# AIS Educators' Choice of Systems Diagramming Techniques:

# A Framework and Analysis

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September 21, 2007

We would like to thank Dr. Sandy Richtermeyer for data collection assistance at the 2006 AIS Educators' Conference.

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## Abstract

Systems diagramming (SD) is an important component of companies' information systems documentation. Its increased importance, due to a heightened awareness surrounding business process improvement and compliance concerns, makes it critical for inclusion in an accountant's education. A broad array of educators, including those in accounting information systems (AIS), audit and management information systems (MIS), teach these methods for the purpose of assessing the internal control environment, evaluating, designing or changing current systems, and describing business processes.

First, this study develops and validates a framework for classifying various SD methods. Second, using a select set of variables from the framework, this study creates and tests a model to explain educators' choices of method to teach. Based on results of a survey given to AIS graduate and undergraduate educators, we examine whether educators' recent IT/IS work experience, length of AIS teaching experience, and research area affect their choice of teaching SD methods in graduate and undergraduate AIS courses.

AIS researchers can use our framework to prompt further research and discussion on the state of SD education and to position AIS education research on the subject. AIS educators can use our results to gain insight into SD usage among other AIS faculty, including what level in education they are teaching these techniques and which factors affect their choices. Educators can also use our framework to inform students about the origins and uses of SD.



**Keywords:** systems diagramming; systems documentation; system flowchart; business process map; data flow diagram; REA model; E-R diagram; UML; AIS education; AIS framework

**Data Availability:** Data is available upon request.

## I. INTRODUCTION AND MOTIVATION

Systems diagramming (SD) is a key component of an organization's information systems (IS) documentation and has become even more critical in response to heightened awareness surrounding business process improvement as well as compliance concerns with legislation such as the Sarbanes-Oxley Act of 2002 (SOX 2002). Private companies as well as public companies are increasing their focus on system documentation. A recent survey reports that 72% of private companies have increased emphasis upon reading or preparing information systems documentation over the last three years, nearly as much as public companies (82%)(Bradford and Brazel 2007a). Educators commonly include SD in AIS courses to teach students how to assess the internal control environment, evaluate, design or change information systems, and describe business processes (Bradford, Richtermeyer, & Roberts 2007b).

The primary purpose of this study is to develop and validate a framework for classifying SD methods included in AIS texts and taught in AIS courses. The secondary purpose of this study is to design and test a model to explain how individual, organizational, and environmental variables influence educator choice of which SD methods to teach in graduate and undergraduate AIS courses. Using results of a survey distributed to AIS educators, we validate the framework and test the model.

While traditionally SD has been an integral part of AIS education, its inclusion in accounting curricula has become even more important in response to recent authoritative guidance and governmental legislation (e.g., SAS 55, 78, 94, 96, and 99 and Section 404 of SOX)(American Institute of Certified Public Accountants 2007). Internal controls reviews and assessments required for compliance with Section 404 and financial statement audits frequently include SD to document a company's manual controls as well

as general and application controls. Graphical depictions of key business processes can supplement or replace written narratives, walk-throughs and checklists and are oftentimes the easiest way for external auditors, internal auditors and other accounting personnel to identify the controls they will test.

The ability to read and prepare SD is also an essential component in evaluating, designing, and changing IS as well as describing business processes. Many organizations currently replacing systems are focusing on the implementation of enterprise systems such as Enterprise Resource Planning (ERP), Supply Chain Management (SCM) and Customer Relationship Management (CRM). Systems diagramming is useful in describing business processes (process modeling) during implementation of these systems. Practitioners use process modeling to aid in requirements analysis, gap-fit analysis and business process reengineering (BPR). All of these activities in the enterprise systems life cycle require an understanding and description of existing processes (the "as is" state) and development of future processes (the "to be" or "best practices" state) (Bradford, Roberts, & Stroupe 2001).

When implementing enterprise systems, organizations oftentimes will include accounting personnel and/or internal auditors on the project team. These individuals will need the ability to read and/or prepare SD documentation.[1] Systems implementation also requires data modeling, an activity that relies on an understanding of SD methods. Accounting practitioners should acquire knowledge of the SD used to model relational databases, as these serve as the conceptual foundation and authoritative data source for enterprise systems. Organizations also commonly use off-the shelf relational database

1 In a 2006 survey of 403 IMA members holding accounting-related titles, the majority indicated that the ability to prepare SD was very important (34%) or somewhat important (26%) in their current position. More respondents considered it very important (40%) or somewhat important (37%) to be able to read documentation (Bradford et al. 2007b) . These findings emphasize the importance of SD in accounting practice, and thus, in accounting education.

packages such as Microsoft Access in end-user computing. Development of these systems also depends on the employees' understanding of SD.

