This cluster represents the highest level of IS 2010 adherence among the four clusters identified. Cluster 3 includes an average of nine (medium) required courses and fourteen

(high) elective offerings. Cluster 3 was also most likely to include career tracks and was equally likely to require a capstone class during a student’s final semester as Cluster 2. The inclusion of detailed career tracks may partially explain the high number of elective course offerings as compared to Cluster 2.

An illustration of a sample curriculum for the Adoptive cluster is provided in Table 8. This example includes seven required classes and offers eleven electives in several career tracks areas, including Web Developer, DBA, Project Manager, IT Consultant, and e-Learning Manager.

*Cluster 4 – Flexible.* The Flexible cluster includes 35 of the sampled AACSB programs (27.6%) and ranges between 20% and 60% adherence to IS 2010 guidelines. Cluster 4 includes an average of five (low) required courses and fourteen (high) elective offerings.

An illustration of a sample curriculum approach for the Flexible cluster is provided in Table 9. This example includes several recommended IS 2010 classes as electives, such as Enterprise Architecture and IS Strategy. In addition, this program also includes several electives for students to take in ERP and data warehousing.

<p><b>Profile</b></p>	<ul style="list-style-type: none"> <li>● Name of Cluster: <b>FOCUSED</b></li> <li>● # of Programs: 30 (23.6%)</li> <li>● IS 2010 Adherence: mean 51.3%, range 30% - 70% (Medium)</li> <li>● Average Required Courses 7 (Medium)</li> <li>● Average Elective Courses: 4 (Low)</li> <li>● Career Tracks: None</li> <li>● Capstone: Required in approximately half of surveyed programs</li> <li>● Relative to Cluster 1: more likely to offer IS IS2010.2 (Data Management), IS2010.3 (Enterprise Architecture); capstone required; less likely to offer career tracks</li> </ul>
<p><b>Selected Quotations</b></p>	<p>“Within that guideline, we’ve tried to keep some flexibility as to what we can do within the classes.”</p> <p>“A positive is we see what other programs are thinking, but it does not cater to local needs like teaching SAP software where local businesses demand it.”</p>
<p><b>Sample Curriculum</b></p>	<ul style="list-style-type: none"> <li>● IS 2010 Adherence: 50%</li> <li>● Required Courses: 7</li> <li>● Elective Offerings: 2</li> <li>● Career Tracks: None</li> <li>● Capstone: Not Required</li> </ul> <p>Required Courses:</p> <ol style="list-style-type: none"> <li>1. Analyzing Business Operations</li> <li>2. Supply Chain Management</li> <li>3. Information Systems in a Modern Enterprise</li> <li>4. Database Management</li> <li>5. Analytics</li> <li>6. Data Mining</li> <li>7. Analytics Technologies</li> </ol> <p>Notable Electives: Business Computing Systems</p>

**Table 7. Profile Summary & Selected Quotations - Cluster 2**

<p><b>Profile</b></p>	<ul style="list-style-type: none"> <li>● Name of Cluster: <b>ADOPTIVE</b></li> <li>● # of Programs: 36 (28.3%)</li> <li>● IS 2010 Adherence: mean 59.4%, range 40% - 80% (High)</li> <li>● Average Required Courses 9 (Medium)</li> <li>● Average Elective Courses: 14 (High)</li> <li>● Career Tracks: Included more than Cluster 1</li> <li>● Capstone: Similar to Cluster 2</li> <li>● Relative to Cluster 1: more likely to offer IS2010_4 (Project Management) and IS2010.7 (IS Strategy), career tracks</li> <li>● Relative to Cluster 4: more likely to offer IS2010.5 (IT Infrastructure) and IS2010.6 (Systems Analysis &amp; Design)</li> </ul>
<p><b>Selected Quotations</b></p>	<p>“It is always great to have guidelines, so that we can always match our courses with the guidelines to make sure we are on the right track.”</p> <p>“Advantages are that when [the students] graduate they have a core set of tools, techniques, and knowledge that represents best practices in the IT field and IS field.”</p>
<p><b>Sample Curriculum</b></p>	<ul style="list-style-type: none"> <li>● IS 2010 Adherence: 80%</li> <li>● Required Courses: 7</li> <li>● Elective Offerings: 11</li> <li>● Career Tracks: 5</li> <li>● Capstone: Required, but not during final semester</li> </ul> <p>Required Courses:</p> <ol style="list-style-type: none"> <li>1. Principles of Information Systems</li> <li>2. Database Management</li> <li>3. Intro to Business Applications</li> <li>4. Business Communications</li> <li>5. Info Technology Hardware and Systems</li> <li>6. Systems Design and Implementation</li> <li>7. Systems Design and Implementation Lab</li> </ol> <p>Notable Electives: Project Management, IS Strategy</p> <p>Career Tracks: 5 – Web Developer, DBA, Project Manager, IT Consultant, E-Learning Manager</p>

