An Innovation Perspective Of Accounting Information Systems Student Characteristics

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ABSTRACT

This research involves a study of students selecting the AIS major from the perspective of innovation theory. The study involved analysis of survey responses and academic records of 245 undergraduate students from a northeastern U.S. university. Study results suggest that AIS majors have a higher level of domain specific innovation than accounting and other traditional majors. AIS majors were found to have higher high school averages and Math SAT scores than traditional non-accounting majors, but no significant differences in verbal SAT scores. AIS majors did not differ significantly from accounting majors in any of these three measures.

INTRODUCTION

Recent legislation, such as Sarbanes-Oxley (SOX) Section 404, and the ubiquitous nature of computerized process in organizations require that accountants have a basic understanding of IT and its surrounding control. Further there is a need for specialists who understand highly technical controls and security features, and the implications of these controls on financial processing. Accounting Information Systems (AIS) programs provide fundamental IT control and accounting knowledge. As publicly traded companies continue to rush towards SOX Section 404 compliance, the need for AIS graduates is exploding. Still for AIS programs to succeed, they must be able to identify and market this exciting and relatively new field. This empirical study investigates the characteristics of AIS students from the perspective of students as innovative consumers of educational programs.

INNOVATION IN ORGANIZATIONS

As Crain notes, "customers want an endless supply of new products" (2004, p. 12). Despite efforts to continually develop new products, "companies are finding it increasingly hard to maintain a unique advantage long enough to make good profits on an innovation" (Engardio and Keenan 2002, p. 94). Colleges and universities have embraced this educational innovation as a way to meet needs of segments of students and provide flexibility in delivery of course content through methods such as online education and new majors. To keep pace with technological, information systems and communication changes, universities have also launched new majors, such as accounting information systems and digital media arts to provide students with knowledge and skills in emerging career fields. These new majors are designed for the innovative student interested in staying current with a changing world.

Successful new majors must attract students to sustain the major and build a critical mass of students. It would be useful for schools to identify prospective students who are the types of innovators most likely to enroll in new majors. Targeted communication with innovative high school seniors is critical because students increasingly have more choices in selecting universities and majors, and appear to be better informed in making these choices.

The purpose of this research is to explore the characteristics of students who elect a major in AIS, a relatively new field of study. We first describe the contents of AIS programs. Then we review the literature on innovativeness. We next describe the empirical study we conducted and the results we obtained. Finally we discuss our findings and the implications they have for launching successful AIS programs at colleges and universities.

AIS MAJOR

The prevalence of information technology requires accountants to have a fundamental level of information technology (IT) skills. Guidance from the International Federation of Accountants (IFAC) indicates that accountants should obtain general knowledge of IT, IT control knowledge, IT control competencies, IT user competencies, and additional specialized knowledge in the role of the manager, evaluator, or designer of a system (IEG11, 2003). General knowledge of IT includes areas such as, but not limited to, the systems acquisition development process and the role of technology. IT control knowledge and competencies involve maintaining knowledge of control frameworks, assessing effectiveness of computerized controls, and performing risk assessment, all of which are significant to Sarbanes Oxley Section 404 compliance efforts. IT user competencies involve the use of IT tools to solve business and accounting programs. In the area of specialized knowledge, the role of evaluator (IT Auditor) is of significant importance in evaluating the effectiveness of IT controls. IFAC intends that these competencies should be obtained through accounting program coursework and practical experience.

A small number of schools offer a major in AIS or Financial Information Systems (FIS) that extends beyond fundamental IT controls and general IT knowledge (Dillon and Kruck 2004; & Bryant et al. 1998). These programs graduate students who are well-suited to help companies and accounting firms bridge the gap between accounting, auditing and IT. Although AIS programs vary, common courses include Principles of Accounting Information Systems, IT Auditing, Database Management, Systems Analysis and Design, E-business, Enterprise Systems, and fundamental financial and managerial accounting courses. IFAC provides guidelines for AIS programs (IEG11, 2003).

AIS programs are well positioned to provide graduates that can fill the expanding need of IT control design and assessment specialists that are required to meet Sarbanes-Oxley Section 404 compliance. Never the less, the growth in the number of schools offering AIS programs has been slow. Understanding the characteristics of student innovators may assist schools in increasing growth of AIS programs.

NEW MAJORS

Unlike many other products and services that students consume, the choice to "consume" a new major such as AIS requires a multi-year period of consumption. While durable goods are also consumed over a period of many years, a bad choice can often be corrected, especially if the product is under warranty. Services can be terminated. It is often easy for the consumer to learn whether the product or service is performing poorly soon after purchase.