Following practice, professional certification exams such as the CPA, CIA and CMA also are placing greater emphasis on SD. For example, the "Business Environment and Concepts" CPA examination materials include content related to system flowcharts (SF), Data Flow Diagrams (DFDs), Entity-Relationship Diagrams (ERD), and Resource, Event and Agent (REA) models (Whittington and Delaney 2006). Additionally, the CPA Exam's "Auditing and Attestation" Content Specification requires examinees to read or document their understanding of internal control systems using SF (American Institute of Certified Public Accountants 2005). The CIA exam material includes process maps (PM) and systems flowcharts (SF) (Wiley 2007). Finally, the CMA examination material, Information Systems I section, includes DFDs, SFs, and object-oriented programming (a Unified Modeling Language (UML) development tool)(IMA (Institute of Management Accountants) 2007). [2]

The current study reveals that nearly 100% of graduate and undergraduate AIS educators teach one or more SD methods in their courses. This underscores the importance of SD in AIS education and motivates us to understand how, when and why educators are using each method. Furthermore, there is scant research on the subject. Few studies have examined the use of SD methods in accounting (e.g., Bradford et al. 2007). Their focus was on *practitioners'* use of SD methods while this study primarily examines *educators'* use of SD methods.

We organize this paper as follows: Section II presents the framework and model, Section III validates the framework and develops our hypotheses; Section IV describes

[2] Some authors refer to Unified Modeling Language as Universal Modeling Language (e.g., Andrews 2007). We use the term Unified throughout this paper.

the research methodology and includes sample descriptives; Section V discusses the results of our study; and Section VI concludes with a discussion, limitations, and future research directions.

## II. FRAMEWORK AND MODEL DEVELOPMENT

Based on the preceding discussion, it is evident that accounting practitioners rely on SD techniques to accomplish and support a variety of tasks, such as planning for new enterprise systems and documenting controls. As accounting educators, we must be aware of the demands that accounting-related careers will place on our students and adequately prepare them for their futures. The following framework provides a reference for both educators and researchers, who may use this framework as a guide for understanding and exploring educators' choices of which SD method to teach.

Bradford et al. (2007b) identify SD methods used by practitioners and included in AIS texts and courses. We construct the SD framework by classifying these methods based on their respective origins. The center of our framework (see Figure 1) classifies methods as originating from industry and practice (UML and PM), AIS or IS theory (REA model, E-R Diagram, and DFD), or no origin (SF and DF).[3]

The practice-based methods are recent developments. IBM software engineers Jacobson, Booch, and Rumbaugh developed UML in 1996 as a development tool for object-oriented analysis and design (Andrews 2007). UML is now standard in many types of software solutions used for system development (Amescua, Garcia, Velasco et al. 2004; George, Batra, Valacich et al. 2004). Commonly considered as a tool for modeling

3 Although we searched extensively for the origination of flowcharts, we found no definitive source or foundation. Although flowcharting guidelines exist, there is no governing authoritative literature, nor strict set of rules. Flowcharts have been used for so long that no one individual is specified as the "father of the flowchart". The reason for this is obvious. A flowchart can be customized to fit any need or purpose. For this reason, flowcharts will be recognized as a method with no clear origin.

software applications, UML is also a technique useful for a variety of modeling activities, including business process modeling as noted by a recent Internal Auditor article (Andrews 2007).

General Electric pioneered the PM in the 1980's to improve their manufacturing process efficiencies. However, managers have expanded the use of this SD technique to all types of industries and processes. Today it has gained widespread acceptance by leading global organizations as a SD technique used to document, analyze, streamline, and redesign business activities (Bandara, Gable, & Rosemann 2005). A recent study reveals that the PM (also known as business information flow diagrams or swim lane method) is the second most widely used SD technique (after SF (46%)) among IMA members who hold accounting-related titles. PM was used much more frequently (29%) than was UML (6%) (Bradford et al. 2007b).

Theory-based methods include REA (AIS method), E-R Diagrams, and DFDs (both IS methods). Developed as a conceptual model, REA provides guidance and structure in designing relational databases (McCarthy 1982). The key premise of the REA model is that a company's IS should support the information needs of all users of the organization, including financial and non-financial (Hall and Singleton 2005).

