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Declining CIS Enrollment: An Examination of Pre-College Factors

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Keywords: computer career, career counseling, declining computer majors, enrollment decline

EDSIG activities include the publication of ISEDJ, the organization and execution of the annual ISECON conference held each fall, the publication of the Journal of Information Systems Education (JISE), and the designation and honoring of an IS Educator of the Year. • The Foundation for Information Technology Education has been the key sponsor of ISECON over the years. • The Association for Information Technology Professionals (AITP) provides the corporate umbrella under which EDSIG operates.

Declining CIS Enrollment:
An Examination of Pre-College Factors

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Abstract

Anecdotal and direct enrollment evidence indicates there is a declining interest in Computer Information Systems (CIS) as a major. We believe one of the significant contributors to this decline is the lack of availability of accurate information about this area to high school students when they are making choices about future careers and appropriate colleges. We tested this proposition by surveying freshmen in our introductory computers course to determine their differential knowledge of the various computer career fields. In addition, we collected data concerning the information that a student used to select a college, select a major, their initial college major and the source of that information. The results of this survey provide initial guidance on some remediation activities that CIS programs may undertake to increase the number of students pursuing a CIS major.

Keywords: computer career, career counseling, declining computer majors

1. INTRODUCTION

A growing body of evidence that indicates there is a declining interest in Computer Information Systems (CIS) as a university major. If this decline in enrollments continues, it will have a major impact on both academic organizations and businesses that depend upon these graduates to re-supply these very specialized positions. Our research has located a fair amount of speculation as to the cause of this decline but only a limited amount of targeted research. We believe that some of the problem lies with decisions made by students when they are still in high school deciding on possible future careers. In this research project, we undertake to survey incoming students to determine factors that dissuaded or encouraged them to major in CIS.

2. PROBLEM AND PURPOSE

Most, if not all, direct and anecdotal evidence points to a steady decline in the number of students who are electing to major in a computing-related field, such as Computer Information Systems (CIS), Computer Science (CS), or Management Information Systems (MIS) (Kessler, 2005; Rednova, 2005). There is speculation that this is due to the dot-com bust and the concern about the outsourcing of jobs to countries such as China and India.

However, according to the U.S. Department of Labor, high-level jobs that combine technical and business skills are still abundant in the U.S. The Bureau of Labor Statistics projects that the number of jobs in the industry sector **Computer Systems Design And Related Services**, which includes jobs such as information systems managers, programmers, systems analysts, database administrators, and network

administrators, will increase by 54.6% from 2002 to 2012 (Bureau 2004).

If there are not enough qualified graduates to fill these jobs, however, this robust employment demand could be stymied. While the shortage of qualified Information Technology (IT) graduates has not become a significant problem yet; the decline of computing majors, if the trend continues, will create a problem in the near future.

Interviews with our students have led us to suspect that one factor contributing to the decline in CIS majors may be that high school counselors, along with other sources, are not providing students with accurate information about the CIS field when they are selecting a college major. Other sources of information, such as family, peer and the popular press, may be also be sources of information used to form opinions about this field of study.

We propose to determine the factors that influence a student's decision concerning a CIS major by conducting a survey of students enrolled in freshman level introductory computer courses. The questionnaire will examine their awareness of computer careers and factors that influenced their choice of a computer related major or non-computer related major. We hope that an analysis of this data will provide some insight into remedial actions that may be undertaken to reinvigorate enrollment in CIS courses.

3. BACKGROUND

The number of students majoring in computing degrees has fluctuated greatly over the last twenty-five years. According to Computing Research Association's Taulbee Survey (Zweben, 2004), undergraduate Computer Science (CS) degrees awarded nearly quadrupled in the early 1980s to over 42,000 degrees per year. This was followed by a period of swift decline and a leveling off during the 1990s of approximately 25,000 degrees per year. During the late 1990s, CS degree production again surged to over 43,000 in 2001. Since 2000, however, there has been a steady decline in the number of CS degrees with a total of 14, 185 awarded in 2003/2004. In addition, the number of students that have declared CS as their major has declined

steadily and is now 39 percent lower than in the Fall of 2000 (Vegso, 2005.)