**Table 8. Profile Summary & Selected Quotations - Cluster 3**

**5. DISCUSSION**

Recent studies (e.g., Bell et al., 2013; Lifer et al., 2009) investigating IS model curriculum adherence have questioned the lack of model curriculum adoption by many programs. As IS faculty continue to face the challenge of keeping curricula up-to-date, compliant with accreditation standards, and relevant to industry needs, this study provides a unique examination of IS curricula through the lens of curriculum profiles. The four profiles identified (Independent, Focused, Adoptive, and Flexible) represent different strategies for defining IS curriculum. Although Cluster 3 (Adoptive) represents the highest adherence to IS 2010, we believe this study provides some rationale and justification for departments to be positioned in the other clusters as well. For instance, we identified a program in Cluster 2 (Focused) that includes several required courses in the area of data mining and analytics. These courses represent a focused curriculum that may limit overall IS 2010 adherence, yet equips students with a specialized background in a high-demand IS domain. Focused

curriculum design may represent a conscious strategy to emphasize a single career track through several required courses in a given area. In short, our analysis suggests that some programs with low adoption scores may be pursuing a strategy of flexibility or focused tracks in order to address regional or industry needs.

Our analysis also highlights opportunities to leverage existing curriculum structures for IS programs desiring to increase their IS 2010 adherence. For example, we identified several programs in Cluster 4 (Flexible) that required very few courses but allowed students to tailor their education with electives in areas such as global resources, project management, and operations. Programs that fit within this profile may benefit from organizing these electives into career tracks as suggested by the IS 2010 guidelines. Justifications for career tracks include allowing students to specialize and meet regional demands in a formalized process (Bell et al., 2013). Formalizing career tracks would increase program adherence to IS 2010 without necessarily increasing resource demands.

<p><b>Profile</b></p>	<ul style="list-style-type: none"> <li>● Name of Cluster: <b>FLEXIBLE</b></li> <li>● # of Programs: 35 (27.6%)</li> <li>● IS 2010 Adherence: mean 38.9%, range 20% - 60% (Low)</li> <li>● Average Required Courses 5 (Low)</li> <li>● Average Elective Courses: 14 (High)</li> <li>● Career Tracks: None</li> <li>● Capstone: Not Required</li> <li>● Relative to Cluster 3: less likely to offer IS2010.5 (IT Infrastructure), IS2010.6 (Systems Analysis &amp; Design)</li> </ul>
<p><b>Selected Quotations</b></p>	<p>“...if you simply follow the guidelines you might lose some flexibility in modifying your degree program to fulfilling the local or regional company needs.”</p> <p>“Guidelines are good, but you have to adapt it to local conditions in terms of faculty availability and also having the curriculum approved by the department, etc.”</p>
<p><b>Sample Curriculum</b></p>	<ul style="list-style-type: none"> <li>● IS 2010 Adherence: 30%</li> <li>● Required Courses: 3</li> <li>● Elective Offerings: 13</li> <li>● Career Tracks: None</li> <li>● Capstone: Not Required</li> </ul> <p>Required Courses:</p> <ol style="list-style-type: none"> <li>1. Introduction to Management Information Systems</li> <li>2. Database Concepts</li> <li>3. Systems Analysis &amp; Design</li> </ol> <p>Notable Electives: Enterprise Architecture, IS Strategy, ERP for Small &amp; Medium Enterprises, Enterprise Data Warehouses, Enterprise Resource Planning</p>

**Table 9. Profile Summary & Selected Quotations - Cluster 4**

Finally, we believe that the challenging task of curriculum design can be facilitated by identifying exemplar institutions that have implemented a desired curriculum model. For programs with a goal of increasing their adherence to IS 2010, we have identified five programs that fall within Cluster 3 (Adoptive) that have been identified as highly adoptive of IS 2010:

- Old Dominion University
- University of Houston
- University of Tampa
- Utah State University
- Virginia Commonwealth University

Visiting the websites of these programs will provide specific information on how they have implemented their respective curricula and provide a helpful benchmark for programs considering curriculum changes.