The E-R diagram is a graphical technique used to portray database schema (Chen 1976). These diagrams illustrate the logical structure of databases by depicting the entities in a system (the objects about which we collect and store data) and the relationships among those entities (Gelinas, Sutton, & Hunton 2005; Romney and Steinbart 2005).

The DFD emerged from the MIS field and is used to depict a system's processes, data flows among the processes, and sources, destinations, and storage of data (Demarco

1978). The DFD has traditionally been a popular technique taught and used in MIS until the more recent emergence of object oriented design (Wang 1996).

Methods with no clear origin include system flowcharts and document flowcharts. System flowcharts are graphic illustrations of the flow of information through a system. Using a multitude of symbols, the system flowchart shows information such as logic flows, inputs, outputs, data storage, and operational processes such as physical flows, activities, and entities (Gelinas et al. 2005). Flowcharting can be an important tool in helping organizations assess risk and establish a sound internal control program, particularly in light of the Sarbanes-Oxley Act (Hurt 2006). Auditors traditionally use system flowcharts to highlight internal controls during an audit (Bradford et al. 2007b).

Document flowcharts are a simplistic form of the system flowchart, showing only the various documents involved in a system. They also portray the procedures performed on the documents (Hurt 2006). [4]

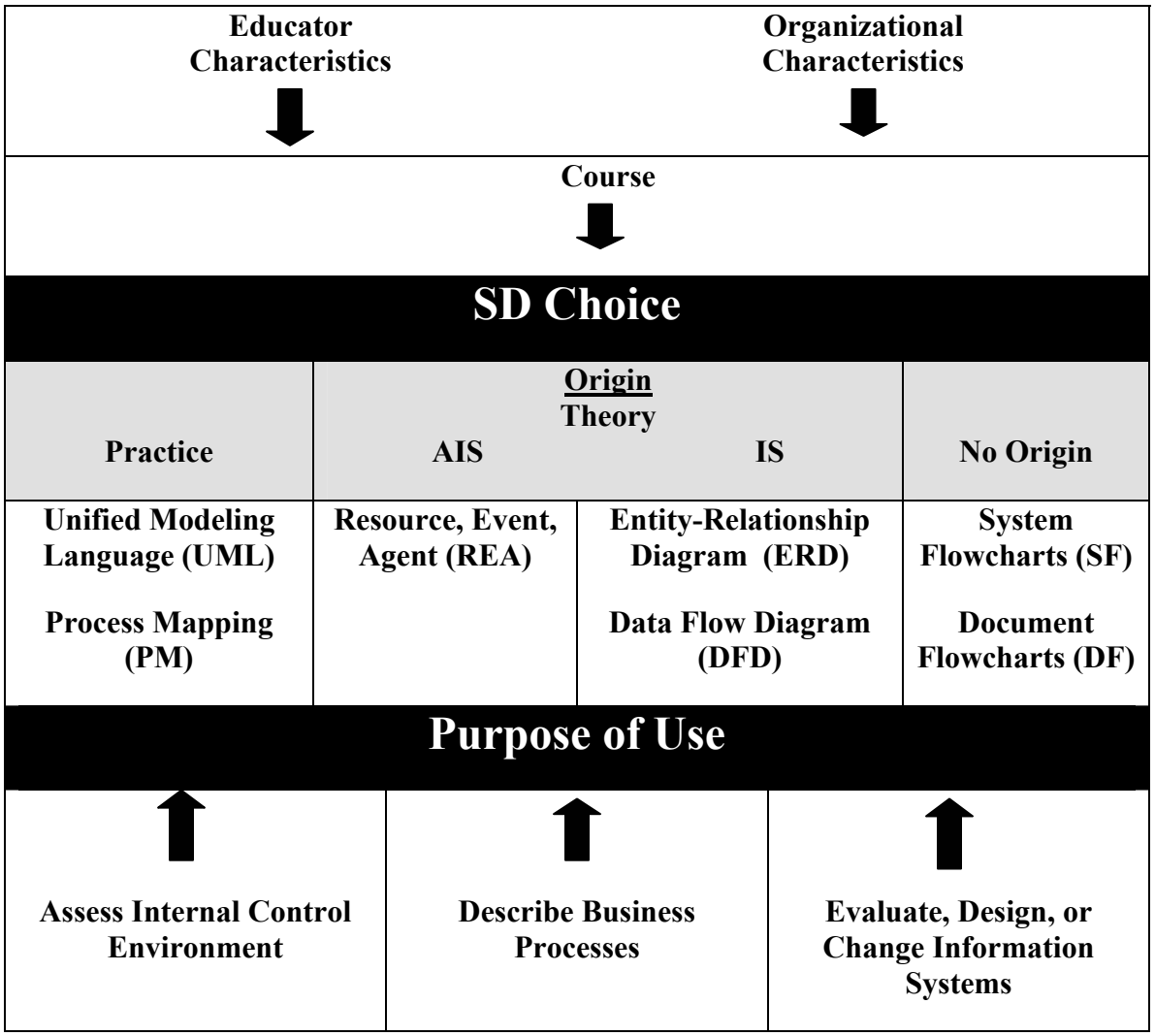
At the top of the framework, we include two categories of factors that may influence educators' choice of which SD method(s) to include in class: individual educator characteristics and organizational characteristics. Individual characteristics can relate to the educators' practical work experience, teaching experience or research interests. For example, recent work experience in audit or IT/IS likely results in exposure to practice-related methods, which could positively influence educators' choice to teach those methods. Organizational characteristics relate to the teaching and research environment at a school. Whether the school as a Masters or Ph.D. program can generally serve as a proxy for more emphasis placed on research. We include course variables as mediating variables. Course variables primarily comprise level (graduate or

