IT Entrepreneurial Intention Among College Students: An Empirical Study

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ABSTRACT

IT (Information Technology) entrepreneurs have been contributing greatly to economic growth and job creation. Despite its importance, IT entrepreneurship remains understudied in business research. Particularly, the study of IT entrepreneurial behavior has been ignored in both Information Systems (IS) and entrepreneurship disciplines. Utilizing the social cognitive career theory (SCCT), this study, for the first, time investigates empirically IT entrepreneurial behavior among college students. The results indicate that students' IT entrepreneurial intention is determined directly by their expected outcomes, social influence, and self-efficacy. The study concludes with recommendations for IS education in business schools.

Keywords: Entrepreneurship, Computer self-efficacy, Behavioral modeling, Social impact theory

1. INTRODUCTION

Entrepreneurship plays a key role in economic development and job creation. Entrepreneurs not only incubate technological innovation, but also create employment opportunities and competitiveness (Zahra, 1999). Entrepreneurship is prominent in technology industries where technology innovation creates many new businesses and jobs. Information Technology (IT) is one of the most popular industries that rapidly incubate entrepreneurs. In addition, many entrepreneurs have used IT as tools to create many businesses in a variety of industries. A large number of companies have been created by IT entrepreneurs including college students and graduates. Many IT entrepreneurs have founded world-class businesses such as Dell.com, Facebook.com, Microsoft.com, and Google.com. Today, IT, as the fundamental business infrastructure for business operations and new business enabler, has attracted many college students majoring in business, computer science, or engineering to become IT entrepreneurs. College students are well educated and technologically savvy and many college students are interested in exploring business ventures in technology. Studying IT entrepreneurship among college students, thus, should be an important research agenda in business practice and education.

According to the U.S. Small Business Administration (SBA), "an entrepreneur is a person who organizes and manages a business undertaking, assuming the risk for the sake of profit" (http://www.sba.gov). Many entrepreneurs use their IT skills to create businesses that deliver goods or services in a variety of business areas or industrial sectors. Therefore, this study views IT entrepreneurs as the people who use information technologies to create businesses. According to this definition, although many IT entrepreneurs work in IT-related industries, they are not limited to the IT industry. For example, IT entrepreneurs have created online stores, insurance services, social media, and consulting firms. Compared to entrepreneurs in traditional industries such as food, restaurant, retail, tourism, and manufacturing, IT entrepreneurs are more knowledgeable, technology-dependent, and personally innovative (Yli-Renko, Autio, and Sapienza, 2001; Oakey, 2003). IT entrepreneurs usually start businesses with their technological skills, intellectual property (e.g., patents and licensing), or new business models. Although entrepreneurship research has existed for several decades, there is a lack of research on IT entrepreneurship in academia, and particularly in the study of IT entrepreneurship behavior. Thus, this study believes that filling this research gap will contribute to both academia and practice.

From an educational perspective, understanding students' academic and career choice intentions (e.g., entrepreneurial intention) would help educators tailor their curriculum designs to meet students' unique academic demands and future career preparation. For example, by understanding students' entrepreneurial intentions, IS educators could provide special mentoring programs for those who have strong entrepreneurial intentions and help them understand better the business implications of technology, such as, business opportunities and risks. IS educators could also develop better curriculum that integrates students' technology skill development into their future business practices. In addition, with a knowledge of entrepreneurship, IS students can understand better how IT

creates business value and can motivate themselves to transform technology innovation into market opportunity.

The purpose of this study is two-fold. First, this study aims to understand entrepreneurial behavior in the IT context – IT entrepreneurial behavior. In particular, this study empirically investigates college student IT entrepreneurial intention as well as its antecedents. Based on the social cognitive career theory (SCCT) (Lent, Brown, and Hackett, 1994), this study examines how computer self-efficacy, entrepreneurial self-efficacy, social influence, and expected outcomes determine IT entrepreneurial intention.

Second, as the first attempt to study entrepreneurial behavior in the IS discipline, this study hopes this study will prompt more research in this unexplored field. The literature review and observations from business practice indicate that IT entrepreneurs may have different behavioral characteristics and antecedent factors than those in traditional industries (e.g., retail, manufacture, food service, etc.). This study believes that a better understanding of student IT entrepreneurial behavior would provide educators with more knowledge to improve the IS curriculum and education.

The rest of the paper is organized as follows. The next section gives a review of the literature in IT entrepreneurship, followed by a description of the research model and hypothesis development. The research methodology and data analysis are presented subsequently. The study concludes with discussions of research implications, limitations, and recommendation for IS education.