In summary, the IS 2010 Model Curriculum Guidelines have specifically been designed to provide a consensus-driven curriculum standard for the IS discipline while simultaneously being “flexible and adaptable to most information systems programs” (Topi et al., 2010, p. 368). The competing virtues of standardization and customization present a challenge to the IS community as it seeks to define its academic canon while accommodating local and regional employment needs. On one hand, establishing a core body

of knowledge is clearly important for creating standardized performance benchmarks and accreditation criteria for programs that claim the title of information systems. In support of this perspective, some have advocated that general AACSB accreditation standards should be supplanted by or supplemented with more IS-specific standards set forth by a professional organization such as the AIS (Gorgone, 2006), similar to the accreditation processes in other disciplines such as accounting or chemistry (Impagliazzo and Gorgone, 2002). On the other hand, this perspective must be weighed against the practical and strategic need for IS departments to adapt and innovate—a need fueled by the rapid pace at which the IS discipline evolves relative to other disciplines. In this vein, one IS faculty we interviewed said:

*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.*

Ultimately, we believe that both standardization and customization are worthwhile and necessary objectives for the IS community. Indeed, the IS 2010 guidelines are expressly written to accommodate both objectives through an established core curriculum coupled with career tracks that

provide opportunities for customization. Encouragingly, the results of our study show that while there is certainly variation in IS curriculum profiles, most programs seem to have achieved their own balance that combines a level of standardization around IS 2010 with a dose of customization that leverages their unique qualities and strategic focus. We hope that the curriculum profiles we have identified will prompt IS programs to thoughtfully consider the positioning of their respective curricula and stimulate ongoing discussion about the state and direction of IS curriculum as a whole.