[4] We did not include document flowcharts on our survey instrument, as document flowcharts are a subset of systems flowcharts.

undergraduate) and topic (audit, IT audit, AIS, or MIS), but could also include course delivery method and student population. These variables are mediating because although we believe course factors influence educators' final choices, educator and organizational characteristics influence the initial set of SD methods from which educators eventually choose.

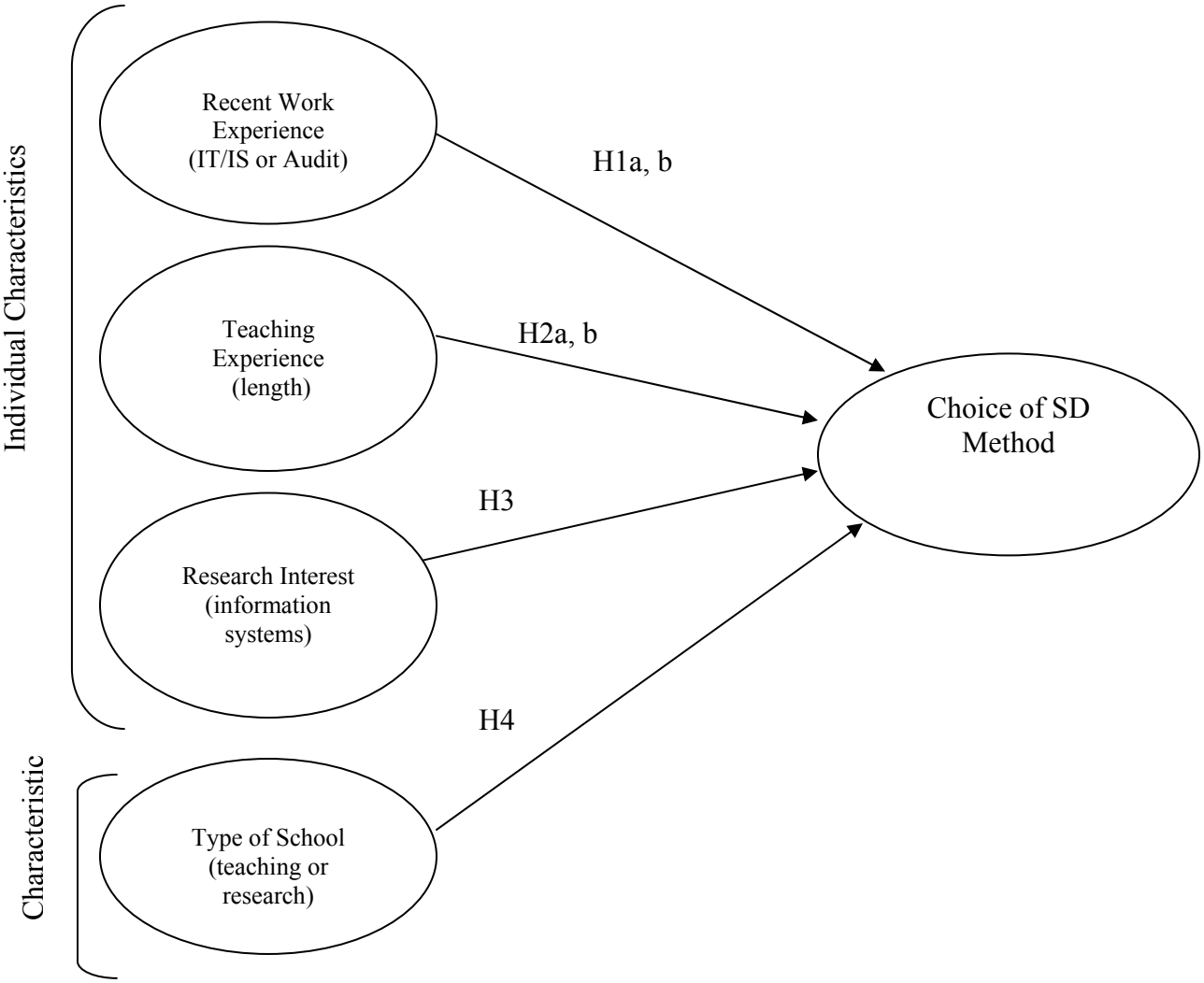
Along the bottom of the framework, we list three specific purposes of use of SD (Bradford et al. 2007b). Although the characteristics noted above are likely to influence choice of method, choice is also dependent on the objectives of the lesson. Purpose of use relates to the tasks students will eventually be using these methods to accomplish. Both educators and researchers should be interested in matching purpose of use in the classroom to actual uses in practice.