Current figures appear to indicate that student majors in Computer Information Systems (CIS) or Management Information Systems (MIS) are also declining. Although figures are not compiled for CIS/MIS nationwide, the levels of CIS/MIS majors at our university and statewide appear to mirror the trends of CS majors. Our own CIS department has seen a 32 percent decline in CIS majors since 2000. When we examined enrollments in CIS/MIS for other Louisiana state universities, we found that at the statewide level there has been an even larger decrease (43 percent) in the number of students seeking a CIS/MIS degree since 2000 (Table 1).

The reasons why students are wary of majoring in CIS/MIS is not well documented. Some educators, such as Robert Baskerville, professor and chair of CIS at the Robinson College of Business At Georgia State University, speculate that the dot-com bust, the outsourcing of IT jobs, and the volatility of IT stocks may be discouraging students from pursuing IT degrees (BizEd, 2004.) Baskerville goes on to suggest, "This may be a cyclical process in the information systems job market. As the economy comes back and the demand for IT workers resumes, businesses will find a significant shortfall in skilled workers." This shortfall will spur students to flock back to CIS/MIS programs in order to take advantage of the job opportunities. Baskerville states that we may have to wait until the popular press discovers that there is an impending shortage in the IT workforce before enrollment figures will increase.

A related study conducted at the Center for Economic Research at Chapman University in Orange California may shed some light on reasons why there are declining CIS/MIS majors (Doti, 2005.) Although this study did not focus singularly on CIS/MIS degrees, it analyzed data for business school degrees, both master's and bachelor's, awarded in the U.S. over the last 30 years. The purpose of the study was to determine factors that influence the number of degrees awarded each year. Conventional wisdom has held that when the economy is good, enrollments in business schools drop; and conversely,

when the economy is in a slump, workers return to school and enrollments increase.

Their data did not support this widely-held conventional wisdom. The researchers found that while there is year-to-year fluctuation, there has been a steady consistent growth in business school enrollments, from 30,000 in 1973 to 120,000 in 2000 (Doti, 2005.) By testing various macroeconomic variables, the researchers were able to determine factors that may account for the year-to-year fluctuations in business degrees:

- A 1 percent increase in the U.S. gross national product (GNP) yields a 0.6 percent increase in the number of master's degrees awarded three years later.

- A 1 percent increase in the number of high school graduates leads to a 0.6 increase in the number of business degrees awarded four years later.

- A 1 percent increase in the unemployment rate results in a 0.2 decrease in the number of business degrees awarded four years later.

The results of this study indicate that good economic times will spur students to enroll in business degrees. While CIS/MIS degrees usually include a number of business courses and are often housed with the business disciplines, the recent overall trend in CS/CIS/MIS enrollments seem to indicate that the level of enrollments are not as heavily influenced by the general economy. That is, while business school enrollments have showed a steady increase over the last five years, CS/CIS/MIS enrolments have exhibited an overall decline during the same period. Table 1 (located at the end of the article) compares CIS enrolments with the other College of Business (COB) enrolments and provides support for this general observation among Louisiana Universities collectively (excluding the authors' university) and the authors' university specifically.

4. PURPOSE AND METHODOLOGY

To uncover some of the causes of this enrollment decline, we decided to examine entering students' differential knowledge of the various computer career fields and to determine the factors that influenced their selection of college and major field of study. We hope that the results of this survey will provide guidance on some remediation activities that we may undertake to increase the number of students pursuing a CIS program at our university.

We selected students in freshman level introductory computer courses offered by the College of Business and General Studies as our target population. This group was selected on the basic assumption that at this point in their college studies they would have had the least amount of modification in their attitudes and knowledge of computer related careers and majors since leaving high school.

In selecting the items to be included in the questionnaire, we drew on many of the suggested causes of disinterest that were suggested in our literature review (BizED, 2004; Doti and Tuggle, 2005; Kessler, 2005; Rednova, 2005). We also used our own experience in teaching, researching and consulting on issues important to CIS students and prospective employers. Where possible, we used Likert scales for question responses to enable statistical analysis where sufficient responses were available. After developing the initial questionnaire, we had it reviewed for face and content validity by four students representative of the target population along with four instructors and four college recruiters familiar with the target population.

