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How Practitioners in Design Industry Become Innovative? The Identification of Influential Factors

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ABSTRACT

In the retrospective on the educational history, innovative capability cultivation has been a major concern in education, particularly in the field of design. This study was conducted to determine the major factors influencing innovative capabilities of practitioners in the design industries, focusing on their professional proficiency, employment attitudes, and work efficacy. This study was also designed to determine the effects of these three factors on the innovative capabilities as well as the correlations among these factors. Validated questionnaires were mailed to 261 practitioners in the design industries in Taiwan. The data were analysed using SPSS version 18.0 and AMOS software. Pearson correlation analysis, Confirmatory Factor Analysis (CFA), and Structural Equation Modeling (SEM) were employed. Several main conclusions were drawn from the study: (1) the practitioners in the design industry generally possessed professional proficiency, employment attitudes, work efficacy, and innovative capabilities; (2) there were significant and positive relationships among professional proficiency, employment attitudes, work efficacy, and innovative capabilities, and (3) the co-existence and interactive structures were obvious among these four essential factors. Based on the data, several suggestions for the practitioners and organizational administrators were provided.

Keywords: Design industry, professional proficiency, work efficacy, innovative capability, Taiwan

INTRODUCTION

Research Background

Today is an era dominated by creative design. Design stimulates a dramatic change in the global industries. Design has become a popular discipline in Taiwan. So far the development of design discipline in this country has had a history of more than 50 years. After such a period, Taiwan's design industry has already reached a certain level and has been tremendously integrated into the production and marketing systems. However, under the open competition of international market, Taiwan's design industry must transform from a subcontracting industry relying on labor-intensive approach to an innovative industry employing creative designers. Due to current fierce global competition, cultivating creative design talents is becoming more critical.

Consequently, Taiwan's design departments in universities/colleges are mushrooming due to the current trend. Some have won numerous prizes in world's major design awards. However, with regard to employment situation in Taiwan, the graduates' designs major have had difficulty in finding and sustaining their job in design industry. Moreover, ratio of graduated design discipline students having served for more than one full-time job within one year after graduation is the highest as compared to other disciplines. This shows a very low degree of employment stability, i.e., they changed job quite often (Zang, 2013). Thus, this phenomenon is worthy of research.

Industry-academia gap in design discipline in Taiwan has been the focus of heated debate taken seriously by universities/colleges, in terms of training the relevant talents for this sector. Therefore, this study intends to determine the relationships among four factors, namely, professional proficiency, employment attitudes, work efficacy, and innovative capabilities, through the use of multiple regression and SEM.

RESEARCH PURPOSE AND OBJECTIVES

This study aims to determine the relationships among professional proficiency, employment attitudes, and work efficacy of design practitioners on their innovative capabilities, as well as the internal correlations among these four factors. Specifically, the objectives of the study are as follows:

(a) to explore the job duties of the practitioners in design industries
(b) to identify the needs of professional proficiency for design industry
(c) to investigate the performance traits of current design practitioners on employment attitudes, work efficacy and innovative capabilities
(d) to determine the internal structural relationships among professional proficiency of design practitioners and their employment attitudes, work efficacy and innovative capabilities

LITERATURE REVIEW

Meanings and Dimensions of Design Profession Proficiency

Function of design has been constantly extended to strengthen consumers' brand identity and integrity (Underwood & Ozanne, 1998). In addition, designers must also consider environmental sustainability in their designs (Ho, 2008). Therefore, under the present situation, Taiwan's industry has come to a bottleneck, and the current manufacturing subcontracting urgently needs a substantial transformation. Thus, creativity and innovation have become a new magic weapon for enterprises' survival (Hsu, 2007).

According to the occupation name and definition specified in the Standard Occupational Classification System of the Republic of China (Rev. 6) (Directorate General of Budget, Accounting and Statistics, Executive Yuan, 2010), the designer is defined as a person who has specialized knowledge for all businesses engaged by him/her, usually requiring higher education or professional training, or having passed a related professional examination. From that definition, it can be learned that, in order to be competent, a person who is engaged in a design-related industry is required to pass a relevant examination or obtain a relevant certification. Therefore, this study used the theoretical and practical items in the content of Category B Certificate of Taiwan's Visual Communication Design as the test to measure the designer's proficiency.

Taiwan's Design Field Certificate Specification was formulated in 1993 but today it has been unable to meet the current requirements of the times, so in order to respond to industries' demands toward professional fields, Category B Certificate has been particularly subdivided into four kinds of certificates: Graphic Design, Identification and Image, Packaging Design, and Illustration Design, (Council of Labor Affairs Executive Yuan, 2006). The Design Field Certificate Specification has explicitly specified the abilities a visual communication design personnel should possess. These include two dimensions of basic knowledge and application techniques, and further divided into 16 items including basic aesthetic attainment, basic graphics, basic design, text shapes and layouts, printing concepts, color concepts and applications, photographic presentation concepts, illustration

(design drawing), creative thinking and color artwork production, computer graphics, script drawing, screen configuration, identity design, packaging design, communication and expression design description, and costs (Council of Labor Affairs Executive Yuan, 2006). Therefore, this study attempts to explore from industry's perspective what capabilities a person engaged in design field should have, and to examine the extent of consistency between the design test items and current design trends.

