FRESHMEN EXPECTATIONS OF INFORMATION SYSTEMS CAREERS VERSUS THEIR OWN CAREERS

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ABSTRACT: College student interest in careers as information systems (IS) professionals has declined dramatically in recent years. If continued, this trend could have a profound effect, both on academia and industry. One possible explanation for this decline is that students hold negative perceptions of the workstyle associated with the positions held by IS graduates. A study of freshman business majors was conducted which compared their perceptions of IS workstyle to their own expected careers. The study showed that compared to their perceptions of IS jobs, they expected their own jobs to involve substantially more human interaction and less direct involvement in the implementation of computer technology. The results suggest a need for: (1) a more proactive strategy to market the IS career both inside and outside the classroom, and (2) some creative approaches for the placement and content of programming activities in both the major and the career.

Keywords: Student attitudes, student perceptions, curriculum, workstyle, entry-level positions, job preferences, information systems careers.

INTRODUCTION

UCLA has conducted an annual survey of college freshmen at two and four year colleges and universities for several years (2, 3, 4). Since 1977 they have included careers as "computer programmer or analyst" among the choices. Of the choices available, these are the only ones directly relating to a career as an IS professional. According to the UCLA surveys, interest in programmer/analyst occupations surged from 2.8% in 1977 to a high of 8.8% in 1982.

This unprecedented rise in interest was then followed by an equally dramatic decline in interest to a low of 2.7% in 1987. The peak in interest in 1982 resulted in a corresponding peak in graduates in 1986. The large declines in computer-related enrollment over the 1985-1988 period will be reflected in a marked decline in degrees conferred during 1989-1992.

Colleges and universities, many of which struggled to add computer- related curriculum capacity during the early and mid-1980s have already felt the sting from declining enrollments. Now, they are trying to maintain the viability of their programs.

Industry, on the other hand, is just beginning to feel the effects of the reduced number of graduates. This decline in interest has not gone unnoticed and has been the basis for articles in the Wall St. Journal (10) and Computerworld (26). While a number of hypotheses are espoused in these and other articles (21), little organized research has been done to determine the cause of the decline.

Are IS Professionals Different from Users?

IS professionals are those persons who work as programmers, systems analysts, project managers, operations managers, etc., in the functional area of data processing (DP) or management information systems (MIS). It has long been theorized that persons who work in IS are somehow different from other persons who work in business organizations--persons who today would be referred to as "end-users" or "non-users".

The historic focus of this difference has been on those who design information systems versus managerial users of such systems (8, 11, 14, 15, 17). Cougar and Zawacki (8) performed the most extensive study to date of IS personnel and users. They studied three occupational groups

(clerical, professional, and managerial) and examined "growth need strength" and "social need strength" in more than 2,500 IS workers. They found that within the same occupational group, IS personnel tend to have higher growth needs and lower social needs than users. Their finding is supported by two other studies that indicate that introversion is substantially more common among IS personnel than among users (16, 18).

Both studies utilized the personality typology developed by Karl Jung (13) which contains four dimensions: extrovert-introvert, sensing-intuitive, thinking-feeling, and judging-perceptive. The Lyons (16) study indicated that two-thirds of IS personnel were introverts while the Mawhinney (18) study indicated that only half of managerial users were introverts.

The Entry Level Position

Couger and Zawacki (8) attributed the low social need among IS workers to the nature of the entry level position. The traditional entry has been through computer programming, regardless of whether a person enters as a result of an intraorganizational transfer from some other functional area or as a direct hire out of an undergraduate college program. Indeed, at a recent international conference on computer personnel, a panel of practicing IS managers agreed that the first step in the IS career path in their organizations involved "immersion in technology" which was accomplished in a programming environment (23).

A similar phenomenon occurs in academia at the entry level of undergraduate programs intended to prepare students for careers in IS. The first course in almost all such programs is a programming course. The model curriculum for the Association for Computing Machinery (20) recommends an introductory programming course as the first course in the curriculum. Although the DPMA (9) recommends that the programming course be preceded by two other courses (Introduction to Computer Information Systems and Microcomputer Applications in Business), the first of these is usually a business core and the second an elective. Thus the programming course is the first course in the major. Furthermore, students who dislike programming are less likely than students who enjoy programming to continue on in such programs.

Couger and Zawacki (8) contend that communication and behavioral skills are not crucial to the success of a programmer, but technical skills are. Weinberg described the programmer's lack of desire for social interaction well: "If asked, most programmers probably say they preferred to work alone in a place where they wouldn't be disturbed by other people" (24, p. 52). Thus it appears that both entry level positions and undergraduate programs "conspire" to discourage an IS career except for those more interested in technology than in human interaction. These traits later become a problem as the programmer progresses to the next step in his/her career path, typically that of systems analyst.