Because we wished to collect the opinions of incoming students in an introductory computer course, we decided to use a web-based survey to reach our target population. We believe that the shortcomings of web-based surveys, which were identified by O'Malley, et al., (O'Malley, 2002) such as demographics, technology capability, and literacy capability of the participant, appear to be non-factors in this survey given the subject matter and the target population. The survey instrument is shown in the Appendix.

5. DISCUSSION OF RESULTS

This study represents an initial foray into the subject of enrollment declines in CIS majors. However, it is interesting to examine the responses at this point. This section will

present some preliminary observations about these initial respondents. Forty-four usable responses were obtained with approximately the same number of students from the business and general studies courses. While the sample provided some interesting implications, there was insufficient data to do any analytical statistics. All tables are located at the end of the article.

Demographics

As Table 2 indicates, the respondents form a diverse group of students rather than the compact distribution that we expected from a freshman level course. About half of the students are 25 or older with the average number of course hours completed and in progress considerably higher than a traditional freshman.

Major Selection

Tables 3, 4, and 5 give some background into the interest and attitudes of the students with regard to computer related majors. The students were asked if they had ever considered a college major dealing with computers (Table 3). If the student selected one of the choices indicating they were not in a computer related major, they were directed to a follow-on question based upon their selection. If they chose "Yes, but…" they were directed to the question shown in Table 4. If they chose "No," they were directed to the question shown in Table 5.

There were 14 respondents to the question shown in Table 4 with 17 responses, since multiple answer selections were permitted. While there was no single reason that emerged, we feel that all of the selections indicate a lack of sufficient information to make a good decision. There were not enough responses to "Other" for analysis.

Table 5 gives some interesting things to think about in determining what is classified as a technical career. No single factor dominated the "Other" responses but they do provide some direction for expanding the choices in this section in future questionnaires. Comparing these responses with their current majors may provide some additional insight into ways to attract students into some of the less technical

areas of CIS, such as business analysis or web mastering.

High School Influences

Tables 6, 7 and 8 attempt to discover the factors students used to develop their opinions and awareness of computer related majors prior to matriculation. When looking at Table 6, we can see that personally developed information appears to play a very important role in the decision making process.

In Table 7 we examined the perceived effectiveness of high school counseling in providing effective guidance to college majors, especially those related to computers. Based on a cumulative comparison of the responses to all questions in this section, only 27% of the respondents answered favorably (agree or strongly agree) about their high school counseling experience.

Table 8 shows that while the majority of students are comfortable with their personal computer skills, they have little knowledge of the availability, societal impact or career opportunities in CIS and other computer related disciplines.

6. SUMMARY AND CONCLUSIONS

This paper presents the results of a pilot questionnaire given to a relatively small sample of students. However, we feel this initial study has shown that there are areas that can be addressed that may lead to CIS enrollment increases. The results seem to indicate that our initial speculation that high school students are not obtaining adequate and/or accurate information concerning computer-related majors appears to be true for many students. The results also uncovered a variety of causes for the disinterest in a computer career. Reasons that involve personal likes and dislikes (i.e. I don't like computers or I don't want a technical career) are probably not something that can be ameliorated. However, those reasons, such as lack of career information and the perception of a weak job market are areas that can be addressed proactively.

One particularly surprising result was the fact that over half of the respondents reported choosing their major using only self-developed information. They appeared

to give limited influence to family, high school counselor, peers, or the popular press. We initially believed that high school counselors played a large role in the student's career decision-making process, but our results indicated otherwise. Our survey found that students have a high level of dissatisfaction with their high school counseling experience.

All of these factors discussed above might be addressed and improved by a CIS information campaign directed at counselors and teachers of computer classes in the high schools matriculating our students.

The survey also overwhelmingly indicates that students have little knowledge of the availability, societal impact or career opportunities in CIS. This is something that might be remediated effectively by including these topics as part of our introductory computer classes. This would help to counter any inaccurate information acquired by the student prior to enrolling in college and, at the same time, provide the very knowledge that the student needs to make an informed career choice.

