

Innovative Behavioral Intention and Creativity Achievement in Design: Test of an Integrated Model

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Abstract. Accumulating creative achievements is a way to represent design ability and competitiveness for design students. This study proposes to employ the theory of planned behavior to predict creative achievements and augments it with personal intrinsic and extrinsic relative benefits, significant others' expectation and evaluation, self-efficacy, and facilitating conditions that are believed to influence students' innovative behavioral intention. The hypothesized model was validated empirically using data for 277 students from industrial and visual designs. The results confirmed that both innovative behavioral intention and perceived behavioral control affect student's creative achievements significantly. Subjective norms and perceived behavioral control were significantly related to the intention to exhibit innovative behavior, but attitude was not. Additionally, self-efficacy exerts its influence on students' perceived behavioral control more significantly than other antecedent variables. This paper presents an integrated model that provides a direction to help design students to increase their creative achievements accumulation in a school environment.

Keywords: Theory of Planned Behavior (TPB), Innovative Behavioral Intention, Creative Achievements.

1 Introduction

Creativity is a key factor determining competitive ability in the design field. In addition to domain knowledge and skills learning, design students are more encouraged to engage in specific design activities in practice. The goal is to enhance the design ability of the students so that they can accumulate creative works, design awards or design experiences for evidences of creativity in design ability when pursuing future careers. These creative outcomes which were accumulated in a period of time are defined as creative achievements by Carson, Peterson, and Higgins in 2005. Yang, You, and Guo (2010) interviewed the design students in relation to their employment situations after they graduated, and found that most of the interviewees pointed out that the design companies were not concerned with their educational background but with their design ability instead. The results revealed that the students who had more evidences about their design ability at school had more advantages and

a higher degree of adaptation in their new careers. Hsu, Chang, and Yang (2007) investigated business recruitment methods and found that, in addition to interviews, 97% requested portfolios, 38% wanted tests, and 16% asked to have practical experience. Above methods such as the portfolios and practical experience are also related to creative achievements. Accumulating creative achievements from taking part in design activities not only made easier for students to understand the design position and reduce the gap between school and the workplace, but also provided an opportunity to accumulate the evidences of design ability.

However, accumulating creative achievements cannot be administered in a compulsory way. Jong and Hartog (2010) found that a positive relationship exists between innovative working behavior and innovation outcomes. It appeared that the students' willingness to actively accumulate creative achievements could depend on their behavioral intention. Ajzen (1985) proposed the theory of planning behavior (TPB) to explain the personal intention and to predict behavior. In the TPB model, an individual's behavior is directly affected by the behavioral intention and perceived behavioral control and indirectly affected by three variables, namely, attitude, subjective norms, and perceived behavioral controls (Ajzen 1991; Fishbein and Ajzen 1975). And these three factors are also affected by external variables, for example, beliefs structures (Chu and Chiu 2003), contextual forces (Bock et al. 2005), or personality (Ajzen 1989). This theory had been examined repeatedly by many studies and has been applied in various domains such as knowledge sharing (Cheng and Chen 2007), the usage of information technology (Taylor and Todd 1995), e-learning (Lee 2010), and training in participation behavior (Maurer et al. 2003; Ho et al. 2010). Compared with creativity and design education research, despite some studies indicating that innovative behavior can effectively predict innovative outcomes (Scott and Bruce 1994; Jong and Hartog 2010), there are no studies integrating the TPB model into their research. The attitudes, subjective norms, and perceived behavior controls of TBP, and the antecedents of the three factors have not examined and integrated in a model for predicting creative achievements yet, though they are crucial not only in academic but also in practice. Our study seeks to understand better how these factors combine to influence design students in their creative achievements.

The main goal of this study was to explore the determinants that increase students' tendencies toward innovative behavioral intention and to predict the creative achievements based on the TPB. Since innovative behavior appears to be facilitated by personal motivation (Amabile 1983) and the climates for innovation such as the support for innovation or the resource supply (Scott and Bruce 1994). This paper add intrinsic and extrinsic motivations, significant others expectation and evaluation, self-efficacy, and facilitating condition are integrated with theory of planning behavior (TBP).

