

The Competitiveness of the Information Systems Major: An Analytic Hierarchy Process

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ABSTRACT

A sharp reduction in student enrollment in the information systems major has become an urgent issue in the information systems (IS) community. This study investigates the factors affecting the selection of major by business students, the relative strengths and weaknesses of the IS major with respect to those factors, and the short-term and long-term strategy to counteract this phenomenon. A questionnaire-based field survey of 246 students at twelve universities in the United States was conducted. The data was analyzed using an analytic hierarchy process. The results demonstrate that the IS major retains its share of strength in factors like *personal interest, aptitude, starting salary, and job flexibility*. However, the study also shows that factors like *most difficult major, hard to find jobs, insufficient promotional efforts, and indifference to institutional reputation* are of concern and these issues need further addressing for improving the competitiveness of the IS major. Referent group also had pessimistic opinions in majoring the IS. The short-term and long-term suggestions to enhance the competitiveness of the IS major are provided.

Keywords: IS Major, Analytic Hierarchy Process, IS Major Competitiveness, Major Selection

1. INTRODUCTION

A sharp reduction in student enrollment in the Information Systems (IS) major¹ has become a critical issue in the IS community. Active discussions on the community websites (e.g., Nemati, 2004) workshops, panel (Kaiser et al., 2004) and new IS curriculum development meetings (Gorgone et al., 2003; Gorgone et al., 2005) have been held to identify the problems and find the solutions; however, IS departments in the United States have still experienced 25 to 75 percent enrollment reduction in recent years (George et al., 2004). This reduction seems to support Nicholas Carr's pessimistic view about the value of IT discussed in his Harvard Business

Review article entitled 'IT Doesn't Matter' (Carr, 2003). Several suppositions have been made about the IS enrollment drop including the shrinkage of the IS job market caused by the recent dot.com failures and bubbles of IT industry (e.g., George et al., 2004), but an empirical study has yet to be conducted. Based on college major selection literature in education and educational psychology, this study seeks to investigate (1) the factors affecting major selection of college of business students, (2) the relative strengths and weaknesses of the IS major over other business majors with respect to those factors, and (3) the short-term and long-term strategy to counteract this phenomenon. This study first identifies four major selection factors including personal preference, other's preference, preference toward an institution, and career preference. Ten sub-factors are identified in an extensive literature review and by conducting interviews. Then by applying an Analytic Hierarchy Process (AHP) method, this study investigates the relative importance of each factor and ranks alternative majors. It provides the detailed information of the strengths and weaknesses of IS major. AHP is a multi-criteria decision-making method that allows decision makers to model a complex problem in a hierarchical structure consisting of

¹ Information Systems, as an academic field, encompasses two broad areas: (1) acquisition, deployment, and management of information technology resources and services (the information systems function); and (2) development and evolution of technology infrastructures and systems for use in organizational processes (systems development). (Gorgone et al., 2003, p. v)

goals, objectives, sub-objectives, and alternatives (Saaty, 1980). Based on pairwise comparison judgments, AHP integrates both criteria importance and alternative preference measures into a single overall score for ranking decision. AHP has been applied successfully to resolve a variety of problems and more than 1000 articles have published in the past decades (Forman and Gass, 2001). The findings of this study are expected to provide a better understanding of IS major selection, which may help IS departments to develop a plan for coping with the current decline in enrollment and enhance the IS major's competitiveness.

2. LITERATURE REVIEW

The selection of a major by college students has been one of the critical issues receiving the interest of educators, psychologist, counselors, and college administrators. The number of students selecting a major is important because of academic planning needs and has major implications for public policies concerning resource allocation in higher education" (Leppel et al., 2001, p.374). Many studies have been conducted to determine the factors affecting major selection. The factors can be classified into three streams of research.

First, based on Holland's theory of vocational choice (1997), researchers have investigated the relationship between personality (traits) orientation and major selection (Leppel, 2001; Noel et al., 2003). Their major interest is to identify the personality factors (traits) characterizing each major and to deliver useful information to students and counseling services. Critical to increasing student satisfaction, is the fit between personality orientation and selected major. "Fit" also influences the student's intention to persist thereby resulting in higher graduation rate, and career success (Leppel, 2001). For example, Noel (2003) identified that three business majors (accounting, IS, and finance) were significantly different with respect to personality traits and personal self-monitoring. For example, accounting students were more reserved, prone to use concrete and focused thinking, affected by feelings, restrained, persistent, timid, practical, and tense in their personal interaction. Meanwhile, IS students can be characterized as easygoing, creative, enthusiastic, uninhibited, venturesome, and imaginative and are more likely to disregard rules and act expediently. Noel et al. recommended that each department should consider these traits in designing lectures, communicating with students, and developing advertisement materials (e.g. pamphlets, websites, or letters) for student recruitment. Wikoff and Kafka (1978) investigated the relationship between the choice of college major and Sixteen Personality Factors. They found that for male students, superego strength, self-sufficiency, imaginativeness, and forthrightness significantly influence the Social Science major, while intelligence, radicalism, self-concept control are important for deciding on an English major.

