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# IS IS DIFFERENT? EXPLORING STUDENT CHOICES FOR GRADUATE MAJOR SELECTION

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## ABSTRACT

Students and industry alike tend to confuse or use interchangeably information systems (IS) and information technology (IT), making it difficult for prospective students to distinguish one program from the other. Previous studies on program choices in IS or IT focused on undergraduates. We extend this research to the graduate setting, using the Theory of Planned Behavior to assess the decision-making process for students selecting a graduate degree in IS or IT. Our instrument is pilot tested and validated and our designed data collection strategy includes respondents who have demonstrated their choice of graduate majors. We have recently begun distributing the survey to graduate students at a large southeastern university with majors in both IS and IT, and we have included the demographic statistics of the initial data. Research outcomes may help students choose appropriate majors, while providing programs with information on how to recruit students who are a good fit.

### Keywords

Theory of planned behavior, information systems, information technology, graduate degrees, beliefs, attitudes

## INTRODUCTION

With a low unemployment rate of 3.7% (https://tradingeconomics.com/united-states/unemployment-rate) and steadily increasing wages (https://tradingeconomics.com/united-states/wages) in the wake of high inflation, universities are competing with industry for students. While associate and undergraduate programs are hit the hardest, graduate degrees saw a declining enrollment of about 11,000 in 2021; this represents a general trend downward of college enrollment since about 2012 (https://www.npr.org/2022/01/13/1072529477/more-than-1-million-fewer-students-are-in-college-the-lowest-enrollment-numbers-). At the same time, while there is substantial research on the selection of IS as an undergraduate major, there is limited research evaluating how students decide to major in graduate programs in IS or IT. Furthermore, there is little understanding of the differences between IS and IT, in industry or academia. Our research has two primary goals: 1) Evaluate the differences between IS and IT, as seen by the views of potential graduate students; and 2) Assess the underlying beliefs, attitudes, and intentions that lead to student decisions to major in graduate programs in IS or IT.

## LITERATURE REVIEW

In line with our two major goals, the Literature Review is divided into two sections: Information Systems (IS) vs. Information Technology (IT); and Theory of Planned Behavior. We begin by discussing differences between IS and IT.

### *Information Systems (IS) vs. Information Technology (IT)*

The terms information systems (IS) and information technology (IT) are often used interchangeably (Boaden & Lockett, 1991, 23), potentially creating confusion in an academic setting, particularly for students, advisors, and faculty members. For instance, Brooks, Clark, & Gambill (2018) found similarities in course requirements for IS and IT majors, with almost all AACSB-accredited undergraduate programs in the US requiring coursework in database/data warehousing, data communications and networks, programming, and systems analysis and design. With similar curriculum, students may be unable to distinguish between the degrees. As universities, the earlier we can match a student with a major, the more positive impact we can have on progression, retention, and graduation.

A brief historical perspective illuminates the distinctions between the two fields. IS has been an academic field since the 1960s, along with its cousins, computer science and computer engineering. Over the next few decades, these three academic computing fields evolved, but maintained separate identities. Unlike the other two, the IS field has historically struggled to describe itself

in a clear and comprehensive definition. Alter (2008, 451) proposed a simple, clear, definition of the field, that offers explanatory power: "IS is a system in which humans and/or machines perform work using information technology and other resources to produce informational products and/or services for internal or external customers." Alter's definition clearly distinguishes the people and systems who perform work and produce information products (and services) from the IT itself. By 2016, ACM and AIS released a joint report on curriculum recommendations for graduate degrees in IS (Topi, Karsten, Brown, et al., 2016), suggesting a balance of three overarching competences: information systems, individual foundations, and domain knowledge, with flexible interplay within and between these competencies to meet the needs of each program or student. In the 2020s, educational curriculum in IS combines coursework in computing and IT with business processes (ACM & IEEE, 2020). However, numerous names for the IS degree continue to abound, with faculty, advisors, students, and industry having trouble distinguishing among the technology-related degrees.

Adding to the confusion, almost three decades after the appearance of IS degrees, IT degrees emerged. ACM states that: "IT deals most directly with specific, concrete technology components in an organizational context." (ACM & IEEE, 2020). Again, here the definition distinguishes that IT programs should be working with concrete technology components. The focus in IT academia is aligning technology with the goals, problems, and needs of the user, along with understanding how to develop and maintain computing infrastructure while supporting users. Further, educational curriculum in IT focuses on construction of secure technology systems for diverse users (Ekstrom, Gorka, Kamali, et al., 2006), with core competencies in communication, ethical reasoning, and team collaboration (ACM & IEEE, 2020). Thus, IT may be considered a sub-system of IS that is primarily focused on managing technology and improving its use to enhance business goals and processes. However, due to the integration of IT into all computing disciplines and the overlap between computing fields, it can be difficult to clearly distinguish between the fields. There is no published guiding curriculum for a Master's in IT, likely because it is the youngest of the computing fields,

Even with definitions that seek to clarify differences and with the input of several voluntary member and accreditation groups who review programs, students continue to report that they choose not to major in IS because they feel uninformed about the major and have little awareness of career opportunities (Walstrom, Schambach, Jones, & Crampton, 2008). Hodges & Corley (2017) suggest informing students about the differences between technology-related majors as early as possible. If students have better information, they may select a technology degree which matches their interests.