**Figure 1**
**System Diagramming Framework**




In this study, we create and test a model of SD choice, using a set of variables from the characteristics in the framework above. Although we explore how course level affects choice, we do not include purpose of use in the current study. Figure 2 displays our model.

**Figure 2**
**Model of SD Method Choices in Graduate and Undergraduate AIS Courses**




## III. Framework Validation and Hypotheses Development

In this section, first we validate the framework. Second, we develop testable hypotheses related to our model.

### Framework Validation

We developed our SD method framework to classify methods based on their origin. We believe that certain individual and organizational characteristics affect SD choice. We also theorize that course level mediates the relationship between these

characteristics and choice of method. The framework also includes the three major purposes of use for SD methods found in AIS texts and noted by practitioners in a recent study (Bradford et al. 2007b). Although one would expect educators to make every effort to learn about the many methods available, time is limited. We believe that educators will decide to teach certain SD methods based not only on their academic and industry background, but also based on the type of educational institution they are affiliated with and the level of course they teach. In this section, we attempt to validate our SD framework using Spearman correlations to confirm SD groupings in each origin.[5]

To validate our SD framework, we explore whether AIS educators are likely to teach certain SD methods in conjunction with other SD methods, as indicated by the framework. We analyze the correlations among the incidence of teaching each method, finding significant correlations among methods we had grouped together in the framework based on origin. Table 1 includes Spearman correlation coefficients and significance. The data suggest that overall, graduate and undergraduate educators teach the AIS theory-related SD methods in concert. REA models and E-R diagrams significantly correlate at .293 (p-value = .011). Likewise, E-R diagrams significantly correlate with DFDs at .374 (p-value = .001). However, we find no significant correlations between REA and DFDs. The practice-based methods, UML and PM, are significantly correlated at .293 (p-value = .011). In support of placing SF in a separate category, we find no significant correlations between teaching SF and teaching any other method.

[5] We use Spearman correlations because the variables are dichotomous (1=teach a SD method, 0= do not teach).

**Table 1**
**Correlations among Teaching SD Methods Overall**
**Spearman Correlation Coefficients (p-values)**
**n=74**

| | REA Models | E-R Diagrams | System Flowcharts | Process Maps | Data Flow Diagrams | Unified Modeling Language |
|---|---|---|---|---|---|---|
| REA Models | 1.00 | | | | | |
| E-R Diagrams | **.293 (.011)** | 1.00 | | | | |
| System Flowcharts | .095 (.418) | .136 (.248) | 1.00 | | | |
| Process Maps | -.035 (.767) | .091 (.441) | .039 (.740) | 1.00 | | |
| Data Flow Diagrams | .076 (.519) | **.374 (.001)** | .133 (.260) | .010 (.931) | 1.00 | |
| Unified Modeling Language | .100 (.396) | .028 (.816) | -.041 (.729) | **.293 (.011)** | -.142 (.226) | 1.00 |

The significant correlations provide partial assurance for the validity of our framework. We test individual hypotheses in order to further validate our framework and model. Following are hypotheses related to the individual and organizational-level characteristics presented in our model. Note that given the lack of prior research in this area, we do not hypothesize about how course level influences SD choice. However, we do perform analyses to explore the effects of this variable.