Second, studies have examined the relationship between demographical variables such as gender, income, minority and major selection (Lackland and Lisi, 2001). Many examinations have been conducted to identify the reasons for

gender imbalance in college majors. The low percentage of females obtaining bachelor's degrees in engineering, physical sciences and graduate programs have been reported (Snyder and Hoffman, 2001). Conversely, women represent 89% of early childhood education and nursing majors. Canes and Rosen (1955) investigated the effect of the number of female faculty members in various majors on the number of female students who chose those majors. No statistical significance was found. Recently, Trusty et al. (2000) reported that higher socioeconomic status was more strongly associated with women selecting nontraditional majors than was the case for men. Green (1992) examined the effect of *average household income* on college major selection. He found that male business majors come from wealthier families than female business majors. Davies and Guppy (1997) also found that students from households with lower socioeconomic status are more inclined to select more lucrative majors. Rask and Bailey (2002) investigated the effect of the presence of *minority* faculty members on a particular major selection. By analyzing university classes of 1988-2000 data, they found that the proportion of classes taken with a faculty member "like-you" has a significant positive effect on the intention to select that major.

Finally, several studies examined psychological, environmental, and academic variables affecting major selection of college students. This is the primary focus of our study. Factors can be classified into four categories: *personal*, *important others*, *institution*, and *career* preference factors. Personal interests and aptitudes (or ability) have represented the personal preference factor (Hansen and Neuman, 1999; Lapan, 1996). For example, using the Campbell Interest and Skill Survey (CISS), Hansen and Neuman (Hansen and Neuman, 1999) found that students' interest is important in determining a college major. Kim, Markham and Cangelosi (2002) and Coperthwaite and Knight (1995) found that good fit with students' ability is the second most important reasons for selecting a business major. *Others' preference* such as family and peer preference has been known to significantly affect a student's choice of major (Bean and Metzner, 1985; Betz and Fitzgerald, 1987; Keynama and Smith, 1996; Pearson and Dellmann-Jenkins, 1997). For example, Bean and Metzner (1985) demonstrated the influence from references on major selection and persistence. Hackett, Esposito and O'Halloran (1989) found the significant influence of parents' preference on women's college major choice. The effects of important referents' influences on attitude, learning, and behaviors have received theoretical support from Social Learning Theory (Bandura, 1986) and Theory of Planned Behavior (Ajzen and Fishbein, 1980). *Preference toward an institution* has been measured by institutional reputation, difficulty of major, and effort to promote a major. Gabrielsen (1992) indicated that the image, reputation, and prestige of a major were considered important by college students selecting a major. Mauldin, Crain and Mounce (2000) and Vangermeersch (2000) found perceived quality of instruction, departmental reputation as important factors for choosing an accounting major. Adams, Pryor and Adams (1994) replicated Gul et al. (1989) finding that faculty reputation, is more important than parental pressure, expected ease of earning a degree and

recommendation by counselors. Finally, *career preference* has been investigated using measures such as job availability, average salary, and career flexibility. George, Valacich and Valor (2004) found that the recent and rapid rise and fall of IS major students were strongly related to the job opportunities of graduates. Their results are consistent with Turner and Bown's (1999) finding indicating that labor market expectations significantly affect major selection. Gul et al. (1989) pointed out that students in accounting considered job satisfaction, earnings potential, employment availability, and aptitude for the subject more than students in other fields of study. Berger (1988) analyzed the National Longitudinal Survey of Young Men using conditional logit model of major choice, and found that individuals are likely to choose majors offering greater streams of future earnings. Mauldin, Crain and Mounce (2000) also found employment opportunities and higher starting salaries are primary reasons for selecting the business degree.

In summary, a significant amount of effort has been invested in revealing the factors affecting a college student's major selection. The findings of these studies help counselors, faculty, and college administrators provide students with useful information for selecting their majors. However, several limitations have been noted such as (1) business has been classified into a single major without considering the many sub-majors; (2) IS has not been classified as a separate business major; (3) a variety of factors have been used to explain major selection and (4) studies were conducted when IS did not experience enrollment drop. By classifying business major into six sub-majors, by integrating previous findings of the factors affecting major selection, and by conducting the study in year 2004 when IS is experiencing significant enrollment decline, this study addresses those issues.