This is a much more difficult process when choosing majors. When a student elects to major in a field, the student often can only estimate the package of knowledge content that will be provided during his tenure at the chosen school based primarily on the title of the major and any brief description provided in the college catalog. The high level of risk that the student bears in making such a choice is greater than the risk he would encounter in choosing to consume a new product. This greater risk arises primarily from uncertainty caused by the lack of complete "product" information he is able to obtain at the time of choice. Uncertainty is a key component of the adoption process (Gatignon and Robertson 1985). Faculty may change, courses may not be available, the job market may deteriorate, and a number of other things may happen. Having never "consumed" a major before, the students is in a learn-as-you-go mode whereby it may take three or four years or more plus post-graduation experiences to decide this was a bad choice. Yet the choice may have a more profound effect on students' future than nearly any other decision they make. Given the high level of risk and uncertainty, why then would a student elect to register for a new major and what type of student would most likely pursue study of a new major?

Selecting a newly launched major is an involved process that provides a potentially risky decision for the student. Applying innovativeness theory to the AIS major decision offers the opportunity to better understand AIS student characteristics. The purpose of this study is to identify whether innovativeness theory is applicable to the AIS major decision and to determine AIS major student innovator characteristics.

THEORY DEVELOPMENT

"An innovation is defined as "an idea, practice, or object that is perceived as new by an individual" (Rogers, 2003 p. 12). Adoption of innovations is a vast research area that has focused on topics such as the characteristics of the innovation, the rate of adoption, the influence of the social network, and the characteristics of the innovator (Rogers, 2003). All of these topics offer relevance to the field of education. For instance, new programs and majors should be designed so that they will be positively perceived and used by students. Understanding rates of adoption of educational innovations would enable administrators to better evaluate the status of new programs and methods and project future success of these innovations. Comprehending the innovator's social network and the influence of others on the decision to adopt innovations is useful for educators. Finally, being able to identify and attract innovators will increase the success rate of new educational programs and methods. Innovation in education often involves administrators, instructors, and students.

There is a rich tradition of research in the acceptance and diffusion of educational innovations that dates back to the 1920's (Rogers, 2003). Many of the studies have focused on the rate at which different educational innovations have been adopted by educators. Some examples of educational innovation studies are diffusion of modern math (Ready, 1992), worldwide diffusion of kindergarten (Wollons, 2000), educational use of technology (Frank et al., 2004), and online marketing of educational programs (Gomes & Murphy, 2003). The focus of this study is on the innovative AIS student and his or her characteristics.

From a marketing perspective the inclination of an individual to purchase and try something new has been studied with respect to a wide variety of products and services. Consumer innovation is "a predisposition to buy new and different products and brands rather than remain with previous choices and consumer patterns" (Steenkamp, Hofstede, & Wedel, 1999). A distinction has been drawn between a general, innate state of innovativeness and a domain-specific state that manifests itself in a behavioral manner specific to some particular domain (Goldsmith and Hofacker 1991; Hirschman 1980; Midgeley and Dowling 1978). With domain-specific innovativeness, an individual may be innovative in one area while not innovative another. For example, an individual may be one of the first consumers to purchase a new electronic product but one of the last to adopt new clothing fashions.

Domain-specific innovativeness (DSI) has been shown to be a strong predictor of a variety of measures including behavioral intentions and behavior itself (Agrawal and Prasad 1998; Citrin, et. al. 2000; Goldsmith 1998; Goldsmith, Flynn and Goldsmith 2003; Goldsmith and Flynn 1992; Goldsmith and Hofacker 1991). Furthermore, DSI has been shown to be a better predictor of consumer innovation than an individual's overall innate level of innovation (Roehrich, 2004). In this study we adapt the DSI scale of Goldsmith and Hofacker (1991) to the realm of student innovativeness with respect to enrollment in college offerings of AIS. AIS is offered at few schools in the U.S., and several of these schools have launched their program in recent years, and the researchers consider AIS as new major. Therefore we hypothesize that:

H1: Students who enroll in AIS will exhibit a higher level of DSI that students who enroll in older, more traditional majors.

Adoption of an innovation may also be influenced by innovator characteristics beyond DSI. For instance, the innovator should be able to understand the nature and benefits of an innovation. Accordingly, Rogers (2003), suggests that intelligence is positively associated with an individual's level of innovation. Furthermore considering the significant importance of intelligence in the educational process, it appears likely that a student's intelligence would influence adoption of educational innovations.

Therefore we hypothesize that:

H2: Students who score higher on the DSI scale will have higher levels of intelligence than those who score lower on the DSI scale.