2. LITERATURE REVIEW

Entrepreneurship is one of the most important fields in business research and practice, and it has a vital role in economic development. Entrepreneurship has also been recognized as a driver to sustain and promote competitive advantages (Covin and Miles, 1999). Entrepreneurship research studies entrepreneurial behaviors, practices, and success factors. Entrepreneurship has been broadly studied in various disciplines including management science, economics, psychology, sociology, and anthropology (Ireland and Webb, 2007; Simpeh, 2011). There is a long history in entrepreneurship research. Schumpeter's (1934) pioneering works in the 1930s paved the way for today's entrepreneurship research and practice. In his book, Schumpeter connected entrepreneurs theoretically with innovation. He insisted that entrepreneurs contributed to economic growth through innovation. Further to Schumpeter's seminal work, a large number of studies have been conducted to examine how innovation is related to entrepreneurship. For example, Covin and Miles (1999) indicated that the entrepreneur was an innovator who addressed market needs with new business models, technologies, services, and products.

In academia, entrepreneurship research seeks to understand how, who, and with what to create future market demand (Shane and Venkataraman, 2000). Entrepreneurs are also decision makers who construct and exploit opportunities to enter a new market (Blaug, 1995). Entrepreneurs are generally considered a heterogeneous group in nature, characteristics, and behaviors from industry to industry and even in the same industry. Although entrepreneurship has been studied extensively, there is a lack of examination of entrepreneurship in a specific business context.

A comprehensive literature review indicated a paucity of research in IT entrepreneurship and little is known about IT entrepreneurial behavior. There are major differences between IT entrepreneurship and traditional entrepreneurship. More knowledge is required to operate firms in technology-intensive industries than in those that, for example, sell furniture (Wee, Lim, and Lee, 1994). Marvel and Lumpkin (2007) found that formal education and prior knowledge of technology were vital to innovation outcomes of technology entrepreneurs. Similarly, Dheeriya (2009) indicated that online entrepreneurs needed a good knowledge of basic HTML language, or electronic payments, or shopping cart software, and "the desire to use technology as a primary driver of business or 'tech-savvyness' to be an important variable influencing the success of an online venture" (Dheeriya, 2009, p. 280). IT entrepreneurs usually need more technical knowledge as well as higher innovation attitudes and capabilities.

Entrepreneurial behavior is one of the major areas of entrepreneurship research. The behavioral approach focused primarily on the organization and examined the individual entrepreneurial behavior in business operation (Gartner, 1988). Stevenson and Jarillo (1990) maintained that entrepreneurial behavior revealed how entrepreneurs acted, why they acted as entrepreneurs, and what happened when they acted. After an extensive review of the literature, this study found that the study of IT entrepreneurial behavior is very limited. This is consistent with the finding that "a large and growing body of theory and data exists on entrepreneurs - that has been rarely cited or even acknowledged by IS researchers" (Mourmant, Gallivan, and Kalika, 2009, p. 500). Studies of IT entrepreneurial behavior in IS literature are almost nonexistent. Actual college students' IT entrepreneurship has remained unexplored largely. This research aims to investigate empirically IT entrepreneurial behavior among college students.

3. RESEARCH MODEL AND HYPOTHESES

In general, there are two ways to study behavior. One method is to directly measure behavior (e.g., Thompson, Higgins, and Howell, 1991). The other method is to indirectly measure behavior, mostly using behavioral intention. Behavioral intentions are motivational factors that capture how much effort a person is willing to dedicate to perform a behavior (Ajzen, 1991). The theory of planned behavior (Ajzen, 1991) suggests that behavioral intention is the most influential predictor of behavior. Sheppard, Hartwick, and Warshaw (1988) used meta-analysis to indicate that there is an average correlation of 0.53 between intentions and behavior. The second method has been widely utilized in IS research (e.g., Lee and Chen, 2010). This study utilizes behavioral intention as a proxy variable to represent real behavior of IT entrepreneurship.

3.1 Social Cognitive Career Theory (SCCT)

Built upon Bandura's (1986) social cognitive theory (SCT), the social cognitive career theory (SCCT) (Lent, Brown, and Hackett, 1994) proposed a framework for understanding the

individual's academic and career choices and behavioral intention. Extending Bandura's (1986) triadic reciprocal model of causality, which describes dynamic interplay between personal factors (e.g., self-efficacy), behavioral intention, and environmental influences, the SCCT further suggests that self-efficacy, expected outcomes, and environmental context (i.e., contextual supports and barriers) together determine the individual's academic/career interests and goals (Lent, Brown, and Hackett, 2000). Figure 1 presents the SCCT framework (adapted from Lent, Brown, and Hackett, 2000).