3. ANALYTIC HIERARCHY PROCESS

The analytic hierarchy process (AHP) provides an overarching view of the complex relationships inherent in the problem and helps the decision maker assess whether the evaluation criteria are of the same order of magnitude. This facilitates comparison of homogeneous alternatives. AHP consists of three principles decomposition, comparative judgment, and priority synthesis (Saaty, 1990). *Decomposition* is related to the construction of a hierarchical structure model to present the problem. The highest level represents the overall objective; the middle level represents evaluation criteria; and the lowest level represents decision alternatives. *Comparative judgment* is a pairwise comparison of the factors at the same level for measuring their comparative contribution to the overall objective. A comparison matrix is developed by comparing pairs of criteria or alternatives. The pairwise comparison helps decision-makers to judge the contribution of each criterion to the objective. Finally, *priority synthesis* computes a composite weight for each alternative, based on preferences identified through the comparison matrix. Based on the value of composite weight, the relative priority of each alternative can be obtained. A sensitivity analysis follows to show how criteria weighting changes can affect the changes of ranks of

alternatives. The consistency of the results is measured using a consistency ratio (CR)². A CR of less than 10% is considered adequate to interpret the results (Carnero, 2005).

AHP has been known to enhance the evaluation, choice, and resource allocation phase of decision making. That is, AHP effectively measures the relative impact of factors affecting possible outcomes, and in doing so, predicts outcomes. The predictions then are useful inputs for evaluating alternative courses of action. AHP has been applied successfully to resolve various IS problems such as project selection (Chen and Huang, 2004), diagnostic technology (Carnero, 2005), manufacturing systems (Shang and Sueyoshi, 1995), and telecommunication systems vendors (Tam and Tummala, 2001), and e-business areas (Ngai, 2003).

4. RESEARCH METHODOLOGY

The factors affecting major selection were identified by conducting an extensive literature review on college student's major selection, interviews, and a focus group study. First, eight factors were identified by reviewing the previous literature. Then, two additional factors *career flexibility and promotional effort* were found by conducting interviews and a focus group study. A total of twenty-one junior and senior undergraduate students of the College of Business at a large public university were interviewed. They were asked to answer three open questions including 1) factors affecting their major selection, 2) possible reasons why students have less intention to select IS major, and 3) suggestions that might increase student enrollment in the IS major. Finally, a focus group study with a total of fifteen career service managers, undergraduate school officials, IS faculty, and recent graduates was conducted to review the factors identified through literature review and interviews. A two-level hierarchical structure of ten factors was found after conducting a two-round card sorting procedure (Moore and Benbasat, 1991). The first-level (so called 'criteria') consists of four preference clusters *personal preference, others preference, preference toward an institution, and career preference*. The second-level consisted of sub-objectives for each criterion. Personal preference included *personal interest and aptitude (or skills)*, others preference included *family and peers' preference*, preference toward an institution included *reputation, difficulty, promotional effort*, and career preference included *job availability, average salary, and career flexibility*. A brief description of each factor can be found in Table 1. Figure 1 shows the research model of this study.

² Consistency ratio can be calculated by examining transitivity in the pairwise comparison matrices. For example, if criterion A is judged to be twice as important as criterion B and criterion B is judged to be twice as important as criterion C, then perfect consistency results if criterion A is judged to be four times as important as criterion C. A consistency ratio measures how far a decision-maker's judgments are from perfect consistency. Highly inconsistent matrices can distort the final result.

Objectives	Sub-Objectives	Descriptions
Personal Preference	Personal Interest	Personal interest, like or enjoyment
	Personal Aptitude	Personal aptitude, capability or skills
Others Preference	Family	Preference of parents, brothers/sisters or other family members
	Peers	Preference of friends, classmates or other referents
Preference toward an institution	Reputation	Faculty reputation, academic excellence and recognition
	Difficulty of Major	Coursework load, flexibility or graduation difficulty
	Promotional effort	Amount of efforts to advertise a particular major
Career Preference	Job Availability	# of job opportunity or market trends
	Average Salary	Average starting salary or salary increase rates
	Career Flexibility	Easiness of changing jobs

Table 1 Factors Affecting Major Selection

A questionnaire-based field survey was conducted to investigate the relative importance of business major selection factors with respect to choosing the most preferred major. It was performed in year 2004 with 279 business undergraduate students at twelve public universities in the United States³ (see Table 2). All universities have experienced two digit enrollment decreases during the past three years. They all have six business majors, although there are slight differences in naming the majors (e.g. management science, operations).