## 6. REFERENCES

- AACSB. (2011a). DataDirect, Retrieved February 2, 2011, from <https://datadirect.aacsb.edu/public/profiles/search.cfm#results>
- AACSB. (2011b). Eligibility Procedures and Accreditation Standards for Business Accreditation, Retrieved May 5, 2011, from <http://www.aacsb.edu/accreditation/standards-2011-revised-jan2011-final.pdf>
- Aasheim, C. L., Williams, S., & Butler, E. S. (2009). Knowledge and Skill Requirements for IT Graduates. *Journal of Computer Information Systems*, 49(3), 48-53.
- Bell, C. C., Mills, R. J., & Fadel, K. J. (2013). An Analysis of Undergraduate Information Systems Curricula: Adoption of the IS 2010 Curriculum Guidelines. *Communications for the Association of Information Systems*, 32(2), 73-94.
- Couger, J. D., Davis, G. B., Dologite, D. G., Feinstein, D. L., Grogone, J. T., Jenkins, A. M., Little, J. C., Longenecker, J. E. J., & Valacich, J. S. (1995). IS'95: Guideline for Undergraduate IS Curriculum. *MIS Quarterly*, 19(3), 341-359.
- Datar, S. M., Garvin, D. A., & Cullen, P. G. (2010). *Rethinking the MBA*. Boston, Massachusetts: Harvard Business Press.
- Davis, G. B., Gorgone, J. T., Couger, J. D., Feinstein, D. L., & Longenecker, H. E. (1997). IS '97 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems. *The DATA BASE for Advances in Information Systems*, 26(1), 1-94.
- Gill, T. G., & Hu, Q. (1999). The Evolving Undergraduate Information Systems Education: A Survey of U.S. Institutions. *Journal of Education for Business*, 74(5), 289-295.
- Gorgone, J. T. (2006). Information Systems Accreditation: Preparation, Process, and Standards. *Communications of the Association for Information Systems*, 17(19), 391-403.
- Gorgone, J. T., Davis, G. B., Valacich, J. S., Topi, H., Feinstein, D. L., & Longenecker, H. E. (2002). IS 2002 Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems. *The DATA BASE for Advances in Information Systems*, 34(1), 1-53.
- Gorgone, J. T., & Gray, P. (2002). MSIS Model Curriculum and Guidelines for Graduate Degree Programs in Information Systems. *The DATA BASE for Advances in Information Systems*, 31(1), 99-110.
- Gorgone, J. T., Gray, P., Feinstein, D. L., Kasper, G. M., Luftman, J., & Stohr, E. A. (2000). MSIS 2000: Model Curriculum and Guidelines for Graduate Degree Programs in Information Systems. *Communications of the Association for Information Systems*, 3(1), 1-51.
- Gorgone, J. T., Gray, P., Stohr, E. A., Valacich, J. S., & Wigand, R. T. (2005). MSIS 2006 Curriculum Preview. *Communications of the Association for Information Systems*, 15(1), 544-554.
- Hair, J. F., Anderson, R. E., Tatham, R. L., & Grablovsky, B. J. (1979). *Multivariate Data Analysis (with Readings)*. Tulsa, OK: Petroleum Publishing.
- Harrigan, K. R. (1985). An Application of Clustering for Strategic Group Analysis. *Strategic Management Journal*, 6, 55-73.
- Impagliazzo, J., & Gorgone, J. (2002). Professional Accreditation of Information Systems Programs. *Communications of the Association for Information Systems*, 9(3), 50-63.
- Kesner, R. M. (2008). Business School Undergraduate Information Competencies: A Study of Employer Expectations and Associated Curricular Recommendations. *Communications of the Association for Information Systems*, 23(1), 633-654.
- Kung, M., Yang, S. C., & Zhang, Y. (2006). The Changing Information Systems (IS) Curriculum: A Survey of Undergraduate Programs in the United States. *Journal of Education for Business*, 81(6), 291-300.
- Lee, D. M., Trauth, E. M., & Farwell, D. (1995). Critical Skill and Knowledge Requirements of IS Professionals: A Joint Academic/Industry Investigation. *MIS Quarterly*, 19(3), 313-340.
- Lifer, J. D., Parsons, K., & Miller, R. E. (2009). A Comparison of Information Systems Programs at AACSB and ACBSP Schools in Relation to IS 2002 Model Curricula. *Journal of Information Systems Education*, 20, 469-476.
- Lorr, M. (1983). *Cluster Analysis for Social Scientists*. San Francisco, CA: Jossey-Bass.
- Maier, L. J., & Gambill, S. (1996). CIS/MIS Curricula in AACSB-accredited Colleges of Business. *Journal of Education for Business*, 71(6), 329-345.
- Miller, C. J., & Crain, S. J. (2007). Law-Based Degree Programs in Business and Their Departments: What's in a Name? (A Comprehensive Study of Undergraduate Law-Based Degrees in AACSB-Accredited Universities). *Journal of Legal Studies Education*, 24(2), 235-289.
- Mills, R. J., Hauser, K., & Pratt, J. A. (2008). A Software Development Capstone Course and Project for CIS Majors. *Journal of Computer Information Systems*, 48(4), 1-14.
- Plice, R. K., & Reinig, B. A. (2007). Aligning the Information Systems Curriculum with the Needs of Industry and Graduates. *Journal of Computer Information Systems*, 48(1), 22-30.
- Punj, G., & Stewart, D. W. (1983). Cluster Analysis in Marketing Research: Review and Suggestions for Application. *Journal of Marketing Research*, 20, 134-148.
- Sabherwal, R., & King, W. R. (1995). An Empirical Taxonomy of the Decision-Making Processes Concerning Strategic Applications of Information Systems. *Journal of Management Information Systems*, 11(4), 177-241.

