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The Willingness of Business Students on Innovative Behavior within the Theory of Planned Behavior

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***Abstract*—**Classes on creativity, innovation, and entrepreneurship are becoming quite popular at universities throughout the world. However, it is not easy for business students to get involved to innovative activities, especially patent application. The present study investigated how to enhance business students' intention to participate in innovative activities and which incentives universities should consider. A 22-item research scale was used, and confirmatory factor analysis was conducted to verify its reliability and validity. Multiple regression and discriminant analyses were also conducted. The results demonstrate the effect of growth-need strength on innovative behavior and indicate that the theory of planned behavior can explain and predict business students' intention to participate in innovative activities. Additionally, the results suggest that applying our proposed model in practice would effectively strengthen business students' intentions to engage in innovative activities.

***Keywords*—**discriminant analysis, growth need strength, innovative behavior, TPB model

I. Introduction

THE current scientific model for business education and management research might not be preparing today's business students and business community for real-world business issues [1]. Some believe that institutional education lacks relevance to the business world [2]. Ensuring relevancy between theoretical models and real practices has been a major challenge in attempts to professionalize business schools. Indeed, some corporations have complained that the faculties of business schools lack important knowledge about industry and technology. Business schools also face contemporary challenges from globalization, open innovation, corporate renewal, and venturing [3].

For a fundamental business education, it is very important for business schools to focus on developing managerial knowledge and skills rather than identifying the various external or internal pressures that affect the performance of an organization or firm. To this end, business schools should focus on the following four strategies: knowledge about management, knowledge about society, knowledge for management, and knowledge for society [4].

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In practice, it has often proven difficult to improve knowledge management, integrate research and development with business strategy, and bridge the interface between technology and business [5]. Some American universities provide courses on innovation management or technology management, and some universities in Singapore and Taiwan have initiated technology-management education in Asia. Preparation in technology management and intellectual property are typically incorporated in postgraduate programs. The curriculum in business schools is based on theory and general knowledge about skills for entry-level jobs [1], [6]. The programs are designed with a view toward working across disciplines and in conjunction with advances in technology [3].

Recently in Taiwan, some universities have begun to encourage students to think creatively and to pursue creative and entrepreneurial endeavors. However, this is not a widespread trend. In the present study, we investigated business students' intention to participate in innovative activities at a university and attempted to identify the principal motivators and cognitive factors that may strengthen intention.

II. Literature Review

In general, the theory of planned behavior (TPB) is effective for evaluating students' intention. However, we predict that the concept of growth-need strength (GNS) could improve predictions of behavior toward innovative activities supported by university policies. Thus, in the present study, we used both TPB and GNS to predict business students' intention to participate in patent application activities.

A. Intention (IN)

Intention is an excellent proximal predictor of an individual's behavior [7]. Intention and behavior are not the same, and they differ in their psychological distance from the actual act of doing something. However, some researchers that have compared attitude and intention to real action have found a strong correlation between the two. For example, [8]. assessed students' intention and use of new technology and reported variances of 47% and 51%, respectively, indicating that intention and real action may sometimes coincide, especially regarding innovative activities at universities.

B. Attitude (ATT)

Attitude is defined by [9]. as a positive or negative feeling toward performing a certain behavior. [10]. suggested that as

attitudes and behaviors become more specific, they become more highly correlated. The relationship between attitude and behavior is based on an individual's conscious processing. Hence, the more persistent one's attitude is and the more tangible the behavior is, the more likely it is that there will be a strong relationship between the two. Attitude is caused by beliefs and evaluated based on the performance of a behavior [7]. Thus, the stronger the attitude is, the greater is the intention to take real action. Therefore, we hypothesized that business students' attitudes would positively influence their intention to participate in patent activities at their universities.

C. Subjective Norm (SN)

A subjective norm is an individual's perception of another's opinion about a behavior before the individual performs that behavior [9]. An individual may be influenced by what another person thinks about a particular behavior, and this can be in the form of pressure from society as well as from one's personal environment. Subjective norms comprise normative beliefs and motivations to comply with societal expectations [7]. Therefore, the higher the social pressure to perform a given action is, the greater the individual's intention to implement that action will be. Thus, the more universities motivate business students to follow teachers' instructions, the more willing they will be to comply. Therefore, we hypothesized that subjective norms would positively influence business students' intention to participate in patent activities at their universities.