The necessary skills for systems analysts are substantially different from those for programmers. Wood described systems analysts as:

> *people who communicate with management and users at the management/user level; document their experience; understand problems before proposing solutions; think before they speak; facilitate systems development, not originate it; are supportive of the organization in question and understand its goals and objectives; use good tools and approaches to help solve systems problems; and enjoy working with people* (27, p. 24).

Whitten, Bentley, and Ho state *"systems work is people-oriented work and systems analysts must be extroverted or people-oriented people"* (25, p. 19).

Overview of the Study

Bentley College in Waltham, Massachusetts, observed a growth and decline in its undergraduate IS major that paralleled the UCLA studies. The number of majors peaked at 650 in 1986 and then dropped rapidly to its present low of 120. Programs were initiated in an attempt to both understand and reverse the decline in student interest.

One such program included studies of freshmen business majors that assessed their perceptions of a typical IS graduate's workday. The freshmen's perceptions were assessed both at the beginning and at the end of the academic year. Three different aspects were examined, two of which have already been reported. One aspect compared the views of students with those of IS faculty (6), while the second aspect examined the effect of an introductory computer course in changing those perceptions (19). This paper compares the students' perceptions of the IS graduate's workstyle with their perceptions of their own expected starting positions.

HYPOTHESIS

The Hypothesis

The IS program where this study was conducted offers eight other undergraduate business majors. Although the majors that are currently the most popular are accountancy, management, and marketing, the other majors also attract a fair number of students.

Presumably, the typical undergraduate business major provides entry into a position that is related to that major. Thus it is reasonable to expect a student to consider the future workstyle suggested by a given major, if only in a subjective fashion. Consequently, it was anticipated that perceptions of students' own entry-level positions would be different than the same students' perceptions of the typical IS graduate's starting position. Stated in null form, the hypothesis tested was:

> ***Ho:Students perceive no difference between the workstyle of the typical IS graduate and their own expected starting position's workstyle.***

METHOD

Subjects

This study used as its subjects all students enrolled in a required introductory computing course at Bentley College. Bentley, an independent college, is the eighth largest undergraduate college of business in the United States. Although a major in liberal arts does exist, typically more than 95% of the freshmen enter as business students and are encouraged to declare a major when applying.

Bentley was undergoing AACSB selfstudy at the time and successfully achieved this accreditation in 1989. The curriculum reflects the AACSB philosophy which provides for a balance among general education, common body of business knowledge, and major area courses (see Exhibit A for the distribution in the IS curriculum). As is typical of AACSB programs, students may take only general education courses during the freshman year.

The introductory computing course is required to be taken during the first semester of the freshman year. Thus almost all the participants in this study were first semester freshman year business majors. Participation in the study was voluntary and participants were allowed to remain anonymous. However, participants were encouraged to identify themselves in order to facilitate an eventual "post treatment" survey.

In the first survey, responses were received from 406 of the 1058 students, resulting in a response rate of 38%. In the second survey, responses were received from 163 of the 406 students who responded to the first survey, a response rate of 40%.

The Instrument and Procedure

A nine-item questionnaire was developed for the first survey to assess perceptions of the workstyles of graduates of the IS program (see Exhibit B, Items #1 to #9). The items covered a range of activities and aspects that seventeen and eighteen year olds with no prior business or computer background could reasonably be expected to understand.

The first two items dealt with perceptions of general technical background. It was thought that if students believed that IS majors had a relatively stronger math and/or computer background, it could be a barrier to entering the major. Item #8 assessed their perception of the starting salary of the IS graduate. This is an important issue in a business curriculum which presumably advocates the profit motive. Item #6 was included to determine whether these students could distinguish normal IS activities from the more technical activities engaged in by engineers and computer scientists. The five remaining items (#3, #4, #5, #7, and #9) focused on aspects of workstyle which generally distinguish computer programmers from systems analysts (8, 25, 27).

The responses to the questionnaire were scored by assigning numeric values on a scale of 1 to 5 (SD = 1, D = 2, etc.). The nine items were administered twice. The first time was during the third week of the course. The nine items were distributed in the classroom, completed outside of class, and returned through either the instructor or campus mail.

Those students who provided names and addresses were used in a second survey. A questionnaire was mailed directly to the students near the end of the next semester, approximately eight months after the first administration. The questionnaire contained the original nine items in addition to nine more items included to assess the respondent's own background and job preferences with respect to the original nine items (see Appendix B, Items #10 to #18).