For the future, we plan to revise the survey instrument using information gained from responses to this initial survey. Thereafter, we will conduct a survey at the beginning of the Fall 2005 semester with a larger number of participants. We think this will provide us with more students who are early in their college career, i.e. "traditional" freshmen, which should yield an expanded and extended set of data. This research has taken an initial step in the quest for some answers to the question of declining CIS majors. Future research should be able to provide more definitive answers to this important question.

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Appendix – Tables and Web Questionnaire

Table 1. - Five year comparative enrollment

	Fall 2000		Fall 2004		Enrollment Change	
	CIS	COB	CIS	COB	CIS	COB
Other Louisiana Universities with CIS Majors	2743	13952	1561	15657	-43%	12%
Authors' University	361	1074	239	1084	-34%	1%

Data Source: Board of Regents, University of Louisiana System, 2005

Table 2: Basic demographics of respondents

			Female		Male	
Age			Average Hours		Average Hours	
18 - 24	55%	40%	50	74%	34	
25 and older	45%	60%	40	26%	88	
Total	44	25		19		

Table 3: Did you ever consider a college major dealing with computers?

Answer Choices (select one)	Responses	
Yes, I am currently studying a computer-related major.	4	9%
Yes, but I did not pursue it.	14	32%
No.	26	59%

Table 4: I considered a computer-related major but did not pursue it because

Answer Choices (select all that apply)	Responses	
I could not find enough information about computer careers.	3	21%
I thought it would be too hard.	4	29%
I thought it would be too technical.	3	21%
I didn't think I would like the work.	3	21%
I didn't think the employment prospects were good.	2	14%
Other (please specify)	2	14%

Table 5: I did not consider a computer-related major because

Answer Choices (select all that apply)	Responses	
I never heard any information about computer careers.	1	4%
I am not interested in technical careers.	10	38%
I don't like using computers.	4	15%
People who use computers are strange.	0	0%
I didn't think the employment prospects were good.	2	8%
I don't have access to a personal computer.	3	12%
Other (please specify)	7	27%

Table 6: How did you select your major?

Answer Choices (select all that apply)	Responses	
Inputs from family	5	11%
Input from school counselor	7	16%
Inputs from peers	5	11%
Decided yourself without input from anyone	25	57%
Heard about the field from books, TV, etc.	2	5%
Other (please specify)	5	11%

Table 7: Select the designator that best describes your level of agreement with the comments about your high school counseling experience.

SD - Strongly Disagree   D - Disagree   N - Neutral   A - Agree   SA - Strongly Agree

	SD	D	N	A	SA
S(he) gave me good ideas concerning my college major.	8	7	14	9	5
S(he) was knowledgeable about careers in the computing field.	6	9	17	7	4
S(he) gave me good counseling concerning computer-related careers.	8	12	14	5	4
Overall I am satisfied with the college and career counseling I received in high school.	9	8	13	5	8

Table 8: Select the designator that best describes your level of knowledge about each of the listed topics.

None   Min -. Minimal   Mod - Moderate   Signf - Significant

	None	Min	Mod	Signf
College major in Computer Information Systems (CIS)	20	14	7	2
Careers available to a CIS major	21	15	5	2
College major in Computer Science (CS)	22	15	4	2
Careers available to a CS major	23	13	5	2
College majors in other computer-related fields	20	13	8	2
Careers available in computer-related fields	20	14	6	2
Using computers in general	6	7	21	9

Web Questionnaire

Entering Student Awareness of Computer Related Careers   Exit this survey >>

1. Informed Consent

We are conducting research to determine the type and accuracy of information that high school counselors are providing to high school seniors when they are making choices about appropriate colleges and future careers, particularly those relating to computers. We are gathering data from students like you who are enrolled an introductory computer course. We are studying the factors that influence the selection of a particular college major and knowledge of related careers. We hope that the results of this survey will provide guidance on remediation activities that we may undertake to provide more accurate information to high school students concerning computer-related majors and careers.

Your part in this research will be to complete an on-line questionnaire consisting of approximately 20 questions. Participation in the study is voluntary and you may refuse to participate if you so desire. This study is not linked to your grade and refusal to complete the questionnaire will not affect your grade in this course.