D. Perceived Behavior Control (PBC)

Perceived behavior control refers to an individual's perceptions of his or her ability to perform a given behavior, and there are both internal and external constraints [7], [12]. Behavior does not only depend on attitudes and subjective norms but is also determined by personal volitional control [13]. The greater an individual's volitional control over a certain behavior is, the greater the possibility that he or she will perform the behavior becomes. Individuals evaluate their ability to engage in a specific behavior considering factors such as time, money, skills, resources, experience, and so on. Therefore, we hypothesized that perceived behavior control would positively influence business students' intention to participate in patent activities at their universities.

E. Growth Need Strength (GNS)

GNS is the degree to which an individual feels the need to grow, that is, to achieve certain goals. It is the internal drive toward and psychological beliefs regarding achievement. Individuals with high GNS tend to want to learn new things and to exercise independent thought and action at work. They tend to be committed to work [14]. [15]. interpreted GNS as the readiness of an individual to adapt to a changing world and enrich his or her education. GNS may also affect creativity [14]. Individuals with high GNS have a strong need for personal accomplishment, learning, and development and may attempt to transform learning into action. The stronger one's GNS is, the greater one's intention to take real action is likely to be. Therefore, we hypothesized that high GNS would positively influence business students' intention to participate in patent activities at their universities. Previous studies on GNS have made significant progress toward understanding intention regarding creative activities, personal development activities, openness to experience, training effectiveness, and job diagnosis [14]-[18]. The main goal of the present study was to find ways to encourage students to get involved in innovative behaviors such as participating in patent applications. Innovative behaviors, by definition, are novel, and thus individuals typically lack extensive experience with such behaviors. To examine GNS and TPB in the context of student participation in innovative patent activities, we developed the research model shown in Figure 1.

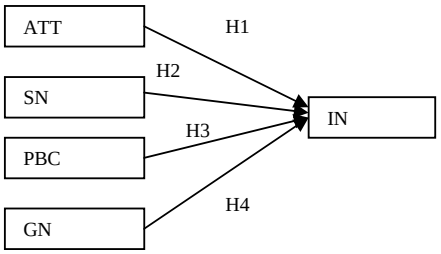

Fig. 1 Research model

III. Method

A. Sample

A total of 304 business school students in Taiwan participated in this study. Student orientation toward innovative activities was measured using a 22-item survey that assessed students' motivations and cognitive approaches regarding participation in innovative activities on five scales: attitudes, subjective norms, perceived behavior control, GNS, and intention. GNS questions were rated on a scale of 1 (strongly disagree) to 6 (strongly agree). The other items were measured on a 5-point scale ranging from strongly disagree to strongly agree. Items used to operationalize the constructs were adopted from previous studies including [14]-[17]. A pretest was conducted to improve the survey instrument, and then a pilot test was performed to assess its validity and reliability (using Cronbach's alpha coefficient and confirmatory factor analysis [CFA]) before the questionnaire was distributed to the students. To determine the appropriateness of our model combining TPB and GNS, multiple regression and discriminant analyses were carried out.

B. Convergent Validity

According to [19]., items belonging to a specific construct show common variance (convergent validity). [20]. suggested using average variance extracted (AVE) and construct reliability (CR) to examine convergent validity. An AVE of .50 or higher or a CR of .70 or higher can generally be considered to suggest adequate convergence at the construct level [21]. As presented in Table 1, all constructs employed in the present study showed excellent AVE and CR values, and thus we concluded that all four constructs had good convergence.

C. Discriminant Validity

Discriminant validity can be used to measure the extent to which constructs differ. At the construct level, it is considered adequate when the square root of the AVE for a specific construct is greater than the estimated correlation between that construct and all other constructs [20]. Table 1 shows the correlation matrix for the six constructs. The diagonal elements (square roots of AVE) were greater than the other elements (correlation coefficients) in the corresponding rows and columns. This implies that each construct shared more variance with its own items than with those of other constructs.