## Individual Variables and Choice of SD Method

### Recent Work Experience and Practice-Based Methods: UML and PM

We believe AIS researchers who have had recent IT/IS or auditing-related work experience will be more likely to include UML and PM in their course for two reasons: First, both UML and PM are not academic research developments but instead originated from industry. Thus, AIS educators with recent IT/IS or audit work experience would be more likely to be exposed to these techniques, through their experiences with ERP implementations and audits. Second, educators exposed to these methods are more likely to be aware of the benefits of the methods, as well as be more proficient and comfortable teaching these methods. These factors increase the likelihood that AIS educators will integrate these methods into their courses. Thus, we present the following hypotheses in the alternate form.

**H1a: Recent work experience in IT/IS or audit will positively relate to teaching UML.**

**H1b: Recent work experience in IT/IS or audit will positively relate to teaching PMs.**

### Length of AIS Teaching Experience and Practice-Based Methods: UML and PM

We expect that the longer faculty teach AIS, the more aware they become of emergent SD methods. Faculty relatively new to teaching AIS are more likely to adhere closely to AIS book content, which for the most part ignores PM and UML.[6] However, in a recent study of IMA members, PMs were the second most widely-used SD method just

6 Only two AIS texts include the PM and only minimally (Bagranoff et al. (2002); Moscove et al.(2003)). UML is currently only included in one AIS textbook (Jones and Rama (2006)).

after system flowcharts (Bradford et al. 2007b). Although IMA members did not extensively use UML, this could change as recent accounting articles have promoted this method as effective for business process modeling (*e.g.,* Andrews 2007).

Admittedly, new AIS educators could have recent practice experience, and thus may be more aware of practice-based methods than seasoned AIS educators may be.[7] However, independent of work experience, we expect that newer AIS faculty will rely more on textbooks for their choice of SD methods, and more experienced faculty will search out newer, practice-based techniques. Thus, we propose the following hypotheses in the alternate form:

**H2a: Length of AIS teaching experience will positively relate to teaching UML.**

**H2b: Length of AIS teaching experience will positively relate to teaching PMs.**

**Research Interest and the AIS Theory-Based SD Method: REA Model**

In the IMA study surveyed cited earlier, only 20% of IMA members use REA models; however, the study suggested that IMA members mistook REA for other methods (e.g., SF), and thus the results could be misleading. The REA model is currently included in nearly half of AIS texts (Bradford et al. 2007b). Additionally, REA has often been a topic in AIS research and teaching conferences and in AIS research journals. The REA model was developed through AIS research (McCarthy 1982), and thus we expect that accounting faculty, many of whom research primarily in IS, will be more inclined to

[7] In the current study, we find no significant correlation between length of teaching and recent practical work experience.

emphasize REA in their classes. Thus, we state the following hypothesis in the alternate form.

**H3: Primary research interest in Information Systems will positively influence teaching of an AIS research-based method, REA.**

Our final variable of interest relates to the type of school at which the AIS educator teaches (an organizational variable). Sixty-six percent (49) of AIS educators in our sample teach at a graduate degree granting school (those with a Ph.D. or Masters Degree program). It is reasonable to expect that faculty at research schools versus teaching schools (no graduate degree offerings) are more likely to be aware of the REA model, an AIS research-based method. Even though they may or may not research primarily in IS, they are likely to be aware of research-based methods through attendance at departmental workshops and discussions with other research faculty. Thus, we state the following hypothesis in the alternate form

**H4: Teaching at a graduate degree-granting school will positively influence teaching of an AIS research-based method, REA.**

## IV. METHOD AND DESCRIPTIVES

### Method

We administered an online survey to faculty listed in the AAA IS Section membership directory. We also collected data via hardcopy format during a concurrent session at the 2006 AIS Educator Conference. We instructed subjects not to answer again if they had already participated. The survey was pilot tested with a subset of AIS educators; we used the feedback to refine the instrument (Appendix). We received seventy-nine responses; seventy-four had taught SD in their AIS courses in the past three years, which we considered current AIS teaching experience. Thus, our final sample

consists of 74 AIS educators, which represents roughly 37% of active AAA IS section members.