The wording, content, and format of the questionnaire were validated by four IS faculty members, doctoral students, and two marketing faculty members before distributing it⁴. After removing 33 unusable responses, a total of 246 usable questionnaires were gathered. Respondent's average age was 23.3 years old. 67% of subjects were male. 21% were freshmen, 26% were sophomore, 24% were juniors and 29% were seniors. All were business major students or plan to select one of the business majors. The number of subjects was well-balanced across 6 different majors ranging from 37 (MS) to 49 (accounting)⁵. Additional demographic information of subjects is listed in Table 3. The participants were voluntary and compensated by a class point.

³ We initially reviewed 76 U.S. public universities with B-school and then selected 12 B-schools with having the same business major structure (department). Although they used slightly different names to represent each major (e.g. Operations vs Management Science, IS vs MIS), it was clear that they had the same six major structures (Accounting, Finance, IS, Management, Management Science, Marketing) applied in this study. Having the same major structure is important to conduct a pairwise comparison using the AHP method.

⁴ The brief description of each factor was provided with the questionnaire.

⁵ The mean (μ) was 41, and deviation (σ) was 5.52.

Demo	Classification	No	%
Gender	Male	165	67
	Female	81	33
Age	Freshmen	52	21
	Sophomore	64	26
	Junior	59	24
	Senior	71	29
Major	Accounting	49	20
	Finance	42	17
	Information Systems	37	15
	Management	39	16
	Mgmt Science	37	15
	Marketing	42	17
University Locations	East Coast	2	17
	West Coast	3	25
	South	3	25
	Midwest	4	33
Major Decision	Decided	59	24
	Undecided	187	76

Table 3 Demographic Information

5. RESULTS

The data were analyzed using Expert Choice⁶, a commercial application implementing the analytic hierarchy process (AHP). Expert Choice has been widely used in previous studies (Chen and Huang, 2004; Ngai, 2003). Six business sub-majors including accounting, finance, information systems, management, management science, and marketing were identified. The analysis using the AHP method provided results in the *relative importance of each objective and sub-objectives, the relative strength of each alternative in each criterion, and overall priority of each alternative.*

5.1 Relative Importance of the Major Selection Factors

The relative importance of each objective and sub-objectives measures how much college students weigh each criterion when selecting their major. As shown in Figure 2, *personnel preference* (0.316) was the most important factor affecting major selection, followed by *career* (0.295), *others* (0.197), and *preference toward an institution* (0.193). At the sub-objective level, *personal interest* (0.192) was the most significant factor, followed by *job availability* (0.178). This suggests that college female students put a much higher priority on family preference than male students, indicating that the former is strongly affected by their family members' opinions toward particular majors⁷. The overall consistency of the input judgment at all levels was 0.03, within the acceptable threshold value of 0.1 (Saaty, 1990).

⁶ <http://www.expertchoice.com/>

⁷ Data were divided by gender and found that for female students (n = 81), the weight on each criterion in their major selection was ordered by personal preference (0.336), others preference (0.297), career preference (0.203), and preference toward an institution (0.164), while for male students (n = 165), the weight was ordered by career preference (0.337), personal preference (0.297), institutional preference (0.224), and others preference (0.102). The results indicated that female students highly considered their parents and peers' opinions in their major selection, while career opportunity is crucial for male students' major selection. The results are consistent with previous studies (e.g. Hackett, Esposito and O'Halloran, 1989).