No identifying information is collected on the questionnaire. No person other than the principal investigators listed below will have access to the requested information. You may change your mind and withdraw from the study at any time without penalty.

If you agree to participate in the study, select the "I agree to participate" below. If you do not wish to participate in the study or stop after starting the survey, select the "Exit this survey" link in the upper right hand corner of every page.

1. I agree to participate.
   Agreed

Select the Next link below to proceed to the questionnaire. Thank you for your help.

If you have any particular questions or concerns about this research project, you may contact any one of the principal investigators:

Dr. Lissa F. Pollacia   Dr. William Lomerson
Northwestern State University   Northwestern State University
pollacia@nsula.edu   wlomerson@nsula.edu
(318)357-5718   (318)357-5051

Next >>

Entering Student Awareness of Computer Related Careers　　　Exit this survey >>
2. Demographics

After answering all the questions on a page, click NEXT to proceed to the next section of the survey or PREVIOUS to return to the previous section of the survey.

2. Gender
Male　　　Female
○　　　○

3. Age
18　　19　　20　　21　　22　　23　　24　　25 or older
○　　○　　○　　○　　○　　○　　○　　○

4. Number of hours of college credit:
[_____]

5. Your major (please do not abbreviate):
[_____]

6. Course Number for this course (e.g., CIS3020, COMP1020, etc.):
[_____]

7. How did you select your major (select all that apply)?
☐ Inputs from family
☐ Input from school counselor
☐ Inputs from peers
☐ Decided yourself without input from anyone
☐ Heard about the field from books, TV, etc.
☐ Other (please specify)
[_____]

8. Did you ever consider a college major dealing with computers?
(Depending upon your answer, you will skip Question 8 or 9 or both 8 & 9.)
○ Yes, I am currently studying a computer-related major.
○ Yes, but I did not pursue it.
○ No.

<< Prev　　　　Next >>

Entering Student Awareness of Computer Related Careers　　　Exit this survey >>

9. I considered a computer-related major but did not pursue it because (select all that apply)
☐ I could not find enough information about computer careers.
☐ I thought it would be too hard.
☐ I thought it would be too technical.
☐ I didn't think I would like the work.
☐ I didn't think the employment prospects were good.
☐ Other (please specify)
[_____]

<< Prev　　　　Next >>

Entering Student Awareness of Computer Related Careers   <u>Exit this survey >></u>

10. I did not consider a computer-related major because (select all that apply)

☐ I never heard any information about computer careers.
☐ I am not interested in technical careers.
☐ I don't like using computers.
☐ People who use computers are strange.
☐ I didn't think the employment prospects were good.
☐ I don't have access to a personal computer.
☐ Other (please specify)

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Entering Student Awareness of Computer Related Careers   <u>Exit this survey >></u>

5. Computer Career Areas

11. To the best of your knowledge, identify the career area that is primarily associated with the described activity.

The choices are CIS (Computer Information Systems), CS (Computer Science), Both (are associated with the activity), Neither (are associated with the activity), DK (don't know).

	CIS	CS	Both	Neither	DK
Deal(s) with developing computer hardware systems.	○	○	○	○	○
Deal(s) with developing information systems.	○	○	○	○	○

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Entering Student Awareness of Computer Related Careers   <u>Exit this survey >></u>

6. High School Counseling

12. For this group of statements, select the designator that best describes your level of agreement with the comments about your high school counseling experience.

SD - Strongly Disagree D - Disagree N - Neutral A - Agree SA - Strongly Agree

	SD	D	N	A	SA
S(he) gave me good ideas concerning my college major.	○	○	○	○	○
S(he) was knowledgeable about careers in the computing field.	○	○	○	○	○
S(he) gave me good counseling concerning computer-related careers.	○	○	○	○	○
Overall, I am satisfied with the college and career counseling I received in high school.	○	○	○	○	○

13. Two letter state code where you attended high school.

14. For this group of statements, select the designator that best describes your level of knowledge about each of the listed topics.