RESULTS

Scale Properties of the Questionnaire

When creating a questionnaire it is a common practice to include multiple items to measure the same general characteristic or dimension. For example, the SAT, which is commonly used in college admissions, contains hundreds of items that presumably measure two general characteristics (dimensions): verbal and mathematical aptitude. In such cases, the subscale score used to measure the dimension is more reliable than an individual item score. The reliability and validity of this dimensionality can be determined through advanced statistical techniques like factor analysis. In many cases such subscales are not intentionally designed into the questionnaire but may still exist anyway.

Similar statistical techniques can be used to determine the existence of such unanticipated subscales (1, 22). The development or validation of such subscales should be performed using a sample of subjects which is different from that used to test the research hypotheses. To this end, the 406 student responses to the first round were randomly split into two groups of approximately one-fourth and three-fourths. The smaller group (n = 100) was used to perform the dimensionality analysis and the larger group (n = 306) was used for hypothesis testing. Expected sample attrition suggested that this second group be kept as large as possible while still maintaining a minimum ten to one ratio of responses to items for the first group in order to perform the factor analysis.

Unfortunately, neither the factor analysis nor the scale reliability analysis used to investigate dimensionality yielded sufficiently interpretable and reliable subscales. Thus the nine items used to measure perceptions of workstyle were treated as nine separate items rather than as a single measurement instrument.

Testing the Hypothesis

Of the original 306 respondents selected for hypothesis testing, approximately one-third responded to the second questionnaire. Thus 115 responses were available for testing the hypothesis. The resulting means and standard deviations (S.D.) are listed in Table 1--first for the IS graduate's workstyle (IS) and then for their own expected starting positions (SELF).

The null hypothesis was tested using t-tests for paired comparisons of the corresponding means. For seven of the nine items the average perceptions of the IS graduate's workstyle were significantly different from the average expectation of the students' own starting positions (one item at $p < .01$ and six items at $p < .001$). The only two items which did not yield a significant difference were the ones regarding math ability (Item #1) and prior computer background (Item #2). Otherwise, compared with their perceptions of the IS graduate's first job, the respondents expect to:

- o spend less time writing computer programs (Item #3)
- o spend more time interacting with other persons (Item #4)
- o spend less time working alone (Item #5)
- o be less involved in designing computer hardware (Item #6)
- o interact less with other computer people (Item #7)
- o receive a higher starting salary (Item #8)
- o be less involved in helping managers select new computer systems (Item #9)

TABLE 1. PERCEPTIONS OF GRADUATE WORKSTYLES

	IS		SELF			
Item#	Mean	S.D.	Mean	S.D.	t-value	Significance
1	2.61	1.01	2.59	1.04	0.14	
2	2.72	1.08	2.52	1.11	0.96	
3	2.90	0.90	1.77	0.72	11.29	***
4	3.39	0.89	4.10	0.65	-8.04	***
5	2.72	0.86	2.21	0.84	5.11	***
6	2.65	0.89	1.67	0.72	10.91	***
7	3.28	0.94	2.21	0.85	9.82	***
8	3.09	0.79	3.41	0.90	-2.72	**
9	3.52	0.73	2.58	0.98	9.27	***

(2-tailed) * $p \leq 0.05$ ** $p \leq 0.01$ *** $p \leq 0.001$

CONCLUSIONS

The hypothesis that students perceive no difference between the workstyle of the typical IS graduate and their own expected starting positions can be rejected on the basis of this study. All but two of the nine items yielded significantly different means. Three conclusions are drawn from these results.

First, these students perceive the entry level position for the IS graduate to be a computer programmer who spends a lot of time working alone and interacting mostly with other computer people. It is apparent that these students would prefer a position with more human interaction and less direct involvement in the implementation of computer technology.

Second, these students have unrealistic expectations about the starting salaries they will receive upon graduation. Historic data from the College Placement Council (6) shows that at the national level the average IS graduate receives several thousand dollars per year more than other business majors--a salary advantage that is consistent with surveys of Bentley's own graduates. Only a very small percentage of graduates in other majors will receive these high salaries.

Third, these students do not perceive themselves to be any different from IS majors with respect to mathematical ability or prior computer background. Consequently, this should not be perceived as a barrier to entering the major itself.

IMPLICATIONS

The reader cannot avoid the conclusion that these students have expressed an aversion to the workstyle of a computer programmer. Although the introductory course in which the study was conducted does not involve programming, the vast majority of the enrolled students had programming experience prior to entering college (12). Although there are good arguments for immersing the "novitiate" into this activity as early as possible, there are also good arguments to the contrary.

Like other professions, IS requires its aspirants to participate extensively in tedious "grunt" work while in entry level positions. For the IS profession, student exposure to these mundane tasks begins with high school programming courses, is augmented by an initial course in the undergraduate major called "programming", and further reinforced by an entry level position called "programmer." These conditions all help to promote and reinforce the image of the profession as one of computer programming rather than systems analysis.