As illustrated by the SCCT in Figure 1, individuals form academic and career goals with their personal capability assessment (i.e., self-efficacy) and expected outcomes. Such capability assessment and expected outcomes come from their prior performance or experiences. In addition, behavioral intention and performance happens in a given context, and they are mutually determined by contextual and personal factors (Looney and Akbulut, 2007). Contextual factors can support or inhibit individuals' behavioral intentions and performance (Lent, Brown, and Hackett, 2000). To be consistent with the IS research tradition, we use social influence to represent contextual factors in our behavioral model.

Figure 1. SCCT (adapted from Lent, Brown, and Hackett, 2000)

3.2 Hypotheses and Research Model

Self-efficacy is individuals' judgments of their capabilities to organize and execute courses of action that are required to achieve expected outcomes (Lent, Brown, and Hackett, 2000). In other words, self-efficacy is an individual's perceptions or beliefs of his or her capabilities to execute actions in a certain context. It may not be an individual's real capabilities. Bandura (1986) posits that self-efficacy is a dynamic set of personal beliefs that changes with the environment. Self-efficacy is task- and domain-specific (Bandura, 1986). An individual's self-efficacy interacts with behavioral intention and social environment (Bandura, 1986; Lent, Brown, and Hackett, 1994). For example, self-efficacy directly shapes individuals' expected outcomes in their academic and career choices (Lent, Brown, and Hackett, 2000; Wilson, Kickul, and Marlino, 2007). Self-efficacy also plays a critical role when individuals interact with information technologies (Akbulut, 2012). Since the SCT, Bandura's (1986) seminal work that postulates the interrelationship between self-efficacy and behavioral intention, a significant amount of research findings empirically support this relationship in a variety of social contexts such as education and information technologies.

In entrepreneurship literature, self-efficacy is more about perceived capabilities to manage characteristics such as innovation, risk and leadership. Entrepreneurial self-efficacy (ESE) refers to individuals' beliefs that they have capabilities of performing successfully various roles and tasks of entrepreneurship (Chen, Greene, and Crick, 1998). A robust body of research has demonstrated explicitly that self-efficacy influences entrepreneurial behavioral intention (e.g., Chen, Greene, and Crick, 1998; Krueger, Reilly, and Carsrud, 2000). Individuals with higher self-efficacy have higher entrepreneurial intentions (Chen, Greene, and Crick, 1998; Krueger, Reilly, and Carsrud, 2000). Accordingly, the following hypothesis is proposed.

H1: Entrepreneurial self-efficacy (ESE) influences positively IT entrepreneurial intention among college students.

In IS literature, self-efficacy is specified as computer self-efficacy (CSE) which refers to individuals' judgments of their capabilities to use computers in various situations (Compeau and Higgins, 1995). Considerable IS studies have identified CSE as a key determinant of individuals' behaviors in using computers (Compeau and Higgins, 1995; Venkatesh, 2000). Individuals who possess high CSE are more likely to form positive perceptions of IT and IT usage intentions (Venkatesh, 2000).

In comparison to CSE, ESE has broader meanings and context. ESE "consists of five factors: marketing, innovation, management, risk-taking, and financial control" (Chen, Greene, and Crick, 1998, p. 295). In the IT entrepreneurial context, CSE is related to innovation self-efficacy, which refers to entrepreneurs' technology and business innovations (Chen, Greene, and Crick, 1998). In fact, IT entrepreneurs must manage innovation and risk in technology (e.g., exploring new technologies and technology usages) and business (e.g., creating new business models or business processes with technology) and exercise leadership in both technology and business management. In other words, IT entrepreneurs often are technology-business innovators. Mourmant, Gallivan, and Kalika (2009) indicated that IT entrepreneurs were a specific group of IT professionals and that those who are high in self-efficacy (i.e., marketing, innovation, management, risk-taking, and financial control) are more likely to become IT entrepreneurs. Therefore, it is reasonable to view CSE as an antecedent factor to ESE. At the industry level, this proposition is consistent with Agarwal, Ferratt, and De's (2007) assertion that the business environment has been characterized by considerable IT entrepreneurial activity and innovation, which largely results from new information technologies. Thus, this study proposes the following hypothesis.

H1a: Computer self-efficacy (CSE) influences positively entrepreneurial self-efficacy (ESE).

Expected outcomes is another important variable in the SCCT (Lent, Brown, and Hackett, 1994), which refers to the perceived likelihood of favorable consequences of a course of action/choices after the individual has acted (Bandura, 1986). SCCT suggests that expected outcomes impact positively behavioral intentions in academic and career choices (Lent, Brown, and Hackett, 1994; Lent, Brown, and

Hackett, 2000). Similarly, entrepreneurial research has identified expected outcomes as one of the most important determinants to entrepreneurial intention (Krueger, Reilly, and Carsrud, 2000). As a result, this study believes that.