**Descriptives**

Of respondents with AIS teaching experience, 65% had taught only undergraduate, 5% had taught only graduate, and 30% had taught both graduate and undergraduate courses in the last three years, which we consider current teaching experience. The majority of respondents teach at four-year institutions that offer either a Ph.D. or Masters in Accounting (67%) and information systems is their primary area of research (65%). Only 36% of AIS faculty surveyed has IT/IS or auditing-related work experience in the previous five years, with slightly more graduate educators having experience.

Table 2 presents the percentages of graduate and undergraduate educator coverage of SD methods. In graduate courses, the most commonly taught SD method is SF (65%), followed by E-R diagrams (62%), and REA Models (54%). Less than half (46%) of the instructors teach DFDs and very few teach PMs (15%) or UML (8%). In undergraduate courses, SFs are also the most commonly taught SD method (87%), followed by DFDs (68%), REA (63%) and E-R Diagrams (61%). Similar to graduate courses, undergraduate courses are not likely to include PMs (14%) or UML (6%). Our sample suggests that instructors teach SD methods more commonly in undergraduate education than in graduate education.

**Table 2**
**Number and Percentage of AIS Instructors Who Teach SD Methods: Categorized by Level**

| | System Flowcharts | Data Flow Diagrams | E-R Diagrams | REA Models | Process Maps | UML |
|---|---|---|---|---|---|---|
| Graduate AIS (n=26) | 17<br>65% | 12<br>46% | 16<br>62% | 14<br>54% | 4<br>15% | 2<br>8% |
| Undergraduate AIS (n= 70) | 61<br>87% | 48<br>68% | 43<br>61% | 44<br>63% | 10<br>14% | 4<br>6% |

## V. RESULTS

To test the hypotheses related to work experience and likelihood of teaching practice-based SD methods (i.e., UML and PM), we first calculated the Spearman correlations. The binary variable, work experience, is coded based on respondents' answer to whether they had any IT/IS or auditing work experience in the past five years. We found no significant correlation between work experience and teaching UML; thus, Hypothesis 1a is unsupported.[8] However, we did find a positive significant correlation between work experience and teaching PM overall (.315 p=.006) and in undergraduate AIS (.357 p=.002).[9] To investigate the relationship between work experience and teaching PM (H1b), we ran a series of logistic regressions using recent educator work experience (yes/no) as the independent variable and PM teaching (yes/no) in various forms (undergraduate, graduate, overall) as the dependent variables. Table 3 presents the results.

[8] Coefficients and p-values are as follows: Overall (.083, p=.480), Undergraduate (.19, p=.103), and Graduate (-.126, p=.284).
[9] Coefficient and p-value for graduate (.191 p=.103).

**Table 3**
**Likelihood of Teaching Process Maps Given Recent Work Experience**

| Dependent Variable: Likelihood of Teaching PM | n | Estimate | Wald Chi-Square | Pr>ChiSq |
|---|---|---|---|---|
| Overall AIS | 74 | 1.82 | 6.21 | .013* |
| Undergraduate AIS | 70 | 2.25 | 7.22 | .007* |
| Graduate AIS | 26 | 1.75 | 2.19 | .139 |

*Significant at the p=.05 level

Results of the logistic regression suggest that recent educator work experience is positively related to teaching PM overall (p = .013), and further analysis reveals that the significance is driven by the relationship for undergraduate courses (p=.007).[10] Thus, the data support Hypothesis 1b. Our findings suggest that faculty with recent practical work experience are more likely to teach one practice-based method, PM.

To test H2a and H2b, the relationship between AIS teaching experience and practice-based techniques, UML and PM, we first evaluate the correlations between the variables. AIS teaching experience is a continuous variable ranging from 1=None to 5= Greater than 10 years.[11] We use dichotomous variables coded yes/no to indicate whether respondents teach a particular SD method. Spearman correlations are insignificant for all levels of UML and for undergraduate and overall levels of PM.[12] We do find a marginally significant positive correlation between teaching experience and teaching PM in graduate AIS courses (.214 p=.067), however, results of a logistic regression do not support a significant positive relationship (p=.130). Thus, H2a and H2b are unsupported.

[10] Although we did not hypothesize about the mediation effect of course level, we find that the relationship is limited to undergraduate courses only. One explanation is the small sample size for graduate courses. Only 4 of 26 instructors use PM in their graduate course.
[11] The complete scale for years of AIS teaching experience is 1=None, 2=Less than three years, 3=Three-six years, 4=Six-ten years, 5=Greater than 10 years.
[12] Spearman correlations and p-values for UML: Overall (.097, p=.411), Graduate (.192, p=.101), Undergraduate (-.021, p=.862), for PM: Overall (.150 p=.202), Undergraduate (.110 p=.349).