Contrast this with the accounting profession, where the introductory courses involve more bookkeeping than accounting analysis, but are usually called "accounting." Furthermore, the typical entry level job does not carry the title "bookkeeper" even if it involves more bookkeeping than anything else. In a similar fashion, the IS profession should consider: (1) the adoption of less threatening course titles for programming courses, and (2) using the entry level job title "junior systems analyst" instead of "programmer" or "programmer/analyst" for those who are really systems analysts in training.

More fundamentally, the profession needs to consider that these students are effectively indicating a desire for human

interaction in their jobs. As previously stated, this is an important characteristic of a systems analyst. Perhaps if they didn't have to "pay their dues" by being so totally immersed in programming courses and working as programmers during the early years of their careers, substantially more students would be attracted to the IS major and career. It is not being suggested that programming should be totally bypassed, but rather that there is a need to develop some creative approaches to the placement and content of programming activities in both the major and the career.

This study does not establish that lower interest in IS careers has been caused by students' perceptions of workstyles. It examined students at only one undergraduate institution at one point in time. Further studies need to be conducted at other types of schools to verify the above conclusions. If possible, studies should be carried out longitudinally in conjunction with the design and implementation of programs intended to change students' perceptions of the IS major and career.

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EXHIBIT A. Curriculum for the Computer Information Systems Major at Bentley College (5)

General Education (54 credits):

Courses	Credits	Courses	Credits
Communication	6	Government	3
Literature	6	Social Science elective	3
Philosophy	3	Mathematical Sciences	6
Humanities elective	3	Natural Sciences	6
History	6	Math/Nat Sci elective	3
Economics	6	Principles of Computing	3

Common Business Core (30 credits):

Principles of Financial Accounting
Principles of Managerial Accounting
Systems Analysis (all other majors take Computer Information Systems)
Managerial Finance
Legal Environment of Business
Organizations and Behavior
Operations Management
Marketing
Business Policy
Introduction to Business Statistics

Required CIS Major Courses (18 credits)

Foundations of Programming
Structured Programming in COBOL
Program, Data and File Structures
Data Communications
Database Management
Systems Design

Elective CIS Major Courses (9 credits):

End-user Computing
Graphics
Software Development UsingUNIX/C
Programming Languages

Unrestricted Elective Courses (9 credits)

EXHIBIT B. THE INSTRUMENT

Legend:	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
	SA	A	U	D	SD

The following questions deal with your perception of the undergraduate Computer Information Systems program at Bentley College. Please indicate the strength of your agreement/disagreement with each statement by circling the letter(s) that best describe your feeling about or reaction to each statement. The typical graduate of this program:

1. Is a whiz at mathematics. ..... SA A U D SD
2. Entered Bentley College with a strong prior background in computers. ..... SA A U D SD

During his/her first job after graduation, the typical graduate of this program:

3. Spends most of his/her working time writing computer programs. ..... SA A U D SD
4. Spends most of his/her working time interacting with other persons. ..... SA A U D SD
5. Spends most of his/her time working alone. ..... SA A U D SD
6. Designs new computer hardware. ..... SA A U D SD
7. Interacts mostly with other computer people. ..... SA A U D SD
8. Has a starting salary above the average Bentley College graduate. ..... SA A U D SD
9. Helps managers select new computer systems. ..... SA A U D SD

The following questions deal with your assessment of your own background and job preferences. I believe that I:

10. Am a whiz at mathematics. ..... SA A U D SD
11. Entered Bentley College with a strong prior background in computers. ..... SA A U D SD

During my first job after graduation, I expect to:

12. Spend most of my working time writing computer programs. ..... SA A U D SD
13. Spend most of my working time interacting with other persons. ..... SA A U D SD
14. Spend most of my time working alone. ..... SA A U D SD
15. Design new computer hardware. ..... SA A U D SD
16. Interact mostly with other computer people. ..... SA A U D SD
17. Have a starting salary above the average Bentley College graduate. ..... SA A U D SD
18. Help managers select new computer systems. ..... SA A U D SD

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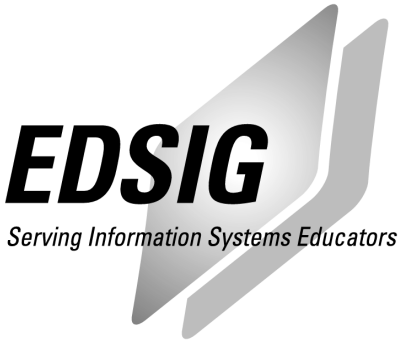

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