AIS programs are an innovation that contains components of a traditional accounting curriculum. The characteristics of innovation and intelligence are expected to differentiate AIS majors from major in accounting and older (traditional) majors.

H3A: Students who enroll in AIS will have higher levels of intelligence than students who enroll in older more traditional non-accounting majors, and

H3B: Students who enroll in AIS will have higher levels of intelligence than students who enroll in an accounting major.

METHODOLOGY

The study involved surveying 245 undergraduate business students enrolled in AIS and traditional business majors at a private university located in the northeastern region of the United States. Men constituted 52.3% of the sample and women 47.7%. The average age of the respondent was 20 years old. The AIS major was started at the school in 2000. It has nearly tripled in size in the four years of existence. Students completed a survey that included Goldsmith and Hofacker's (1991) six item DSI scale adapted to the domain of new majors. Survey responses were matched with demographic information and academic scores that were obtained from official academic records.

We measured student innovator characteristics using our adaptation of the domain specific innovativeness scale (Goldsmith and Hofacker 1991) which is shown below:

- In general, I would be the first in my circle of friends to enroll in a new major when it is offered at my school.
- If I heard that a new major was available at my school, I would be interested enough to enroll in it.
- Compared to my friends I would likely enroll in a new major
- In general, I am among the last in my circle of friends to know about a new major being offered at my school.
- I would not enroll in a new major at school if I haven't heard about it from my friends first.
- I do not like to enroll in a new major before other people do.

Goldsmith and others have adapted this scale to fit a variety of domains with varying degrees of success. Goldsmith and Hofacker (1991) provide evidence of unidimensionality of their six-item domain-specific innovativeness (DSI) scale. Most research applications of the DSI scale have found it to be unidimensional, but a few have not. These few studies have found that for some domains the scale is two dimensional, with the positive items loading on one dimension and the negative on the other (Goldsmith 2000; Goldsmith, Flynn and Goldsmith 2003; Grewal, et al 2000). Goldsmith, et. al. (2003) found that the two dimensions were correlated. When we performed exploratory common factor analysis with oblique rotation on the data we collected, however, we found that not only was our scale two-dimensional with the three positive-worded items loading on one factor while the three negative-worded items loaded on the second factor, but that the factors were not correlated ($r = 0.025$). It is not uncommon to find this two-factor dimensionality in scales employing negatively-worded items (Herche and Engelland 1996). Goldsmith, et. al. (2003) handled the two-dimensional results by aggregating the scores of all six items to form a single DSI measure. Grewal, et. al. (2000), however, chose to ignore the three negative items and only use the three positive items. We follow Grewal, et. al. and use only the positive items (1-3) in our analysis and dropped the negative items (4-6) from our analysis.

Initially statistical tests were used to determine the gender-specific characteristics of innovators versus non-innovators. Unidimensional items were next tested for reliability using Cronbach's Alpha. Factor analysis was then used to compute factor scores for the unidimensional DSI factor. The factor scores were then used to test hypothesis H1, that is, for a relationship between the student choice to enroll or not enroll in a new major, a dichotomous variable, and DSI using a point-biserial correlation coefficient. Correlation analysis and analysis of variance (ANOVA) was used to test hypotheses H2 and H3.

RESULTS

As noted previously, the results of the common factor analysis using oblique rotation to achieve simple structure revealed that the DSI scale was two-dimensional when applied to the new major field of study domain. The two dimensions were not correlated, therefore only the three-positive-item scale was used in subsequent analysis (Grewal, et. al. 2000).

Reliability is defined as "the degree to which measures are free from error and therefore yield consistent results" (Peter, 1979, p. 6). This three-item DSI scale demonstrates strong reliability based on a Cronbach's Alpha of 0.83, more than satisfying Nunnally's criterion of 0.70 for reliability (1967).

Having ascertained the strong reliability of the DSI scale, the relationship of DSI with selection of new major was then investigated. The variable AIS major was coded 1 for a student enrolled in AIS as the first or second (of a dual) major and 0 for a student not enrolled in the AIS major. A higher value for the DSI factor score indicated more innovativeness on the part of the student. In support of hypothesis H1, the DSI scale has a .315 correlation ($p < .001$) with the choice to enroll in the AIS major (Table 1). In addition, one way ANOVA analysis of DSI scores was performed and indicated that the scores differ between the major categories ($F=16.925$, $p < .001$) (Table 4a). The DSI score (standardized) was higher for AIS (.576) than Accounting (-.460) and Old Majors – Non Accounting (-.054) (Table 4). Contrasts of means indicate that AIS mean DSI scores differ from those of Accounting and Old Majors Non-Accounting (both $p < .001$) (Table 4B) further supporting H1.