2 Integrated Model of Design Creative Achievements

Behavior refers to the actions of the individual. The behavioral intention is the extent to which an individual intends to engage in some behavior (Fishbein and Ajzen 1975). Innovative behavior is defined as individual actions directed at the generation,

introduction and application of beneficial novelty at any organizational level (Kleysen and Street 2001). Such beneficial novelty includes the development of new product ideas or technologies, and changes in administrative procedures to improve work relations, or the application of new ideas or technologies to significantly enhance the efficiency and effectiveness of work processes (West and Farr 1989; Kleysen and Street 2001). This study defines the innovative behavioral intention as referring to an individual who has a high tendency to innovate and achieve a status of innovative behavior. Scott and Bruce (1994) pointed out that the ratings for innovative behavior assessed by supervisors are positively and significantly associated with the numbers of inventions on the part of the employees. Other studies have also confirmed the close relationship between behavioral intention and actual behavior (Maurer et al. 2003; Fielding et al. 2008; Smith et al. 2008).

In the TPB model, behavioral intention is affected by attitude, subjective norm and perceived behavioral control (Taylor and Todd 1995; Chu and Chiu 2003; Maurer et al. 2003; Cheng and Chen 2007). The behavioral intention of individuals tend to be strong when they have a positive attitude, they support subjective norm, and there is strongly perceived behavioral control. According to expected-value theory, an attitude is a position regarding an individual's continual like or dislike of people and things. Studies showed that a personal positive attitude influences behavioral intention (Bock et al. 2005; Ryu et al. 2003; Smith et al. 2008). A subjective norm relates to the feeling of social pressure when the actor is engaging in a particular form of behavior. The social pressure comes from the reference group which is a person or a group that affects the decision of the actor (Ajzen 1985; 1989). The values, attitudes, behaviors and norms of the reference group are related to the evaluation, behavior and expectations of the actor (Blackwell et al. 2001). Perceived behavioral control (PBC) refers to a person who can control the extent of their resources or opportunities, such as time, money, ability, and personal knowledge (Ajzen 1989). PBC can directly affect behavioral intention (Ryu et al. 2003), and Ajzen (1985) pointed out that PBC directly affects actual behavior when personal PBC is close to actual behavior, and that PBC can influence the behavior in direct and indirect ways, as long as the actors increase their control over their behavior, the possibility of behavior will increase.

Attitude had been divided into two variables that are related to the personal relative benefit and social relative benefit. The former refers to rewards and the sense of achievement, while the latter is conducive to the overall public interest. Motivation comes from two directions, intrinsic and extrinsic (Amabile et al. 1994), both of which can positively predict the innovative behavior in the workplace (Tsai and Kao, 2004). Hence, the personal intrinsic benefit factors include the accomplishments and the satisfaction, and the personal extrinsic benefit factors include the rewards and the other s' approval. The subjective norm is determined by variables regarding the extent to which significant others want the individual to exhibit a certain type of behavior (Rivis and Sheeran 2003). Chang and Chiang (2008) indicated that both the evaluation and expectations of superiors were related to the creativity performances of individuals. In terms of significant others' expectation, Tierney and Farmer (2004) found that the supervisor who had higher expectations for the employee was perceived as being more creatively supported by the employee. Ramus (2001) pointed

out that the employee liked to try to work creatively when the employee was encouraged and supported by the system or policy. In terms of significant others' evaluation, Yuan and Zhou (2008) found that an individual who expected an external evaluation exhibited greater ability in improving idea appropriateness during the selective retention. Shally (1995) noticed that an individual who had the goals of creativity and work independence in an expected evaluation environment would generate the highest creativity. Ajzen (1985) noted that an individual who had strongly perceived behavioral control had higher self-efficacy, which reflected the strength of confidence of the actor and the probability of succeeding. Several studies (Taylor and Todd 1995; Chu and Chiu 2003) have shown that both self-efficacy and facilitating condition affect perceived behavioral control. The former refers to the degree of confidence which the individual has in one's own ability to finish the task (Bandura 1977). The latter refers to the degree of resources needed when the decision maker engages in some behavior (Taylor and Todd 1995; Chu and Chiu 2003). Tierney and Farmer (2002) pointed out that creative self-efficacy had a significantly positive effect on employee creativity. Amabile and Grysiewicz (1987) found that sufficient resources, such as facilities, equipment, information, and funds, contribute to the creativity of R&D scientists. To sum up, we propose the following hypotheses (HP):

HP 1: The innovative behavioral intention (IBI) is positively related to the creative achievements (CA).