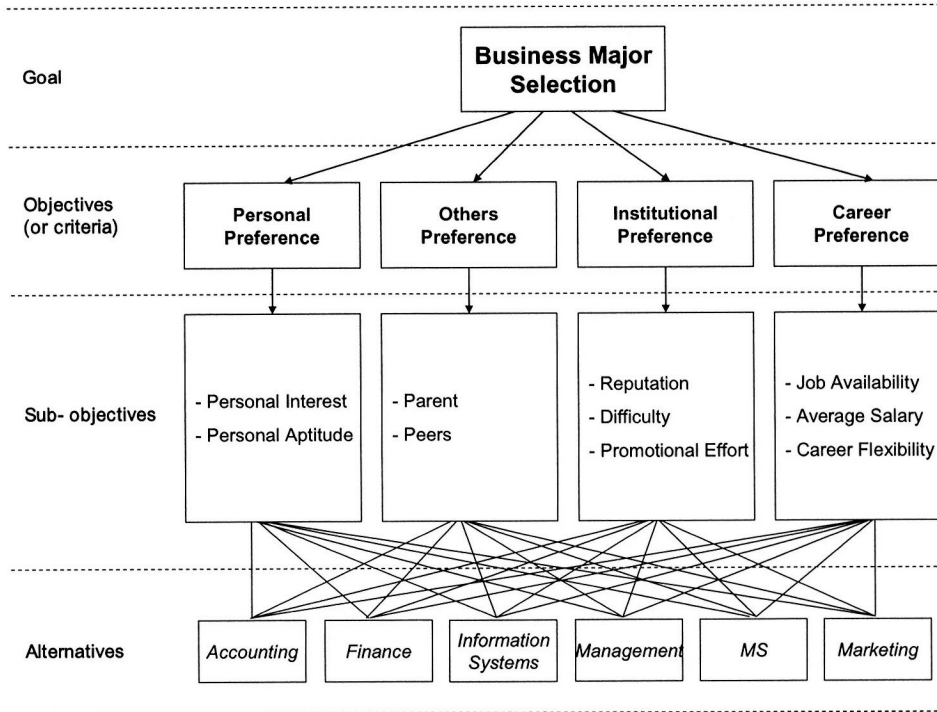


Figure 1 Business Major Selection Model

School	Location	B-School Size	Type of IS Curriculum	# of Subjects	ACC	FIN	IS	MGMT	MS	MKT
A	East Coast	3100	Technical	22	4	3	3	4	4	4
B	East Coast	2200	Traditional	24	5	3	4	3	4	5
C	West Coast	6500	Traditional	22	4	5	3	4	3	3
D	West Coast	3300	Technical	21	4	4	4	3	3	3
E	West Coast	4300	Traditional	21	4	2	4	4	4	3
F	South	2900	Traditional	22	4	5	3	3	3	4
G	South	2000	Traditional	19	5	2	3	2	2	5
H	South	1800	Traditional	20	4	3	2	3	3	5
I	Midwest	1100	Traditional	19	5	4	3	2	3	2
J	Midwest	1600	Traditional	18	3	4	2	4	2	3
K	Midwest	1400	Traditional	19	4	4	3	3	3	2
L	Midwest	1500	Traditional	19	3	3	3	4	3	3

Table 2 Descriptive Statistics of 12 B-Schools

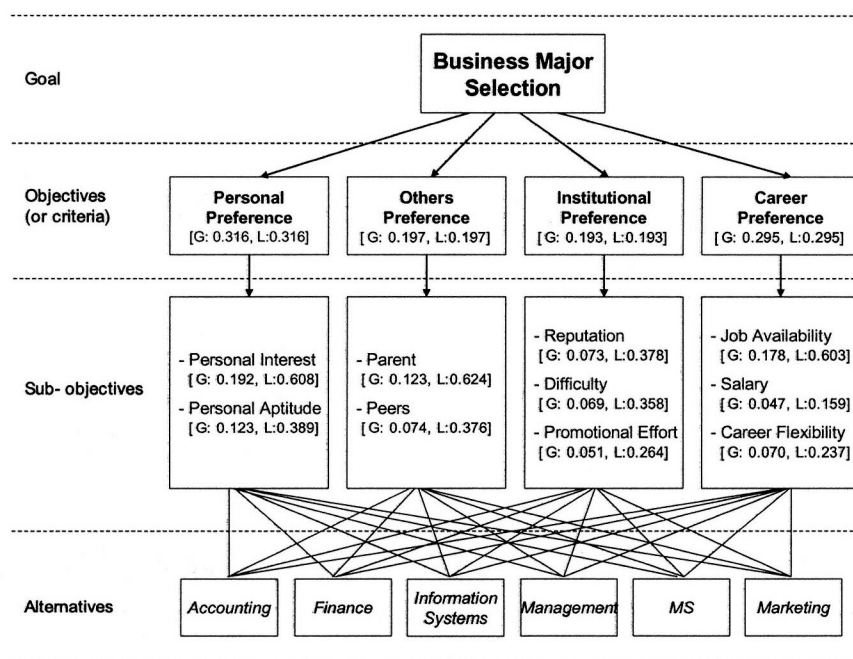
5.2 Relative Strength of Each Major

The relative strength of each major to each criterion examines the extent to which a major is preferred over other majors in each major selection criterion. As shown in Table 4, Accounting was the most preferred major in several criteria including personal interest (0.044), aptitude (0.034), peers opinion (0.024), knowledge on the major (0.012), and job availability (0.047). Finance was a major mostly preferred by parents (0.034) and guaranteed the highest salary (0.010). Management was recognized as a major with the best reputation at least in both institutions (0.017) and to provide highest job flexibility (0.017). IS has relative preference in personal interest, aptitude, average salary and

job flexibility, whilst it is perceived as the most difficult major (0.013), lack of promotional efforts (0.006), unconcern to reputation (0.006), and hard to find a job (0.014). The low-level of job availability compared to other majors implies that the relatively weak IS job market negatively affects the selection of IS as a major. Referents of the students (0.014 for parents; 0.006 for peers) also had pessimistic opinions in majoring the IS.