Hypothesis 3 predicts that educators whose *primary* research area is information systems will be more likely to teach REA in their classes. We find no significant correlation between researching IS and teaching REA in graduate or undergraduate courses. Since our measure required educators to select a single primary research interest, it is possible that educators who did not select IS research do, in fact, research in the IS area.

Hypothesis 4 predicts that the type of school may influence educators' choice of SD method(s) to teach. We find a significant positive correlation between teaching at a research school and teaching REA in undergraduate AIS courses (.223 p=.05). Based on this finding, we run a logistic regression. Results suggest that there is a significant relationship between these variables (p=.05). The findings corroborate each other and lend support to the idea that type of school influences SD choice.

## VI. DISCUSSION, LIMITATIONS, and FUTURE RESEARCH

Systems diagramming is the graphical representation of information systems, which falls under the umbrella of systems documentation. SD's importance is underscored by recent legislation, the role of accountants in system evaluation and change, and the need to understand business process flows for various reasons, including BPR.

We contribute to AIS research by developing a framework to classify SD methods. We also construct and test a model for explaining educator choice of SD methods to teach. The topic is timely in light of the aforementioned reasons and is the first to build a framework for SD and propose a model for analyzing the teaching of SD in graduate and undergraduate accounting education.

We validate our framework by demonstrating that educators teach certain SD methods in conjunction, consistent with our framework. We also find that recent IT/IS or audit work experience (an educator characteristic) is positively related to teaching a practitioner-based method, PM. Although we hypothesized that length of AIS teaching experience relate positively to teaching practice-based methods, we find no support for this. We also find no indication that AIS educators who primarily research IS also include REA in their courses. We find a positive relationship between teaching at a research school (an organizational characteristic) and teaching REA.

Obviously, the content of an instructor's chosen textbook has much to do with the SD method taught. For instance, Jones and Rama's (2006) AIS text revolves around UML and is the only AIS text to do so. However, this study shows that several factors, current IT/IS or auditing work experience and type of institution (teaching versus research), influence the choice of SD method (even if these methods are not included in texts).

We find that textbook coverage of the newer, practice-based methods (PM and UML) is slight. AIS educators and textbook authors should consider including these methods in their courses and textbooks for the following reasons. First, PM is the second most widely used method in industry (Bradford et al. 2007b). Second, PM are employed in ERP implementations for requirements analysis and gap analysis (i.e., matching "as is" processes with "to be" processes of the ERP system). Since enterprise systems should now be an important component of AIS education, PM are a necessary tool for students to master. Many accounting professionals use PM in business; accounting curriculum and texts should keep step with this change.

The study has a few limitations. We can only generalize results to AIS faculty. We cannot generalize to all accounting faculty; nor can we generalize our study to

computer science or MIS education. Very few of our survey respondents indicate that they include practice-based methods in their courses, reducing the power of our statistical analysis. Our model included only a select set of variables from the framework. We did not include course content or course format. The nature of the questions in the current survey also did not allow us to test the lower half of the framework, which predicts that purpose of use will influence educators' choice of SD method.

Average current emphasis on SD methods in the classroom ranges from 1.2 for UML to 3.2 for SF.[13] However, 51% of educators surveyed are determined to increase their coverage in this post-SOX world. Future research could examine whether faculty are increasing coverage and if their purposes of use are shifting. More research is also needed to see how SOX affects SD use in practice and consequently, in accounting education. An educational study that compares each type of technique and its respective effectiveness in illustrating business process concepts may be useful for accounting curriculum development.

Future researchers could use the framework to examine variables excluded from the current model. Other organizational variables to study include tenure requirements, technology resources, and access to the community's business network. Of particular interest would be an examination of the extent to which Auditing educators teach SD and for what purpose. A comparison between AIS and Audit courses would be useful in planning curriculum and ensuring comprehensive coverage of topics. This comparison should attend to differences in purpose of use to highlight to students the multiple benefits of learning these methods.

[13] On a scale of 1 to 5 where 1= no emphasis and 5= strong emphasis. Averages for other methods are REA (2.5), DFD (2.5), ER Diagrams (2.3), and PM (1.4).

This study is the first to examine AIS educators' SD choices. Future research could expand upon our model, using the framework to direct research that examines different individual, organizational and course characteristics. Textbooks could include this framework as a figure to assist students in understanding how SD methods originate and how practitioners use them.

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