- Stevens, D., Totaro, M., & Zhiwei, Z. (2011). Assessing IT Critical Skills and Revising the MIS Curriculum. *Journal of Computer Information Systems*, 51(3), 85-95.
- Tesch, D. B., Crable, E. A., & Braun, G. F. (2003-2004). Evaluating IS Curriculum Issues Through an Ongoing Alumni Assessment. *Journal of Computer Information Systems*, 44(2), 40-48.
- Topi, H., Valachic, J. S., Wright, R. T., Kaiser, K., Nunamaker, J., J. F., Sipior, J. C., & Jan de Vreede, G. (2010). IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems. *Communications of the Association for Information Systems*, 26(18), 359-428.
- Topi, H., Valacich, J. S., Kaiser, K., Nunamaker, J. F., Sipior, J. C., & de Vreede, G. J. (2007). Revising the IS model curriculum: rethinking the approach and the process. *Communications of the Association for Information Systems*, 20(1), 728-740.
- Topi, H., Valacich, J. S., Wright, R. T., Kaiser, K., Nunamaker, J. F., & Sipior, J. C. (2008). Revising Undergraduate IS Model Curriculum: New Outcome Expectations. *Communications of the Association for Information Systems*, 23(1), 591-602.
- Ulrich, D., & McKelvey, B. (1990). General Organizational Classification: An Empirical Test Using the United States and Japanese Electronic Industry. *Organization Science*, 1(1), 99-118.
- Ward, J. H. (1963). Hierarchical Grouping to Optimize and Objective Function. *Journal of the American Statistical Association*, 58(301), 236-244.
- Yamane, T. (1967). *Statistics: An Introductory Analysis* (2 ed.). New York: Harper and Row.

#### AUTHOR BIOGRAPHIES

**Robert J. Mills** is an Associate Professor of Management Information Systems in the Jon M. Huntsman School of Business at Utah State University. His research interests include computer based learning environments, knowledge transfer, and MIS education. Dr. Mills has consulted on technology-based training projects for a variety of organizations including *EnergySolutions*, *Arena/Utah Jazz*, *Silicon Graphics International (SGI)*, and *IBM*.



**Nicole Forsgren Velasquez** is an Assistant Professor in Management Information Systems and Accounting in the Jon M. Huntsman School of Business at Utah State University. She earned her Ph.D. in Management Information Systems and her Masters in Accounting from the University of Arizona. Her research interests include knowledge management, technology impacts, business analytics, and system administration. She holds a patent and her work has appeared in *IBM Journal of Research and Development* and *IJBFR*, and has been presented at several international conferences.



**Kelly J. Fadel** is an Associate Professor of Management Information Systems in the Jon M. Huntsman School of Business at Utah State University. He received his PhD from The University of Arizona. His research areas include knowledge management, end-user learning, and post-adoptive technology use. His research has appeared in journals such as *Information Systems Research*, *Data Base for Advances in Information Systems Communications of the AIS*, and *International Journal of Knowledge Management*. His work has also been presented with recognition at several international information systems conferences.



**Corbin C. Bell** has over twelve years of experience in organizational development, communication, and program management. He received his Ph.D. from Utah State University in 2011. He has developed many objective-based, results-oriented products, technology-based solutions, Web-based utilities, and computer-based training programs. Currently, he is the Organizational Training Program Director and Team Lead for the Software Organizational Development Office (SODO) within the Software Maintenance Group (SMXG) and the SODO Organizational Communications and Training Functional Lead at Hill Air Force Base.



**APPENDIX**

**Direct Survey Instrument**

Identifier Code	
University Name	
School Name	
School Address	
School City Location	
School State Location	
School Zip Code	
Geographic (Census) Locations: (West, Midwest, Northeast, and South)	
Quarters (Q) or Semesters (S)	
Public (1) Private (2)	
Department/Program Name:	
# of IS Courses required?	
Required IS Courses	
Required Course #C1 -	
Required Course #C2 -	
Required Course #C3 -	
Required Course #C4 -	
Career Tracks offered:	
# of Career Tracks offered?	
Career Track #T1:	
Career Track #T2:	
Career Track #T3:	
Career Track #T4:	
Career Tracks / Courses	
Career Track #T1 Courses:	
Career Track #T2 Courses:	
Career Track #T3 Courses:	
Career Track #T4 Courses:	



No matter how sophisticated the technology, it still takes people!™



### **STATEMENT OF PEER REVIEW INTEGRITY**

All papers published in the Journal of Information Systems Education have undergone rigorous peer review. This includes an initial editor screening and double-blind refereeing by three or more expert referees.

Copyright ©2012 by the Education Special Interest Group (EDSIG) of the Association of Information Technology Professionals. Permission to make digital or hard copies of all or part of this journal for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial use. All copies must bear this notice and full citation. Permission from the Editor is required to post to servers, redistribute to lists, or utilize in a for-profit or commercial use. Permission requests should be sent to the Editor-in-Chief, Journal of Information Systems Education, [editor@jise.org](mailto:editor@jise.org).

ISSN 1055-3096