5.3 Overall Preference

Overall preference of each major was calculated. Accounting (0.217) and Finance (0.193) were the most preferred majors among the current college of business students, while IS



G: Global Priority (Priority Relative to Goal), L: Local Priority (Priority Relative to Parent)
Figure 2 Relative Importance of Each Criterion

(0.136) and MS (0.109) were the least preferred majors (see Figure 3).

6. DISCUSSION AND CONCLUSION

By developing a business major selection model and applying an AHP method, this study investigated factors affecting business major selection, the relative importance of the factors, and the priority of alternative major.

This study does have limitations that should be revisited in future studies. First, only twelve business schools used in the study might not be representative of all business schools in the United States. Second, this study was conducted with relatively small samples, particularly female students (n=81). Although this number is adequate when using the AHP method, having a larger female sample would have helped us

avoid sample selection bias. Third, since this study is conducted using the AHP method, multi-item measurement instruments for each factor were not developed. Thus this study could not identify the nomological networks between major selection factors, selection intention, and actual selection. To overcome this problem, future studies using correlation or covariance statistics (e.g. regression or structural equation modeling) are recommended. Finally, this study does not measure the influence of personality factors (e.g. Big Five Model).

Despite the limitations, the findings of this study provide useful information to develop a short-term and long-term strategic plan to enhance IS competitiveness. First, changing the misperception of students about IS job availability is the most critical issue for the IS department. To accomplish this goal, over the short-term, IS departments can distribute

	Personal		Others		Institution			Career		
	Interest	Aptitude	Family	Peers	Reputation	Difficulty	Promotional Effort	Job Availability	Salary	Flexibility
Accounting	0.044	0.034	0.014	0.024	0.015	0.012	0.012	0.047	0.008	0.009
Finance	0.036	0.026	0.034	0.021	0.011	0.011	0.010	0.023	0.010	0.012
IS	0.031	0.026	0.014	0.006	0.006	0.013	0.006	0.014	0.008	0.012
Management	0.031	0.013	0.032	0.011	0.017	0.008	0.008	0.036	0.008	0.017
Marketing	0.033	0.013	0.021	0.008	0.015	0.006	0.009	0.041	0.007	0.011
Management Science	0.018	0.013	0.008	0.005	0.010	0.018	0.005	0.017	0.006	0.008

Table 4 Relative Strength of Each Major to Each Criterion

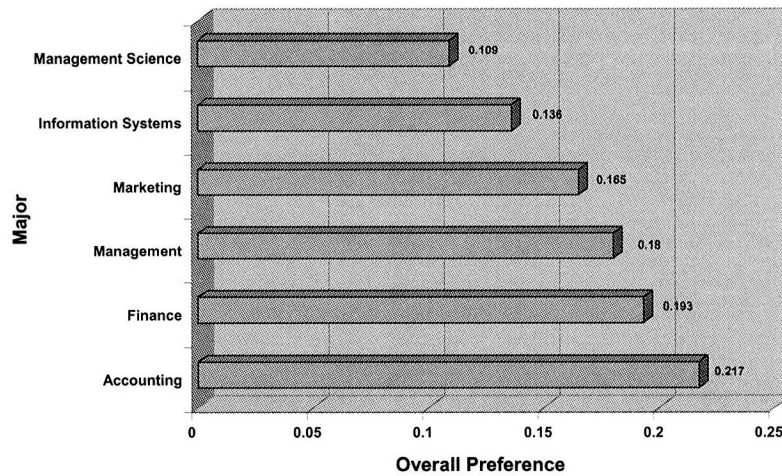


Figure 3 Overall Preferences to the Major

magazine and survey articles about prominent future IS-related job opportunities, circulate current job opening information, and host period seminars with IT professionals. For the long-term, IS departments should create more internship opportunities or industry-sponsored projects (e.g. website design competition) by collaborating with local IS industry, hosting IS job fairs, and changing the curriculum to meet the demands from students, universities and local IT industries (McGann et al., 2005; McKenzie et al., 2004). In addition, IS departments can consider hiring IT specialists as career counselors or internship coordinators who (1) identify new jobs or internships, (2) match them and students' skills and preference, (3) counsel and manage students' job career, and (4) provide effective communications between faculty, students, and employers.