H2: Expected outcomes of being IT entrepreneurs influence positively IT entrepreneurial intention among college students.

In addition, Lent, Brown, and Hackett (2000) indicated that self-efficacy is individuals' judgments of their capabilities which are necessary to achieve expected outcomes (Lent, Brown, and Hackett, 2000). In general, individuals expect favorable outcomes to be produced from activities for which they have the capabilities to accomplish (Compeau and Higgins, 1995; Looney et al., 2006). Bandura (1986) indicates self-efficacy causally influences expected outcomes of behavior, but not vice versa. Accordingly, this study proposes the following hypothesis.

H2a: Entrepreneurial self-efficacy (ESE) influences positively expected outcomes of being IT entrepreneurs among college students.

Social influence describes the environmental/contextual forces on individuals' behavior (Bandura, 1986). SCCT suggests that individuals are influenced by various environmental factors when they make educational and career choices. Social influence includes the influence of family members, instructors, advisors, friends, and community. In education, primary social influences include a variety of social support, role models, instrumental assistance, and financial resources. Prior research findings indicated the more the positive social influence, the stronger the behavioral intention (Lent, Brown, and Hackett, 2000; Akbulut, 2012). In entrepreneurship literature, prior research has identified social influence as a key determinant to entrepreneurial intention (Krueger, 1993; Kolvereid, 1996). This study examines the effect of social influence on IT entrepreneurial intention among college students. As such, this study assumes that

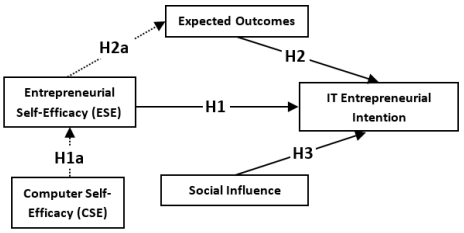
H3: Social influence influences positively IT entrepreneurial intention among college students.

Based on the above hypotheses, this study creates the following research model as shown in Figure 2. As illustrated in the model, ESE, expected outcomes, and social influences have direct causal effects on IT entrepreneurial intention, and CSE's effect is indirect and via ESE.

4. RESEARCH METHODOLOGY AND DATA ANALYSIS

4.1 Instrument Development and Data Sample

A questionnaire was developed based on previous research in IS and entrepreneurship literature. CSE was measured with Compeau and Higgins' (1995) instrument. Expected outcomes were measured with the Heinze and Hu's (2010) instrument. Social influence was measured with the instrument developed by Autio et al. (2001). Measurements of ESE and IT entrepreneurial intention were adapted from Francis's et al. (2004) work, which was designed upon the theory of planned behavior (Ajzen, 1991). All measurements used 7-point Likert scales.



Note: the dashed lines indicated the effects on IT entrepreneurial intention are indirect.

Figure 2. SCCT-Based Research Model for IT Entrepreneurial Intention

The questionnaire was administered to college students who were majors in general business administration. We collected 116 complete questionnaires. All subjects had basic computer software skills (i.e., Microsoft Word, Excel, and Access), and they were also enrolled in a management information systems class. The demographics of the subjects are shown in Table 1.

Variable	# of Subjects	Percentage (%)
Gender:		
Male	62	53
Female	54	47
Age:		
19-24	86	74
>=25	30	26
Years of computer experience:		
> 5 years	79	68
<= 5 years	37	32
Experience working with entrepreneurs or small business:		
yes	73	63
no	43	37

Table 1. Sample Profile

4.2 Statistical Techniques

The partial least squares (PLS) method (Wold, 1985) was employed to analyze a complete survey dataset. PLS is suited for predictive applications and theory building (Chin, 1998; Gefen, Straub, and Boudreau, 2000). Validating the exploratory models is recommended in the early stage of theoretical development and, therefore, PLS usually helps scholars who are interested in the explanation of endogenous constructs (Henseler, Ringle, and Sinkovics, 2009). PLS can also be used to test the measurement model and the structural model (Lohmoller, 1989). The measurement model is used to test the relationships between observed variables (indicators) and their underlying latent variables (constructs). The structural model is used to test the hypothesized relationship

among study constructs, including estimations of path coefficients and their levels of significance.

4.3 Data Analysis and Results

SmartPLS software (http://smartpls.de) was used to perform both instrument validation and structural path modeling. This study conducted the reliability and validity analyses of the measurement model before we performed the path analysis and hypothesis test.