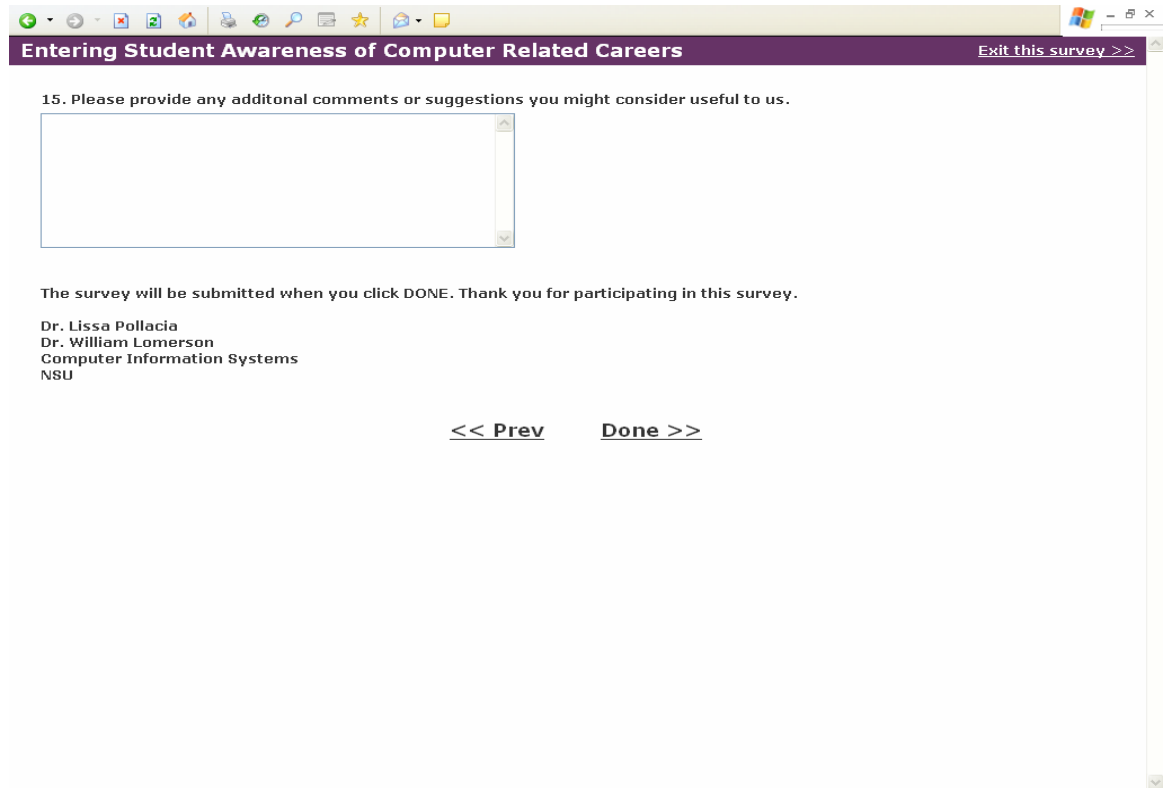|	None	Minimal	Moderate	Significant
College major in Computer Information Systems (CIS)	○	○	○	○
Careers available to a CIS major	○	○	○	○
College major in Computer Science (CS)	○	○	○	○
Careers available to a CS major	○	○	○	○
College majors in other computer-related fields	○	○	○	○
Careers available in computer-related fields	○	○	○	○
Using computers, in general	○	○	○	○

<u>**<< Prev**</u>   <u>**Next >>**</u>

Entering Student Awareness of Computer Related Careers   Exit this survey >>

15. Please provide any additonal comments or suggestions you might consider useful to us.

The survey will be submitted when you click DONE. Thank you for participating in this survey.

Dr. Lissa Pollacia
Dr. William Lomerson
Computer Information Systems
NSU

Entering Student Awareness of Computer Related Careers   Exit this survey >>

15. Please provide any additonal comments or suggestions you might consider useful to us.

The survey will be submitted when you click DONE. Thank you for participating in this survey.

Dr. Lissa Pollacia
Dr. William Lomerson
Computer Information Systems
NSU

<u><< Prev</u>   <u>Done >></u>