TABLE I
CRONBACH α,AVE, CR AND THE CORRELATION MATRIX FOR THE CONTRUCTS

	IN	SN	PBC	ATT	GN	AVE	CR	Cronbach α
IN	0.814					0.65	0.866	0.87
SN	0.67	0.722				0.521	0.763	0.76
PBC	0.611	0.542	0.742			0.551	0.769	0.71
ATT	0.67	0.633	0.607	0.745		0.555	0.785	0.75
GN	0.41	0.361	0.391	0.38	0.806	0.662	0.928	0.92

D. Confirmatory Analysis (CFA)

A CFA with an AMO [please spell acronyms the first time they are mentioned] of 7.0 was conducted to validate the measurement model comprising the aforementioned five scales (Fig. 1). The CFA results indicated that the model fit the data. Our five-factor CFA model yielded acceptable fit indexes: as follows: $\chi 2 = 442.4$, df = 160, $p < 0.001$, GFI = 0.87; AGFI = 0.83; TLI = 0.904; CFI = 0.919; RMSEA = 0.076 [Please define highlighted acronyms]. Although the GFI and AGFI did not reach 0.9, they were over 0.8, which is acceptable according to [22]. Most items also had significant parameter estimates with standardized estimates greater than .05 (only one indicator was below 0.5).

E. Multiple Regressions

The means, standard deviations, and correlations among all variables included in the study are presented in Table 2. We used a series of multiple regression analyses to examine the initial hypotheses. The dependent variable was the intention to participate in patent application. A multiple regression analysis (stepwise) predicting intention was carried out to determine whether GNS emerged as a significant predictor. Attitudes, subjective norms, perceived behavior control, and GNS were all found to predict the intention to participate in patent application. Overall, we performed two sets of multiple regression analysis with attitudes, subjective norms, perceived behavior control, GNS, and intention as dependent variables. The first step in the multiple regression analysis that predicted patent application behavior revealed that attitudes, subjective norms, and perceived behavior control contributed to the prediction of patent application participation ($R = 0.764$, $R2 = 0.583$, $F[3, 300] = 139.85$, $p < 0.001$). The second step showed that GNS predicted participation over and above the contribution of these other factors ($\Delta R2 = 0.007$, $\Delta F = 5.195$, $p < 0.05$). The beta coefficients (βs) for those variables were statistically significant: attitude ($\beta = 0.29$, $t = 5.513$, $p < 0.01$), perceived behavior control ($\beta = 0.217$, $t = 4.418$, $p < 0.01$), subjective norms ($\beta = 0.335$, $t = 6.729$, $p<0.01$), and GNS ($\beta = 0.094$, $t = 2.279$, $p < 0.05$) predicted participation, and positive correlations among attitudes, subjective norms, perceived behavior, and GNS were found. According to the beta coefficients, business students with higher scores for attitudes, perceived behavior control, subjective norms, and GNS had stronger intention to participate in patent activities. Importantly, GNS was an essential indicator in addition to the TPB model for predicting behavior.