Second, IS has been found to be less advertised to the students⁸. Thus a significant effort is needed to promote the IS major and provide students with a better knowledge of the IS major. For example, in a short-term, by supporting the IS student club activities, opening the door of IS faculty office for counseling, and hosting information sessions of IS major (e.g., meetings with recent IS graduates, success stories of IS graduates). Over the long-term IS departments should provide more scholarship/fellowship opportunities, provide students with specialized services (e.g. mailing list service, a database about recent IS alumni, tutor, IT company tours,

⁸ During the interviews, we could find the following anecdotal evidences related to less advertisement of IS major. "No IS student clubs; no interaction with the IS faculty outside of the classroom; few chances to meet CEOs from IS firms, but many chances from Finance and Accounting Firm; no connection with recent IS graduates; no clear IS course structures; no information about IS career paths; no information session about an IS major for freshmen and sophomore; no career service expert to help find an IS internship/job; hard, difficult, less paid, labor-intensive, a lot of travel.

career management service) for preparing IS career. These recommendations should be aimed at increasing the attractiveness of an IS career and help reduce student uncertainty and ambiguity.

Third, to change students' perception of the difficulty in majoring in IS, IS departments should host a series of seminars, lectures, help-sessions to help IS students' learning, and recruit IT specialists to provide customized knowledge services to IS major students. In the long-run, IS departments can change IS curriculum to provide flexibility in majoring in IS. For example, IS departments can open a variety of capstone courses to cover both fundamental and advanced topics in each IS topical area. In addition, they may develop several lower-level undergraduate courses to attract students' interest (e.g. creating online stores) and remove their preconception of the difficulty of majoring in IS. Finally as Kim, Markham and Cangelosi (2002) suggested, providing more opportunity to pursue double major is an effective way to attract students in majoring IS. George, Valacich and Valor (2004) recommended that introductory IS courses are crucial to recruit new students to IS, and thus assigning best instructors to teach this class is recommended to result in a dramatic uptake of the numbers of students majoring in IS.

Finally, the lower-level preference of parents and peers in majoring in IS negatively affects IS competitiveness, which requires significant effort in advertising the IS major. The strong influence of parents and peers on individual's overall behavioral decision has been widely recognized (Pearson and Dellmann-Jenkins, 1997). For the parents, IS departments can develop and distribute e-mails or periodicals including IS major, market trends, job opportunities, salary, faculty excellence, and replacement information. In addition, departments can host information sessions for parents informing the IS major. For peers, posting articles on interesting issues of IT, new technologies, IT-related jobs

Objectives	Sub-Objectives	Strength of IS Major	Short-Term	Long-Term
Personal Preference	Personal Interest	Medium	Develop special sections in the IS department website to provide attractive information targeted for high-school seniors and undecided college students	Support building a variety of student clubs related to IS majors, meeting with students' diverse interest
	Personal Aptitude	Medium	Send brochures and news introducing the IS major to undecided or non-major students	Develop a self-checklist for measuring students' IT aptitude and deliver it to career services office
Others Preference	Family	Low	Distribute brochures or develop e-mail lists introducing IS major, market trends, job opportunities, salary, and recent graduate placement	Open seminars to the parents informing the IS major
	Peers	Low	Post articles on IT jobs and major at students or local newspapers Host prominent IT professionals (alumni) lecture series	Host technology-related events (Microsoft, Cisco, etc) Host national-wide IT competitions (e.g. website design)
Preference toward an institution	Institutional Reputation	Low	Advertise faculty and IS major students achievement	Recruit a nationally recognized IS scholars/ professionals
	Difficulty of Major	Low	Host a series of seminars, lectures, help-sessions to help IS students to learn newest technologies Recruit IT specialist to provide customized knowledge delivery services to IS major students	- Change IS curriculum to provide flexibility majoring in IS (e.g. open a variety of capstone courses, develop fundamental and advanced courses in each IS topical areas) - Develop several lower-level undergraduate courses to attract students' interest and remove their preconception of difficulty majoring in IS
	Promotional effort	Low	Support IS student club activities Host information sessions of IS major (e.g., meetings with recent IS graduates) Open the door of IS faculty office for student counseling	Bring more scholarship/ fellowship opportunities Hire IT specialists to provide specialized services (e.g. career management, tutors) to help IS major students
Career Preference	Job Availability	Low	Circulate current job opening information Host regular seminars with IT professionals - Develop more internship opportunities - Distribute magazine and survey articles about prominent future IS-job career	Contact companies to provide students more job (or internship) opportunities Develop industry-sponsored projects Host an IS-specific job fair Change IS curriculum to include required internship
	Average Salary	Medium	Distribute published average salary information (e.g. monster.com)	Develop a database of the average salary of recent graduates.
	Career Flexibility	Medium	Invite more IT professionals into the classroom to inform a variety of professional careers	Distribute CDs (Videotape) interviewed successful IT professionals - Appoint IT specialist as a career service official