HP 2: The positive attitude (AT) is strongly related to the IBI.

HP 3: The strong subjective norm (SN) is positively related to the IBI.

HP 4: The strong perceived behavioral control (PBC) is positively related to the IBI.

HP 5: The strong PBC is positively related to the CA.

HP 6: The personal intrinsic benefit (PIB) is positively related to the attitude (AT).

HP 7: The personal extrinsic benefit (PEB) is positively related to the attitude (AT).

HP 8: The significant others' evaluation (SOE) is positively related to the SN.

HP 9: The significant others' expectation (SOX) is positively related to the SN.

HP 10: The self-efficacy (SE) is positively related to the PBC.

HP 11: The facilitating condition (FC) is positively related to the PBC.

3 Methods

3.1 Sample Plan and Data Collection

The sample used in this study was taken from design students from northern, central and southern Taiwan. After considering that the main programs of the freshman and sophomore years involved studying a foundation course and accepting less practical training, this study focused on junior and senior undergraduate students as well as graduate students to collect samples using two approaches: to paste the questionnaire website with prize drawing on relevant pages of the design school, its blog and Facebook; to collect the email addresses of participants and send emails with the questionnaire website and prize drawing to the participants.

The internet questionnaire was first constructed based on the literature and then the content was reviewed and modified by two experienced experts for proper expressions. Owing to innovation being an abstract concept, we added an annotation (i.e., "Innovation" means that you put your design ideas into action) at the beginning of each part of the questionnaire as reminder. From a pilot-test with convenient sampling of the design students before formal survey, a total of 74 complete responses were collected for internal consistency analyses. The results showed that Cronbach's alpha values were ranged from .73 (for significant others' expectation) to .92 (for innovative behavior intention), which were higher than the suggested alpha value of 0.7 (Nunnally and Bernstein 1994). For formal survey, a total of 359 responses were received, in which 277 were valid. In terms of the gender, 33.6% (n=93) were boys and 66.4% (n=184) were girls. In year of study, 49.1% were in their junior year, 31.4% were seniors, and 19.5% were in their master's program.

3.2 Measurement

Creative achievement was measured by the creative achievement questionnaire, CAQ (Carson et al. 2005). This study used two fields, i.e., "visual arts (painting, sculpture)" and "inventions" from the second part of the CAQ. A slight modification was made without changing the original meaning in the inventions field. Participants responded based on the facts by multiple choices. There were totally 16 items in these two fields. The items in each field were rank-ordered and assigned ascending weights from 0 to 7 points. Thus, the highest score was 28 and the lowest score was 0 in each field. In short, higher score indicates higher creative achievement.

Innovative behavior intention was adapted from the innovation behavioral questionnaire (Scott and Bruce 1994). All 6 items were modified to measure the degree of intention to put in practice for searching new knowledge, new skills, and new product ideas during a student's time at university. Attitude, subjective norm and perceived behavioral control determined the intention in the TPB. The attitude involved using semantic differential scales with 7-point scale for measurement such as "I think innovation is good, beneficial, and valuable", and all three items were adapted from Ajzen (2002). The three items of subjective norm and three items of perceived behavioral control were adapted from Taylor and Todd (1995) and Lee (2010). Attitude was determined by personal intrinsic benefit and personal extrinsic benefit for which the definitions of both variables were based on the views of Amabile et al. (1994), Chu and Chiu (2003), and Bock et al. (2005). The Work Preference Inventory was used which included intrinsic and extrinsic motivation from Amabile et al. (1994) and which had been transferred to the Chinese version by Chiou (2000). The subjective norm was determined by the evaluation of significant others and others' expectations for which the items were developed using the definition based on the comprehensive views of Chang and Chiang (2008), Ramus (2001), Shally (1995) and Taylor and Todd (1995). The perceived behavioral control was determined by self-efficacy and facilitating condition for which the items were developed using the definitions of both variables from the viewpoints of Ajzen (2002), Bandura (1977) and Taylor and Todd (1995).