Industry confusion continues unabated as well. For instance, the *Bureau of Labor Statistics* provides job names for broad and narrow job titles. A search showed 100 results for "computer," 24 results for "information systems," with most of those relevant to our study, and 12 results for "information technology," of which only four were relevant (https://www.bls.gov/ooh/a-z-index.htm#0-9). Evidently, like academia, industry still has some work to do to understand differences between IT and IS. And academia needs to do a better job of describing their graduates to industry to make good connections.

While there are distinctions between the two fields in both academic and professional settings, we seek to understand how graduate students perceive the overlap and differences between IS and IT. Today ACM recognizes six computing disciplines: CE, CS, cybersecurity, IS, IT, and software engineering, with data science as a seventh emerging discipline (ACM & IEEE, 2020). The diversity of names across the range of academic computer fields is challenging, particularly with a lack of understanding of common names for different majors. This lack of understanding makes it difficult for those in industry to fully delineate the differences, may make it challenging for the business world to recommend appropriate graduate programs to their employees, and may make it hard to attract students to our IS and IT graduate majors (Alter, 2008). We seek to understand why students select graduate programs in IS or IT using the Theory of Planned Behavior as a theoretical model.

### *Theory of Planned Behavior (TPB) to Predict Enrollment in MSIS or MSIT Programs*

The Theory of Planned Behavior (TPB) seeks to explain how a person responds given underlying beliefs, attitudes, and behavioral intentions. Important people in the decision maker's life may influence the behavior through social norms. TPB was an update to the theory of reasoned action (TRA), which assumed that: "…people inclined to perform a behavior of interest….were capable of performing it and…could easily refrain from doing so if they decided against it." (Ajzen, 2020, p. 316); TRA with volitional control added is TPB.

We develop a model using TPB to understand and predict how students decide to major in graduate degree programs in IS or IT (the behavior). Using the principle of compatibility (Ajzen, 2020), we explicitly define the targeted behavior we are exploring: application and matriculation to an MSIS or MSIT program in a large public southeastern university. Students may be at various points in their degree program of study, which we defined as just starting (1-3 courses), about halfway through (4-6 courses), or almost through (7 or more courses). Both selected graduate programs are online, have similar admission requirements, and require the completion of 10 courses, plus any prerequisites.

Prior research has used TPB to evaluate undergraduate choices to major in IS or other technology-related majors, but no research to date has developed and tested a model to determine underlying beliefs, attitudes, intentions, and behaviors that influence choices to major in graduate programs in IS or IT. Prior research has shown that attitude and intention predicts STEM major choice for high school students, with the constructs showing higher predictive ability for women as opposed to men (Moore & Burrus, 2019). Similarly, Damron-Martinez, Presley, & Zhang (2013) showed that attitude, volitional control, and subjective norms predicted behavioral intentions to select an undergraduate minor in business. Here we extend the model to the graduate context, as shown in Figure 1. In the next sections, we discuss job-related beliefs and attitudes; normative beliefs and subjective norms; perceived behavioral control; and intentions and behaviors.

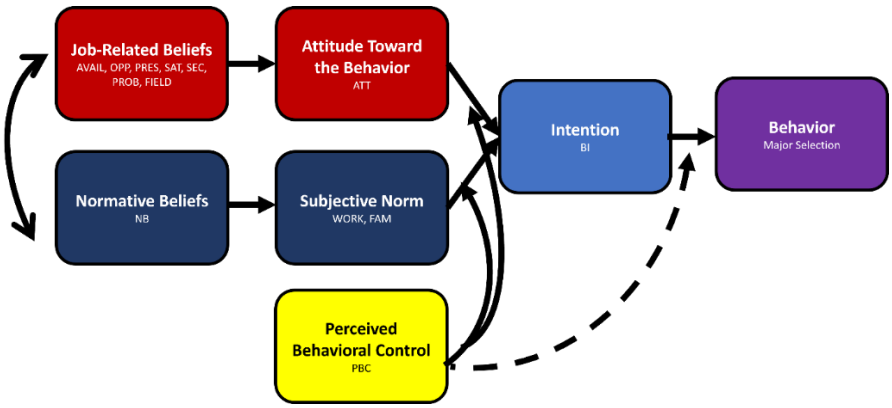


**Figure 1. Selection of MSIS / MSIT Programs**

In general, authors have found that job-related factors are more important than subjective norms when predicting selection of the undergraduate IS or technology-related majors (Walstrom et al., 2008). We sought to understand which job-related beliefs influenced the decision to apply and matriculate to graduate programs in IS or IT. We include the following beliefs in the model:

1) Genuine interest in the field, which is an important belief for undergraduate major selection in IS/IT (Akbulut-Bailey, 2012; Croasdell, McLeod, & Simkin, 2011; Hodges & Corley, 2017; Lee & Sang, 2006; Zhang, 2007).
2) Job availability, which shows a significant path to attitude for choosing undergraduate IS/IT (Croasdell et al., 2011; Hodges & Corley, 2017) and system development majors (Chen, Pratt, & Cole, 2016); and to choosing business major, although Zhang (2007) found an insignificant link to attitudes. In addition, Heinze & Hu (2009) found an insignificant relationship from perceived IT job availability directly to intention to pursue IT major. It will be interesting to see the impact of high job availability, increased salaries, and record-low employment, coupled with a possible recession.
3) Image/reputation of the field, shown as an important belief (Ferratt, Hall, Prasad, & Wynn, 2010), although other studies have found it to be non-significant (Croasdell et al., 2011; Hodges & Corley, 2017; Zhang, 2007). Hodges & Corley (2017) did find that women now believe that the undergraduate IS major is a respectable career choice.
4) Opportunities to advance in the same or different organizations shown as a significant belief (Godfred Matthew, Rita, Okyere, & Edem, 2019); similarly, Lee & Sang (2006) found career flexibility of medium importance, although the path was modeled directly to the behavior of choosing an undergraduate major.
5) Importance of financial rewards and job security, shown as a significant belief (Godfred Matthew et al., 2019); Lee & Sang (2006) found that high pay was important when determining whether students would select an IS major. Job security, however, had an insignificant path to attitudes (Croasdell et al, 2011 Hodges & Corley, 2017; Zhang, 2007).
6) We also model other characteristics of an IS/IT job elicited from the pilot study and other research, including social interactions, helping others, creativity, practical applications, importance of linking business and technology, perceived daily variety of work, and chance to be challenged and solve problems (Ferratt, Hall, Prasad, & Wynn, 2010).
7) Finally, we include satisfaction in the model, which Zhang (2007) found significant.

Perceived behavioral control (PBC) models the certainty that people may need to overcome barriers and accomplish the behavior in question (Ajzen, 2020). PBC is unique in this study; rather than evaluating how PBC may influence a future choice, students reflected upon how PBC affected the previous selection of graduate major and subsequent program enrollment; thus, the students have already overcome the barriers to applying and matriculating. Students who were unable to meet requirements related to test scores, transcripts, business experience, GPA, etc., are not in our population or sample; we do not have access to students who did not enroll. Instead, we model the students who were accepted and chose to enroll. The items for PBC were inspired by prior studies and elicited responses (Damron-Martinez et al., 2013; Heinze & Hu, 2009;

López-Delgado, Iglesias-Sánchez, & Jambrino-Maldonado, 2019; Marques, Ferreira, Gomes, & Rodrigues, 2012; Navratilova, 2013; Ng, Lee, Wong, & Lam, 2020).

Following Ajzen's (2020) recommendation, we ensure that PBC is directly matched with the behavior in question – that is, selection of a graduate major in IS or IT and enrollment into the program. We ask the students if they had the resources to apply to the program (Murithi, Swanson, & Genchev, 2021; Navratilova, 2013; Zhang, 2007); if the process of applying was easy (Heinze & Hu, 2009; Navratilova, 2013); if the choice of the degree was easy (Marques et al., 2012); if the student had sufficient information to choose the major (Damron-Martinez et al., 2013; Navrátilová,, 2013); and if they knew how to apply to the program (Marques et al., 2012; Lopez et al., 2019).

We acknowledge that numerous PBC variables may be relevant to the model if we could include students who applied and were rejected; students who applied and were accepted but chose not to matriculate; and students who began but did not complete the application process. We speculate PBC variables that may have influenced their decision not to enroll include poor language skills for students whose native language is not English (Gatfield & Chen, 2006), difficulty of the curriculum (Zhang, 2007) and major (Croasdell et al., 2011), and previous academic performance (Godfred Matthew et al., 2019). All of the beliefs, attitudes, and intentions flow from the behavior we are exploring (Ajzen, 2020) – that is, the selection of a graduate major in IS or IT and enrollment in the program. Thus, students who applied, were accepted, and enrolled into the program, we believe, had almost perfect control over the process.