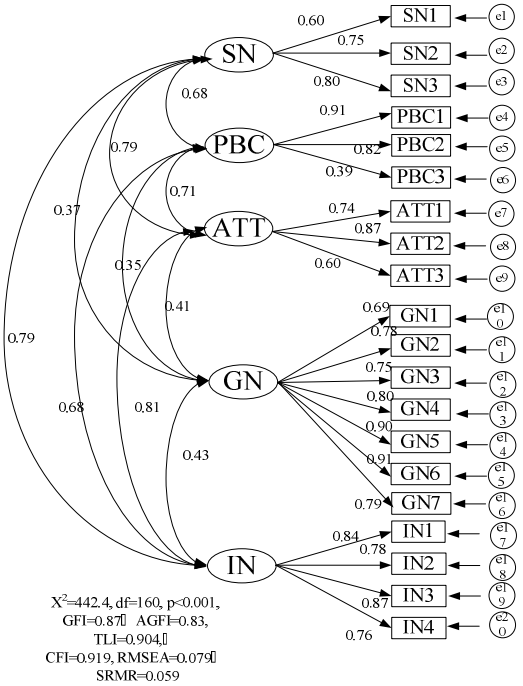

Fig. 2 Confirmatory factor analysis

F. Discriminate Analysis

A discriminant analysis was conducted to determine whether the variables associated with strong intention to participate in innovative patent activities differed significantly from those associated with lesser intention (see Table II and III). Students were separated into high- (n = 174, 57.3%) and low- (n = 130, 42.7%) intention groups, and all variables were entered into the discriminant analysis simultaneously. The overall Wilks' lambda for the model fit was significant ($\lambda = 0.718$, $\chi 2[4, n = 304] = 99.286$, $p < 0.001$), indicating that the predictors significantly differentiated between higher and lower values for intention. The squared canonical correlation coefficient (0.28) indicated that 28% of the variance between the two groups was explained. The classification results indicated that 73.4% of cases were accurately classified. The cross-validated results supported this finding, showing that 73% were correctly classified overall (see Table 2 and 3), and the proportional

chance criterion was 51% [21]. suggested that the criterion for classification accuracy should be at least 25% greater than the proportional chance criterion. Our rate of 73.4% was higher than 63.75% (51% x 1.25 = 63.75%), indicating an acceptable level of predictive accuracy. The standardized function coefficients and correlation coefficient revealed that attitudes, subjective norms, perceived behavior control, and GNS accounted for the differences between the two groups. Functions at group centroids indicated maximal separation between the two groups. These results suggest that business students with more positive attitudes toward innovation, greater perceived behavior control, stronger subjective norms, and higher GNS were more likely to have stronger intention to participate in patent application.

IV. Discussion And conclusion

The present study examined the influences of GNS and TPB on the prediction of students' intention to participate in innovative activities. Multiple regression analyses illustrated that the three variables in the TPB model significantly predicted behavior. Although business students were not familiar with the application procedure, they were interested in participating in creative activity. The analyses also revealed that GNS may encourage business students to transform their creativity into tangible products. This is consistent with results reported by Shally, Gilson, and Blum (2009), who found that GNS was an important predictor of creative performance, along with TPB. However, the participation of business students differed significantly between high- and low-intention groups. Students with higher scores for attitude, perceived behavior control, subjective norms, and GNS were more likely to have a stronger intention to participate in innovative activities.

In conclusion, it seems that, in general, students' intentions to participate in innovative activities at the university will increase if professors encourage students to do so. That is, at the beginning of a curriculum, professors could explain the outcomes and benefits of innovative activities to motivate business students, formulate related beliefs, and ultimately stimulate their growth need. This approach could increase students' intention and thus their actual participation in innovative activities. Additionally, university policy should promote creativity in an innovative environment.

TABLE II
High intention and low intention group' mean and SD

Variables	High intention Mean	SD	Low intention Mean	SD
GN	3.55	0.73	3.09	0.72
SN	4.11	0.52	3.52	0.67
PBC	3.91	0.58	3.29	0.67
ATT	3.79	0.58	3.16	0.57

TABLE III
Discriminate analysis for attitude, perceived behavior control, subjective norm, and growth need strength to intention group

Variables	Correlation coefficients	Standardised coefficients	Structure loadings	Wilks' Lambda	F value
GN	0.231	0.168	0.493	0.911	29.58***
SN	0.576	0.34	0.775	0.805	73.16***
PBC	0.583	0.362	0.779	0.803	73.88***
ATT	0.759	0.438	0.849	0.775	87.86***

***P<0.01
Group centroids: High intention: 0.547
Low intention: -0.732
Press Q: 66.33***, P<0.01
Hit ratio: 73.4%
Proportional chance criterion: 51%

Future studies should explore the antecedent factors of GNS to develop an expanded model and/or explain the source of GNS. Additionally, future research should consider an educational perspective in research and discuss students' learning stages and how those are related to real action.