Table 1
Correlation of DSI with Major Enrollment

Enrolled As Primary Or Secondary AIS Major	Pearson Correlation = 0.315
With	P Less Than 0.001
DSI Positive Factor	N = 235

Next a set of correlations (Table 2) were run between the DSI factor scores and the SAT Verbal and Math scores and high school grade point averages. Results indicate that domain-specific innovativeness was related to high school grade point averages (.15 correlation, $p = 0.028$), but not to SAT Verbal ($p = 0.221$) or SAT Math ($p = 0.202$) scores. The positive sign indicates that more innovative students tended to be more intelligent when intelligence was evaluated using high school grade point averages, thereby supporting hypothesis H2. More innovative students, however, did not score significantly higher or lower on SAT verbal or math tests.

Table 2
Pearson Correlations Between DSI score And SAT Verbal And Math And HS GPAs

		SATV	SATM	HSAVG
DSI Positive Factor	Pearson Correlation	.083	.087	.146
	P	.221	.202	.028
	N	219	219	229

Finally the relationship between intelligence and selection of the AIS major was analyzed through one way analysis of variance (ANOVA) with major category as the factor. Proxies of intelligence -- verbal and math SAT scores, and academic performance, high school average – were utilized as the dependent variables. The means of categories for these measures are listed in Table 3 and results of ANOVA are shown in Table 4A. Results of ANOVA indicate differences for SAT Math Scores ($F=7.931$, $p < .001$) and high school average ($F=7.454$, $p < .001$) but not for SAT verbal scores ($F=1.837$, $p = .162$). Contrast of means indicate that the mean AIS SAT Math score (598) was significantly ($p < .001$) greater than the mean Old Major – Non Accounting SAT Math score (555) but not meaningfully different ($p = 1.0$) from the mean Accounting SAT Math Score (585). Similarly, the mean AIS high

school average (91.6) was significantly (p = .001) higher than mean Old Majors - Non-Accounting high school average (88.2) but does not differ significantly from the mean Accounting high school average (90.4).

In regards to AIS and Old Majors-Non Accounting majors, the above results support hypothesis H3A, for SAT Math scores and high school averages but not for SAT Verbal scores. For H3B, students enrolled in AIS do not differ meaningfully from accounting majors in regards to SAT Verbal and Math scores and high school average.

Table 3
Group Mean Statistics

	Enrolled As Primary Or Secondary AIS Major	N	Mean
DSI Factor	AIS Major	48	.576*
	Accounting Major	46	-.460*
	Old Major – Non-Accounting	137	-.054*
SAT Verbal	AIS Major	46	547
	Accounting Major	46	539
	Old Major – Non-Accounting	137	525
SAT Math	AIS Major	46	598
	Accounting Major	46	585
	Old Major– Non-Accounting	137	555
High School	AIS Major	48	91.6
Grade Average	Accounting Major	47	90.4
	Old Major – Non Accounting	144	88.2

* standardized scores

Table 4A
Analysis Of Variance

		Sum Of Squares	DF	Mean Square	F	P
DSI Factor	Between Groups	26.477	2	13.238	16.925	.000
	Within Groups	181.468	232	.782		
	Total	207.945	234			
SAT Verbal	Between Groups	19861.788	2	9930.894	1.837	.162
	Within Groups	1221757.426	226	5406.006		
	Total	1241619.214	228			
SAT Math	Between Groups	79792.894	2	39896.447	7.931	.000
	Within Groups	1136944.224	226	5030.727		
	Total	1216737.118	228			
HS Avg.	Between Groups	473.631	2	236.815	7.454	.001
	Within Groups	7497.465	236	31.769		
	Total	7971.096	238			

Table 4B
Contrasts Of AIS With Other Major Categories

Dependent Variable	Contrast Of AIS With	Mean Difference	Std. Error	P
DSI Factor	Accounting major	1.036*	.18053040	.000
	Old major Non-accounting	.630*	.14806375	.000
SAT Verbal	Accounting major	8.478	15.331	1.000
	Old major Non-accounting	22.428	12.529	.224
SAT Math	Accounting major	13.696	14.789	1.000
	Old major Non-accounting	43.880	12.087	.001
HS Avg.	Accounting major	1.234	1.15663	.862
	Old major Non-accounting	3.388	.94686	.001

* standardized amounts

DISCUSSION

Study results suggest that Domain Specific Innovation (DSI) applies to the AIS major decision and that student characteristics are related to enrollment in AIS. The strong psychometric properties, e.g. high internal reliability, of the three item DSI scale indicate that this measure is well suited for educational innovations. Using this scale with high school students would provide an efficient method to identify the most likely candidates for new academic programs such as AIS.