4 Results

Using LISREL8.8 and MLE estimates, all factor loadings of items were between .62 and .93, and that all factor loadings were significantly higher than the standard .5 (Hair et al. 1998). The composite reliability (CR) was between .60 and .89, and thus higher than the recommended value of .6 (Fornell and Larcker 1981). The average variance extracted (AVE) of most variables were between .51 and .68, and higher than the recommended value of .5 (Fornell and Larcker 1981). Except for the significant others' expectation (AVE=.47), which is close to the recommended value. Judging from the above, the results exhibited a certain degree of internal reliability and convergent validity, and showed that all values for the correlations of variables were lower than the values of the square roots of the average variance extracted, revealing that all variables had good discriminant validity.

The structural equation model includes model fitness analysis and the overall path coefficients and their significance analysis. In terms of model fitness, the ratio of the chi-square and degrees of freedom was $\chi^2/df = 2.32$ which was lower than .3. Other indices such as RMSEA=.069<.08 (Browne and Cudek 1993), CFI=.96, NNFI=.95, NFI=.93, and IFI=.96 were all greater than .90 (Hair et al. 1998). However, GFI=.81 and AGFI=.77 were lower than .90 and .80(Scott 1994), respectively.

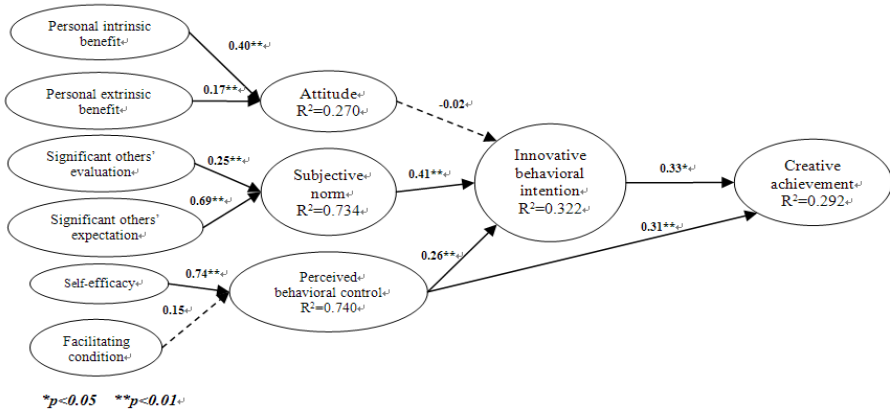


Fig. 1. Structural Model Analysis

Overall, the results indicated that the model was acceptable. The path coefficients and their significance for the 11 hypotheses of the integrated model are presented in Figure 1. The model shows that the coefficient of determination (R²) of each latent variable was 27% for attitude, 73.4% for subjective norm, 74% for perceived behavioral control, 32.2% for innovative behavioral intention, and 29.2% for creative achievements.

5 Discussion

According to the analysis results, the creative achievements of design students are affected by perceived behavioral control and innovative behavioral intention. Ajzen (1985; 1989) pointed out that the behavior is dependent on the personal volitional control, for when people have more behavioral control such as enough ability, opportunity, and resources, the more they engage in such particular behavior. Thus, perceived behavioral control affects behavior directly when the behavior needs enough ability to perform in a particular way. Amabile (1983) described creativity as the confluence of task motivation, domain-relevant knowledge and abilities, and creativity-relevant skills. The second variable emphasized the importance of the ability and knowledge in a specific domain. The study results support the viewpoints of both scholars. While the innovative behavioral intention can explain the creative achievement, the perceived behavioral control also can explain the creative achievements.