4.3.1 Measurement Reliability and Validity: Prior to the research model testing, the reliability and validity of the measurement were examined. This study assessed the reliability with Cronbach's α and composite reliability. The accepted values for both Cronbach's α and composite reliability are 0.70 or higher (Nunnally, 1978). Table 2 shows the SmartPLS output of reliability testing. All Cronbach's α and composite reliability values are greater than 0.70, indicating the measurement instrument is reliable.

There are two important measurement validities: convergent validity and discriminant validity. Convergent validity describes the degree to which a measure is correlated with other measures in a single variable measurement. Discriminant validity refers to the degree to which the measurement for one variable does not correlate with the measurement for another variable. Both convergent and discriminant validities are inferred if the following conditions are met: 1) the measurement indicators load much higher on their measured construct than on other constructs, that is, the own-loadings are higher than the cross-loadings; and 2) the square root of each construct's average variance extracted (AVE) is larger than its correlations with other constructs (Fornell and Larker, 1981). Table 3 represents the item loadings on their measured constructs. All items are well loaded on their constructs; that is, their own (on their measured construct) loadings (in bold font in Table 3) are much higher than the cross loadings (on other constructs). Table 4 shows the AVE values for all constructs. The accepted AVE should be above 0.5 in order to achieve convergent and discriminant validities (Fornell and Larker, 1981). The testing results of both cross loadings and AVEs suggest that all construct measurements have adequate convergent and discriminant validities. Overall, the measurement model used in this study exhibited acceptable construct validity and reliability.

4.3.2 PLS Path Modeling and Hypotheses Testing: Figure 3 shows the path coefficients and their corresponding t-values. The bootstrap approach with 500 re-samples (Chin, 1998) was used to test the significance of path and hypothesis in SmartPLS. A two tail t-test was used to test the level of path significance. According to the two tail t-test (df=500), the 99% significance level or $p<0.01$ requires t-value>2.60 and the 99.9% significance level or $p<0.001$ requires t-value>3.34. When df>100, the t-test is actually very close to the z-test.

Construct	Number of Indicators	Cronbach's α	Composite Reliability
Computer self-efficacy (CSE)	3	0.875	0.922
Entrepreneurial self-efficacy (ESE)	2	0.932	0.967
Expected Outcomes (EO)	3	0.855	0.910
Social influence (SI)	3	0.929	0.966
IT entrepreneurial intention (INT)	3	0.958	0.973

Table 2. Results of Reliability – Cronbach's α and Composite Reliability

	CSE	ESE	EO	SI	INT
CSE_1	**0.879**	0.282	0.446	0.119	0.138
CSE_2	**0.913**	0.351	0.510	0.077	0.177
CSE_3	**0.890**	0.295	0.510	0.121	0.117
ESE_1	0.317	**0.971**	0.392	0.503	0.654
ESE_2	0.361	**0.963**	0.308	0.440	0.558
EO_1	0.594	0.425	**0.884**	0.215	0.474
EO_2	0.363	0.254	**0.879**	0.222	0.450
EO_3	0.462	0.252	**0.874**	0.288	0.397
SI_1	0.076	0.436	0.216	**0.924**	0.449
SI_2	0.062	0.440	0.251	**0.953**	0.498
SI_3	0.179	0.492	0.287	**0.930**	0.530
INT_1	0.108	0.543	0.459	0.554	**0.939**
INT_2	0.188	0.622	0.483	0.470	**0.967**
INT_3	0.172	0.646	0.510	0.502	**0.973**

Table 3. Results of Validity – Cross Loadings

	AVE
Computer self-efficacy (CSE)	0.799
Entrepreneurial self-efficacy (ESE)	0.938
Expected outcomes (EO)	0.773
Social influence (SI)	0.875
IT entrepreneurial intention (INT)	0.922

Table 4. Results of Validity – AVE

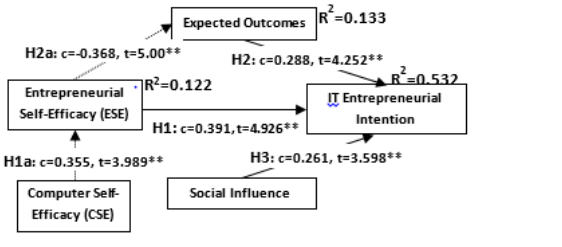


Figure 3. PLS Path Model

5. DISCUSSION

ESE was supported significantly to have a direct influence on IT entrepreneurial intention at the level of $p<0.001$, and thus, hypothesis H1 is supported. These results further confirmed the prior finding that self-efficacy is a key determinant to behavioral intention in the disciplines of entrepreneurship (Chen, Greene, and Crick, 1998; Krueger, Reilly, and Carsrud, 2000) and career development (Lent, Brown, and Hackett, 2000; Wilson, Kickul, and Marlino, 2007). In addition, this study supported significantly hypothesis H1a that CSE influences positively ESE at the level of $p<0.001$. This finding helps better understand characteristics of IT entrepreneurs who may be different from traditional entrepreneurs as the literature review indicates in this paper.