References

[1] S. K. Clinebell and J. M. Clinebell "The tension in business education between academic rigor and real-world relevance: the role of executive professors," *Academy of Management Learning & Education*, vol. 7, no. 1, pp. 99-107, 2008.
[2] J. Pfeffer and C. T. Fong, "The end of business schools? Less success than meets the eye". *Academy of Management Learning & Education*, vol. 1, no. 1, pp. 78-95, 2002.
[3] B. Clarysse, S. Mosey and I. Lambrecht, "New trends in technology management education: a view from Europe," *Academy of Management Learning & Education*, vol. 8, no. 3, pp. 427-443, 2009.
[4] J. March, "Citigroup's John Reed and Stanford's James March on management research and practice," A*cademy of Management Executive*, vol. 14, no. 1, pp. 52-64, 2000.
[5] M. C. Thursby, A. W. Fuller and J. Thursby, "An integrated approach to educating professionals for careers in innovation," *Academy of Management Learning & Education*, vol. 8, no. 3, pp. 389-405, 2009.
[6] C. Q. Trank and S. L. Rynes, "Who moved our cheese? Reclaiming professionalism in business education," *Academy of Management Learning & Education*, vol. 2, pp. 189-205, 2003.
[7] I. Ajzen, "The theory of planned behavior," *Organizational behavior and Human Decision Process*, vol. 50, pp. 179-211, 1991.
[8] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "User acceptance of computer technology: A comparison of two theoretical models," *Management Science*, vol. 35, no. 8, pp. 982-1002, 1989.
[9] M. Fishbein and I. Ajzen, Belief, attitude, intention and behavior: an introduction to theory and research, Reading, MA: Addison-Wesley, 1975.
[10] T. A. Heberlein and J. S. Black, "Attitudinal specificity and the prediction of behavior in a field setting," *Journal of Personality and Social Psychology*, vol. 4, pp. 474-479, 1976.
[11] I. Ajzen, Attitudes, personality, and behavior, New York: Open University Press, 2005.
[12] S. Taylor, and P. A. Todd, "Understanding information technology usage: a test of competing models," I*nformation Systems Research*, vol. 6, no. 4, pp. 144-176, 1995.
[13] I. Ajzen, "From intentions to actions: a theory of planned behavior," In J. Kuhl & J. Bechman (Eds.), Action control: from cognition to behavior, Heidelberg: Springer, 1985.
[14] C. E. Shally, L. L. Gilson and T. C. Blum, "Interactive effects of growth need strength, self-reported creative performance," *Academy of Management Journal*, vol. 52, no. 3, pp. 489-505, 2009.

[15] J. R. Hackman and G. R. Oldman, "Development of the job diagnostic survey," *Journal of Applied Psychology*, vol. 60, no. 2, pp. 159-170, 1975.
[16] R. A. Noe and N. Schmitt, "The influence of trainee attitude on training effectiveness: test of a model," *Personnel Psychology*, vol. 39, pp. 497-523, 1986.
[17] R. A. Noe and S. L. Wilk, "Investigation of factors that influence employees' participation in development activities," J*ournal of Applied Psychology*, vol. 78, no. 2, pp. 291-302, 1993.
[18] R. D. de Jong, M. E. G. van der Velde and P. G. W. Jansen, "Openness to experience and growth need strength as moderators between job characteristics and satisfaction," *International Journal of Selection and Assessment*, vol. 9, pp. 350-356, 2001.
[19] Hair, J., Black, W., Babin, B., Anderson, R., and Tatham, R. Multivariate Data Analysis, 6th ed. Pearson Prentice Hall, Upper Saddle River, New Jersey, 2006.
[20] C. Fornell and D. F. Larcker, "Evaluating structure equation models with unobservable variables and measurement error," *Journal of Marketing Research*, vol. 18, no. 1, pp. 39-50, 1981.
[21] J. F. Hair, W. C. Black, B. J. Babin and R. E. Anderson, Multivariate Data Analysis, New Jersey: Prentice Hall, (2010).
[22] H. Baumgartner and C. Homburg, "Applications of structural equation modeling in marketing and consumer research: a review," *International Journal of Research in Marketing*, vol. 13, pp. 139-161, 1996.

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