Based on the results for the three variables of TPB, the influence of the subjective norms on the innovative behavioral intention is the strongest, the perceived behavioral control follows, but the attitude is not related. The results based on the mean and standard deviation of attitude indicate that many design students described the attitude toward the innovation trend as good, beneficial, and valuable. However, for students to have a good attitude toward innovation does not mean the students will exhibit a stronger innovative behavioral intention. When contrasted with subjective norms and perceived behavioral controls, the approach that consisted of guiding students to have higher creative achievement to increase the significant others' evaluation and expectation or enhance the innovation ability, opportunities and resources for actors was more effective in improving the creativity achievement of the students.

In terms of the antecedent variables, first of all, personal intrinsic benefit and personal extrinsic benefit can both positively affect the attitude of students toward innovation in which case the influence of personal intrinsic benefit is higher than that of personal extrinsic benefit. This result is the same as that of Amabile (1994) who investigated the WPI scale and found that when an individual leaned toward intrinsic motivation, he or she would continue to produce creative works. Besides, our results are similar to those by Tsai and Kao (2004) in that personal extrinsic benefits facilitated creativity improvement, yet the effect of personal extrinsic benefit was lower than that of personal intrinsic benefit. Secondly, significant others' expectation and evaluation both affected the subjective norm, in which the others' expectations were higher than the others' evaluation. Therefore, regardless of the expectations from teachers or students, both can encourage their students or peers to innovate. In addition, our results are similar to those for Yuan and Zhou (2008), Shally (1995), Fodor and Carver (2000), and Tierney and Farmer (2004), for which the results showed that the pressure from the expectations of others effectively influenced the creativity results when students engaged in their creative work. Thirdly, the perceived behavioral control was affected by self-efficacy but was not affected by facilitating condition, in which the self-efficacy was more important than the facilitating condition. The research indicated that the design students needed time, mental effort,

and money to develop ideas, for sketches, modeling, and presenting work at different steps (Yang et al. 2003). However, even if it was possible to provide enough facilitating condition for the students, the self-efficacy that was the key factor for creativity. The results indicated that self-efficacy was able to explain the perceived behavioral control as in the studies by Tierney and Farmer (2002) and Hung et al. (2008). The former research showed that the creative efficacy of employees predicted creative outcomes. The latter research showed that the creative efficacy of 636 students predicted creative life experiences.

6 Conclusion

From above analyses and discussions, the hypothesized model was validated empirically using data for 277 students from industrial and visual designs. The results confirmed that both innovative behavioral intention and perceived behavioral control affect student's creative achievements significantly. Subjective norms and perceived behavioral control were significantly related to the intention to exhibit innovative behavior, but attitude was not. Self-efficacy exerts its influence on students' perceived behavioral control more significantly than other antecedent variables.

This study belongs to a cross-sectional study in which all the data for the variables were collected at the same time, yet this research design may confuse the cause with the effect. However, to resolve this problem, we could consider collecting the data on independent variables and dependent variables from different times, but two problems arise. First, creative achievements take a long time to accumulate. Even if data are collected at separate points of time, future achievements will cover the previous accumulation that is difficult to explain at this point in the relationship between cause and effect. Second, data collection at two points in time might cause a large number of participants to suffer loss and make the collection of data difficult. That is why studies predicting innovative behavior and creativity outcomes always collected data at the same time. Thus, according to the study of Jong and Hartog (2010), this study has used innovative behavior to predict creativity outcomes which reveal that our argument is reasonable.

The attitude variable was no significant affect on innovation behavior intention in the model used in this study. Students have a good attitude toward innovation does not mean the students will exhibit a stronger innovative behavioral intention. However, the descriptive statistics reveal that design students described the attitude toward the innovation trend as good, beneficial, and valuable which means that most students have a positive attitude and support innovation. It seems that the attitude might be affected by social expectations that might cause the participant to select a higher point. Therefore, the items regarding attitude have been improved. The relationship between attitude and innovation behavior intention needs to be carefully investigated in further research.

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