In IS literature, a significant body of findings indicated personal technical innovation is related highly to CSE (e.g., Thompson, Compeau, and Higgins, 2006). CSE measures individuals' self-judgments of their capabilities of using IT (Compeau and Higgins, 1995) and it thus represents technology skill/capability in a behavioral model. Entrepreneurs are innovators (e.g., Covin and Miles, 1999). Chen, Greene, and Crick (1998) suggested five entrepreneurial self-efficacies (marketing, innovation, management, risk-taking, and financial control) and one of these is innovation self-efficacy. For IT entrepreneurs, technology innovation and usage is the enabler or driver of their new businesses. Accordingly, this study believes that technology skill/capability is directly related to the innovation self-efficacy of IT entrepreneurs. This proposition is supported by H1a. In general, students who are high in CSE also have high ESE when they think of being an IT entrepreneur. This is because students who intend to open a new business in the IT-related industry, or using IT, usually think about their IT skills or capabilities first. At the very least, they should be confident in technology or understand how technologies could help them in a new business. It is noteworthy that although the findings support CSE's positive effect on ESE, it may not be reasonable to assume that CSE would have a direct influence on IT entrepreneurial intention. This is because CSE and ESE are in different contexts. CSE is perceived as a capability in using IT rather than in creating an IT business. Therefore, it is more reasonable to assume that CSE is an antecedent to ESE and CSE's effect on entrepreneurial intention is indirect and via ESE.

As predicted by the SCCT, the results supported that expected outcomes positively influence IT entrepreneurial intention in hypothesis H2 at the level of $p<0.001$. Students who have high expected outcomes (e.g., high financial return, more control over working time, or high interest in technology innovation) are more likely to become IT entrepreneurs. In addition, hypothesis H2a, that entrepreneurial self-efficacy (ESE) positively influences expected outcomes, is also supported at the level of $p<0.001$. The causal relationship of self-efficacy and expected outcomes has been supported well in other disciplines, for example, computer-self efficacy significantly impacts the expected outcomes of computer usage such as expected performances (Compeau and Higgins, 1995; Looney et al., 2006) in IS literature, self-efficacy in education programs positively influences the expected outcomes of career choices (e.g., Lent, Brown, and Hackett, 2000; Akbulut, 2012) in education literature. Hypotheses H2 and H2a further confirmed the causal effects of self-efficacy and expected outcomes on behavioral intention addressed in the SCCT (Lent, Brown, and Hackett, 1994) in the IT entrepreneurial context.

Social influence is a key determinant to social cognitive behavior (Bandura, 1986). This study significantly supported that social influences positively impact IT entrepreneurial intention in hypothesis H3 at $p<0.001$. Social influence affects students' academic and career choice behavior (Lent, Brown, and Hackett, 2000). For example, social support from the important people in their lives enhances students' academic choice behaviors (Akbulut, 2012). Students who receive support (e.g., mentoring support, financial support) and encouragement from their professors, family members, or close friends are more likely to have IT entrepreneurial intentions.

In entrepreneurial literature, considerable studies have demonstrated that universities provide an important social context that fosters entrepreneurship (Stuart and Ding, 2006). Universities play a key role in incubating potential entrepreneurs in that they provide social influences including various entrepreneurial supports, education, aspiration, and encouragement. Needless to say, students who have such social influences at universities have high entrepreneurial intentions. If students also have a strong educational background in technology, they are more likely to have intentions of being IT entrepreneurs. Other entrepreneurial studies found that children of entrepreneurial parents are more likely to become entrepreneurs (Halaby, 2003). Therefore, providing necessary social supports for students would increase their intention toward entrepreneurship, particularly for those who have strong technology backgrounds but lack business knowledge or experience.

In summary, built upon the SCCT, this study examined empirically and supported the effects of CSE, ESE, expected outcomes, and social influence on IT entrepreneurial intention. The SCCT is a well-established framework in studying students' behavior of selecting academic and career choices. The findings of this study suggest that utilizing the SCCT in the study of students' IT entrepreneurial behaviors is a good starting effort in the IS discipline and IS education.