The study provided mixed evidence of the importance of intelligence on enrollment in AIS. AIS had higher intelligence, as measured by high school average and by Math SAT scores, than traditional non-accounting majors. However, Verbal SAT scores varied insignificantly between AIS and traditional non-accounting majors.

The AIS majors do not significantly differ in SAT scores and high school averages from accounting majors. This suggests that the level of intelligence in understanding and evaluating AIS is not above or beyond what is necessary in an accounting program. Perhaps there is a threshold of intellectual ability beyond which intelligence becomes unimportant in the new major decision.

This does not detract from the AIS programs' ability to bring in majors that demonstrate higher academic achievement than old – non accounting majors. Furthermore, AIS majors demonstrate higher levels of innovation than the accounting major. The innovative characteristic most likely will lead to more innovative accounting and information systems professionals. These professionals maintain the foundations to have a broader vision of accounting and may be more flexible in undertaken new assignments. Accountants interested in innovation are important to continued success of the profession in the constantly changing business world.

Though more innovative students tend to score higher on both SAT verbal and math tests, the differences were not significant. The higher scores on SAT math for students enrolled in AIS may be explained by the quantitative nature of this program in which they were enrolled. Post hoc comparison of AIS to the Information Systems major was performed to ensure that that the inclusion of technology in the program did not bias study results. AIS major DSI scores, SAT Math scores, and high school averages were significantly higher than information systems major. Therefore, the technology component did not bias results of student characteristics.

LIMITATIONS

The generalizability of the results of our reported study is limited by the fact that the university at which the study was conducted is of a particular type (private, liberal arts college) and is located in a specific geographic region of the United States. In order for the results to be more representative of the general university population, the study needs to be extended to other colleges and universities with the sample size increased. Replication should include other universities of varying types (state vs. private, technical vs. liberal arts, etc.) in various regions of the United States. Increasing the sample size will facilitate determination of significant effects that are marginally non-significant in the current study. Although the study was limited to one school, it still offers valuable evidence to educators. It offers a first effort at defining a scale to measure domain specific innovativeness for the AIS educational domain in which the student is the consumer. Future research should address scale refinements not included in this study.

A second limitation concerns the use of self-report items to measure domain-specific innovation. These items are adaptations of domain-specific items designed to measure domain-specific innovativeness with respect to objects and targets other than new majors in an academic field of study. As with all self-report measures, there is a potential for bias caused by an individual's inability to objectively and accurately evaluate themselves. This bias could be caused by sensitivity to certain issues as well as the individual's inability to objectively view themselves, their feelings and their intentions and behavior.

A third limitation concerns the "newness" of the new major, AIS. As with all products, as time from introduction of the product increases, the "newness" of the product decreases (Rogers 2003). Students enrolling in the

AIS major five years from now cannot be considered to be as innovative as students entering the new major this year. Similarly, students who enroll in a new major as freshman are more innovative than students who enroll after having completed two or three years of college education. To attempt to reduce these effects of time and word-of-mouth our study surveys freshman at matriculation and does so during the first three years of the new AIS program.

CONCLUSION

This study has extended previous research by applying DSI to the area of education and enrollment in a specific major. Accordingly, this study provides a foundation for further research in this area. This research could be extended by investigating the relationship of the innovator with other aspects of the innovation process such as characteristics of the innovation, the influence of the innovator's social network, rate of adoption of the innovation and investigation of innovation on other new majors. For instance, the importance of innovator's characteristics may change with the attributes of the educational innovation. With this knowledge educators could tailor innovations to match the innovation level of the targeted educational group. Also, understanding the influence of others (e.g., peers, parents, teachers, and counselors) in the student's enrollment decision is important to the marketing and communication of a new major. Finally, investigating the level of innovation and the rate at which an innovation is adopted would help educators to understand whether the new major will attract the necessary critical mass to succeed in the long run.

Many accounting educators demonstrate a steadfast determination and strong ability to deliver innovative programs and teaching methods. Still some of these programs fail due to lack of student interest. Focusing on innovative student characteristics offers the potential to develop communication strategies aimed at student innovators that offer the potential of enhancing the success rate of educational innovations such as AIS. Further focusing on innovation characteristics could increase the success of current AIS programs and the launching of cutting edge programs such as AIS and fraud investigation.

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