Students form attitudes toward behaviors based on beliefs regarding the likely outcomes of behavior(s) (Ajzen, 2020). Attitude includes outcome evaluations and behavioral beliefs (Damron-Martinez et al., 2013; Presley, Damron-Martinez, & Zhang, 2010). Previous research has shown that attitude toward the behavior is the strongest predictor of students' intention to pursue higher education in Australia (Gatfield & Chen, 2006). In our study, we measure attitude by asking the students how they felt about the choice made: was it wise, smart, and/or good?

Subjective norm comprises injunctive normative beliefs and descriptive normative beliefs. Injunctive normative beliefs refer to the: "…expectation or subjective probability that a given referent individual or group….approves or disapproves of performing the behavior under consideration," while descriptive normative beliefs assess: "…whether important others themselves perform the behavior" (Ajzen, 2020, p. 315). While some studies have shown that subjective norms have little influence on student undergraduate IS major selection (Walstrom et al., 2008), others describe the importance of opinions from professors (Serenko & Turel, 2021; Zhang, 2007), family (Zhang, 2007), mentors (Muriithi, Swanson, & Genchev, 2021; Serenko & Turel, 2021), peers (Muriithi, Swanson, & Genchev, 2021; Serenko & Turel, 2021), and role models (Serenko & Turel, 2021). Zhang (2007) found differences between men and women regarding the influence of family and professors. Students with different personality characteristics may have different influences, with those who are independent being unlikely to be influenced by social norms when making decisions about higher education (Ng et al., 2020).

In general, intentions are more influenced by attitude than subjective norms (Mills, Beaulieu, & Johnson, 2017). In our retrospective model, we seek to better understand the motivations for applying to an IS or IT graduate programs and enrolling in the program. Thus, we ask students if they intended to major in the degree, wanted to select another major instead, were determined to choose the major (Lopez et al., 2019); and if they knew from the start that they would choose the specific major (Hodges & Conley, 2017). Here we are trying to understand if the selected degree was a first choice or a backup or a failsafe, again understanding motivations for degree selection.

Since our model already contains the actual behavior of major selection, we offer another chance to assess the link between intention and behavior. Webb & Sheeran (2006) showed that intent and behavior were significantly related to each other, and that behavioral intent had a medium-to-large effect on the actual behavior. We already know that students selected a specific major and that they enrolled in the major; thus, we will be able to evaluate the path from behavior back to intentions.

In addition, instead of asking only about IS or IT major choice, we ask students to select from all possible graduate majors in the university; then they answer questions about the major they selected. Thus, we do not prejudice the students to answer questions about the major we are hoping to learn more about (Panko, 2008).

## SURVEY DESIGN, DATA, & ANALYSIS

Once we decided on the behavior we wished to study (choice of graduate major, followed by enrollment in the program), we completed formative research using a pilot test to elicit relevant beliefs, attitudes, intentions, and behaviors. We distributed the pilot to current/former students in the graduate IS program and professors who teach in the graduate IS and/or IT programs. We have designed a survey from the pilot and prior research and use it to evaluate the most frequently mentioned beliefs, attitudes, subjective norms, PBC, and 'intention, in line with Ajzen (2020). The questionnaire has been designed with a 5-point Likert scale from 'strongly agree' to strongly disagree'. We plan to assess convergent and discriminant validity using

confirmatory factor analysis and evaluate the structural equation model to understand the relative influences of the independent variables on students' demonstrated behavior in terms of their choice of majors. Participants in the survey include graduate students in IS or IT at a large public southeastern university. Given that our data represents graduate students' demonstrated choices of graduate degrees, our research facilitates understanding of actualized decision of graduate students (rather than the intent of choices) as influenced by their beliefs and norms - promising a further refined set of insights and higher actionability.

As shown in Table 1, preliminary data collection includes 43 graduate students with majors in IT (outside the College of Business), IS (within the College of Business), and the Dual MBA + IS (within the College of Business). Of those, 30 students report a major in IT, with 15 women and 15 men. Nine students with a major in IS have taken the survey, comprised of five men and four women. Finally, four women pursuing a dual degree option MBA + IS took the survey.

| Major/Category | IT | IS | Dual MBA + IS |
|---|---|---|---|
| Women | 15 | 5 | 4 |
| Men | 15 | 4 | 0 |
| Asian | 11 | 0 | 1 |
| Black or African American | 8 | 2 | 1 |
| White | 9 | 7 | 2 |
| TOTAL | 30 | 9 | 4 |

**Table 1. Demographics from Preliminary Data Collection**

## CONCLUSION

After receiving IRB approval in November 2022, we are currently collecting data to validate our proposed model of reasoned choice and planned behavior of graduate major selection in information systems and technology. We have provided some preliminary descriptive statistics of the data that we have collected so far. From the analysis of the completed set of collected data points (data collection ends in February), we hope to better understand the decision-making process for students who are considering majoring in graduate programs in IS or IT.

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