6. CONCLUSIONS

This study, for the first time, examined empirically IT entrepreneurial intention among college students as well as its antecedent factors. The findings have illustrated that entrepreneurial self-efficacy (ESE), expected outcomes, and social influence cumulatively determine students' IT entrepreneurial intentions. The findings also supported the indirect effect of computer self-efficacy (CSE) on IT entrepreneurial intention. CSE, as a key determinant of IT usage and adoption behavior in IS literature, could be viewed as one of the important characteristics of IT entrepreneurs who usually are savvy in both technology and business. In the following subsections we discuss research implications,

limitations and suggestions, and recommendation for IS education.

6.1 Research Implications

IT entrepreneurs have been contributing greatly to economic growth and job creation. Many IT entrepreneurs form their entrepreneurial intentions or even take action as early as when they are in college. This study realized that IT entrepreneurs have unique behavioral features compared to traditional entrepreneurs. They are not only entrepreneurs but also technology adopters or innovators. This study is a first step in developing a new research initiative in the study of IT entrepreneurial behavior. This study hopes the findings of this study will inspire more research efforts and interest in this field, particularly from the IS discipline.

Students' entrepreneurial intentions can be influenced by many intrinsic and extrinsic factors. Although this study identified and examined only a few of these factors, the results have provided some insights into how IT entrepreneurial intention is formed among college students. One of the research findings indicated that computer self-efficacy (CSE) influences significantly entrepreneurial self-efficacy (ESE), which in turn determines IT entrepreneurial intention. This finding provides empirical evidence for the proposition that technology skills and capabilities are important characteristics of IT entrepreneurs. Similarly, this study further confirmed the effects of expected outcomes and social influence on students' career selection behaviors in the IT entrepreneurship context.

From an education perspective, the findings of this study provide more knowledge about students' future intentions to IT entrepreneurship. By evaluating their expected outcomes, social influences, and self-efficacies (CSE and ESE), IS educators can understand better students' potential career choices and intentions in the IT industry. For example, by accessing their social context such as family attitudes and backgrounds of entrepreneurship, curriculum, internship programs, community environment (e.g., numbers of IT startup businesses in an area, local government and community supports), educators could estimate students' IT entrepreneurial intentions. With this information, educators and entrepreneur incubators can offer appropriate mentoring programs and curriculums and help students prepare for their future careers.

6.2 Limitations

In retrospect this study recognized that adapting the measurement instruments directly from IS literature may cause some biases. Even though the measurements this study used have been tested and applied successfully in prior IS studies, they were mainly used in the study of IT adoption rather than IT entrepreneurship. There are behavioral differences between IT adopters and IT entrepreneurs. For example, the measurement of CSE adapted in this study may not reflect the entrepreneurship context because CSE in IS literature was used to measure individuals' perceived capabilities of applying IT to solve problems rather than the capabilities that would help them exploit a new business venture. In future studies, this study recommends developing new measurement instruments for IS constructs in the study of IT entrepreneurial behavior to reflect the specific research context.

This study also realized this study examined only a very limited subset of the antecedent factors to IT entrepreneurial intention. To understand better students' IT entrepreneurial behaviors embedded in both entrepreneurship and IT contexts there needs to be a more comprehensive and integrative research model. Such a research model should include a wider range of antecedent factors that come from entrepreneurship and IS literature. To extend this study, this study recommends that further studies apply a variety of social cognitive and psychological theories. For example, Ajzen's (1991) theory of planned behavior (TPB) is one of the most successful theories in social psychology. It has been well applied in studying students' academic choices (e.g., Ferratt et al., 2010) and entrepreneurial behavior (e.g., Engle et al., 2010). The review of IS and entrepreneurship literature has indicated that TPB has yet to be utilized in the study of IT entrepreneurial behavior. Thus, applying TPB in this field is the next research agenda.

In summary, although there are limitations, this study is a first step to opening a new research area in the IS discipline. The findings not only enrich understanding of IT entrepreneurial behavior but also set a good research model for future study of IT entrepreneurial behavior from IS and entrepreneurship disciplines.

6.3 Recommendation for IS Education

Following the tradition of entrepreneurship research (that is, entrepreneurs are innovators), this study examines IT entrepreneurial intention with emphasis on the effects of two major self-efficacies: computer self-efficacy (CSE) and entrepreneurial self-efficacy (ESE). CSE describes individuals' self-judgments of their technology skills, and ESE represents self-perceived business innovation skills. Based on the empirical findings in this study, this study proposes the following recommendations for IS education.