Table 5 Strategic Plan for Enhancing IS Major Competitiveness

and major at students or local newspapers, and hosting lecture series of prominent IT professionals, technology-related events (e.g., Microsoft.Net, Cisco), and nation-wide IT competitions will help to change their preference towards IS major. Further, recruiting more women and minority faculty members is recommended since the presence of women and minority faculty role models significantly affect the enrollment of those students. Considering the lower numbers of women and minority students in the IS courses, IS department should put their effort to recruit more women and minority faculty. A summary of short-term and long-term strategic plans is shown in Table 5.

This study does provide several implications for both researchers and practitioners. From a researcher's perspective, this study developed a business major selection model and validated it empirically. Therefore, the proposed model might be used as an alternative model for selecting business major. The model also is expected to successfully be utilized by other schools or departments to investigate the major selection behavior of their students. Second, this study applied AHP and found its appropriateness to resolve a complex business major selection problem. AHP could be applied to future studies resolving various multi-criteria decision making problems in major selection. From a practitioner's perspective, the findings of this study help develop a short-term and long-term strategic plan to make IS a more competitive major. By gauging the strength of the IS major and comparing with that of other majors, IS departments (or community) can make strategic and resource allocation decisions on how to improve the competitiveness of an IS major.

In conclusion, this study investigated the factors affecting IS major selection, their relative importance, strength of the IS major over other business majors, and a short-term and long-term strategy to improve IS enrollment. The findings can help provide the IS community with a better understanding of IS enrollment drop and thus develop a successful strategic plan to counteract it. There are several positive predictions for uptake demand of IS. Recent reports indicated that the drop has already "bottomed out", and employment is slowly starting to make a come back. Although we cannot expect the same feverish demand of the IS major in the 1990s, IS can prosper again if all IS community members collaborate with each other to make it a better and more attractive major.

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Appendix Survey Instrument

This appendix includes a condensed version of the survey instrument. Due to its considerable length, the entire survey is not included. Each question had an explanatory note to provide clarity.

1. Which major do you prefer based on personal interest?
2. Which major do you prefer based on personal aptitude (or ability)?
3. Which major do your parents prefer?
4. Which major do your peers prefer?
5. Which major do you prefer based on institutional reputation?
6. Which major do you prefer based on major difficulty?
7. Which major do you prefer based on care by department?
8. Which major do you prefer based on job availability?
9. Which major do you prefer based on average salary?
10. Which major do you prefer based on career flexibility?
11. Compare the relative importance of personal interest and aptitudes with respect to personal preference.
12. Compare the relative importance of parents and peers' preference with respect to others preference.
13. Compare the relative importance of institutional reputation, major difficulty, and care by the department with respect to institutional preference.
14. Compare the relative importance of job availability, average salary, and career flexibility with respect to career preference.
15. Compare the relative importance of personal preference, others preference, preference toward institution, and career preference in choosing the most preferred major.

Accounting Finance IS Management MS Marketing

For survey questions 1 through 15 listed above, we included the following table. The table includes the 9 point scale for all possible pair-wise comparisons associated with each specific question and serve as a convenient response mechanism.

	1=equal		3=moderate		5=strong		7= very strong		9=extreme		
ACC	1	2	3	4	5	6	7	8	9	FIN	
ACC	1	2	3	4	5	6	7	8	9	IS	
ACC	1	2	3	4	5	6	7	8	9	MGMT	
ACC	1	2	3	4	5	6	7	8	9	MS	
ACC	1	2	3	4	5	6	7	8	9	MKTG	
FIN	1	2	3	4	5	6	7	8	9	IS	
FIN	1	2	3	4	5	6	7	8	9	MGMT	
FIN	1	2	3	4	5	6	7	8	9	MS	
FIN	1	2	3	4	5	6	7	8	9	MKTG	
IS	1	2	3	4	5	6	7	8	9	MGMT	
IS	1	2	3	4	5	6	7	8	9	MS	
IS	1	2	3	4	5	6	7	8	9	MKTG	
MGMT	1	2	3	4	5	6	7	8	9	MS	
MGMT	1	2	3	4	5	6	7	8	9	MKTG	
MS	1	2	3	4	5	6	7	8	9	MKTG	



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ISSN 1055-3096