6.3.1 Emphasis on Innovation in IS Curricula: This study indicated that computer self-efficacy (CSE) influences significantly entrepreneurial self-efficacy (ESE), which is one of the most important antecedents to entrepreneurial intention and behavior. From the entrepreneurship perspective, technology skills can transform business innovations and new businesses. From the IS perspective, technology skills help solve business problems and improve business operations. Although IT users and IT entrepreneurs have different views and goals from technology, they share a fundamental belief - innovation is a core value or enabler to new businesses (the entrepreneurship view) and problem solving (the IS view). Unfortunately, many business schools lack technology and business innovation curriculum in their IS programs. Innovation is one of the high-level IS capabilities (Topi et al., 2010). Specifically, this study gives the following recommendations.

First, IS courses should cover IT development trends and their business implications. By examining IT development trends, IS students could understand better the nature of IT and IT innovation. By further exploring business implications of new technologies, IS students could enhance their critical thinking skills. In addition, by looking at the

opportunities and challenges of new technology development, IS students could increase their interests and motivations in IT innovation and applications.

Second, IS courses should provide knowledge and vision as to how technology innovation could be transformed into business value and/or business ventures. In entrepreneurship literature, innovation refers to either using existing technologies to create new business models and/or new business processes and, thus, new businesses (e.g., Facebook.com) or to using new technologies to create new products, new services, new business models, which lead to new businesses (e.g., Google search engine). By exploiting business values from technology innovation, IS students could connect their technology skills to future business practices, and in so doing this could also help them build problem-solving capabilities in the technology-driven business environment.

Third, current IS curricula focus on building technology and managerial skills, but ignore students' cognitive and psychological training. Students who have low self-efficacy in technology or business may also have poor attitudes and low motivation in technology innovation and, thus, lack interest or motivation in an IS program. Lacking interests in a program often causes poor learning performance. Therefore, this study recommends IS education provides curriculum to help students increase their self-efficacies of technology and business. This will help students enhance their confidence in technology and to be more competitive in the fast developing job market. Efforts could be made to enhance students' self-efficacies by having them involved in real-world systems design and problem solving, by having them work with IT entrepreneurs, by inviting successful IT entrepreneurs to classroom, or by sending students to business plan writing competitions.

6.3.2 Introducing Entrepreneurship in IS Curricula: IS education is a professional program that prepares students for future careers in the rapidly developing job market. IS students should not only master solid technology knowledge, hands-on skills, fundamental business knowledge and management skills but also should hold innovative vision into the future. As defined in this study, IT entrepreneurs are the people who apply IT to create new businesses. This suggests that teaching entrepreneurship in IS program will help students integrate their technology skills into future business applications and motivate them to implement technology and business innovations. This study believes an entrepreneurship curriculum will help IS students build their critical thinking skills and business problem-solving capabilities in a highly dynamic and technology-driven market. This study also believe that innovation attitudes and capabilities are critical to IS students' success in their future career development since IS careers involves the application of technology skills to solve business problems.

In summary, there are two major benefits of teaching entrepreneurship in IS education. On one hand, the entrepreneurship curriculum helps IS students prepare for their careers with enhanced critical thinking skills, problem-solving capabilities, and attitudes toward innovation. On the other hand, IS students are good candidates for entrepreneurship educators and incubators to recruit future IT entrepreneurs. This study also recommends that entrepreneurship education introduce IS courses in their curriculum. Today, many entrepreneurs who hold college degrees establish businesses in the high tech or technology-related industries. IT continues to attract many young college graduates to start up new businesses with their technology skills and business innovation capabilities.

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APPENDIX

Measurement Items for Constructors

Computer self-efficacy (Compeau & Higgins, 1995)

1. I could complete a job using a new software package if there was no one around to tell me what to do as I go.
2. I could complete a job using a new software package if I had never used a package like it before.
3. I could complete a job using a new software package if I had only the software manuals for reference.

Expected outcomes (Heinze and Hu, 2010)

1. I would feel satisfied as an entrepreneur in information technology.
2. I would feel appreciated as an entrepreneur in information technology.
3. I would feel secure as an entrepreneur in information technology.

Social Influence (Autio et al., 2001)

1. If I became an entrepreneur, my family would consider it to be good.
2. If I became an entrepreneur, my close friends would consider it to be good.
3. If I became an entrepreneur, other people close to me would consider it to be good.

Entrepreneurial Self-Efficacy (Francis et al., 2004)

1. If I want to, I am confident that I could start a firm.
2. If I want to, I would be able to start a firm.

IT Entrepreneurial Intention (Francis et al., 2004)

1. I want to become an entrepreneur in the future.
2. I expect to become an entrepreneur in the future.
3. I intend to become an entrepreneur in the future.

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