Meanings and Dimensions of Employment Attitudes

Another objective of the study was to identify employment attitudes of design industry practitioners, as well as to explore the factors influencing employment attitudes. Therefore, the researchers have conducted relevant literature review on Theory X and Theory Y that were proposed by McGregor (1957; 1960) and their application in management. These two theories have had a significant effect on organizational management and organizational behaviors (Bedeian & Wren, 2001; Miner, 2003; Crainer & Dearlove, 2006; Kopelman et al., 2010). According to the proposition of Theory X, managers hold a pessimistic view on employees, reflecting a sense of distrust of managers to employees; while in the contrary, Theory Y holds an optimistic view, it points out that the role of managers should help their subordinates and should nurture their potential, rather than just exercising control and command on them. Although McGregor's theoretical views have continuously guided the related academic and practical development of organizational management and organizational behavior, but only until recent years, some scholars have begun to develop attitude and behavior scales for McGregor's theories, and which are of great significance to the application of McGregor's theories (Miner, 2002; Kopelman et al., 2010; Qiu & Xie, 2011).

Meanings and Dimensions of Work Efficacy

The concept of self-efficacy was proposed by social psychologist Albert Bandura. Bandura's self-efficacy theory focuses on individual's views, beliefs and expectations for his/her own work tasks, so self-efficacy is also the subsequent result of interactions of individuals with external environment, individual abilities, and achievement performance. An employee's self-efficacy and performance model is shown in Figure 1 (Bandura, 1977; 1986). The self-efficacy to be investigated in the present study is the self-assessment of required professional knowledge and capabilities in the workplace for design practitioners. Self-efficacy, by nature, is a kind of self-confidence, and is the belief for successful implementation of an act for their own; because if people do not believe in their own capabilities, they would not change (Yukl, 2002).

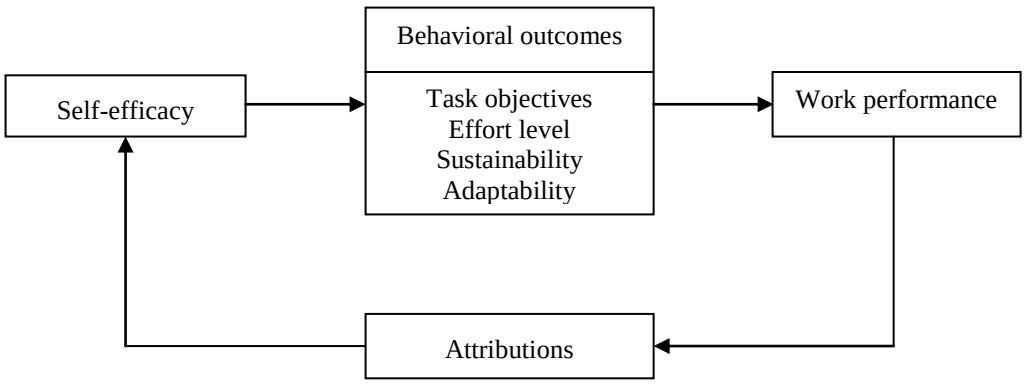

Figure 1: Self-efficacy－performance model
(Bandura, 1986)

The effect of self-efficacy on work performance lies in the strength of employees' confidence in facing a difficult situation. The sustainability of dealing with difficulties when facing a challenge, as well as a kind of adaptability that allows employees to overcome their difficulties. Therefore, employees' view on their own abilities would affect the self-regulation mechanism that determines their achievements. High or low self-efficacy would affect an individual to take confronting or retreating action in a particular context, and the ability to courageously face the problem or overcome difficulties; it also affects work adaptability.

This study has integrated the definitions to explain work efficacy. In individual's work context, the confidence is defined as the ability to solve problems and to complete tasks; the ability to adjust and adapt when facing different work environment. In order to measure individual's self-efficacy, it is divided into three categories, i.e., "work confidence", "ability perception", and "adjustment and adaptation" (Yen, 2009).

Meanings and Dimensions of Innovative capability

Today, economic sector has been transformed from manufacturing and service-oriented to information flow-oriented industry. In the future, it will further evolve into a "knowledge" based economy. Thus, innovative capabilities will become an indispensable part, because in the post-modern society, innovative individuals may acquire leading position in the workplace (Chen, 2009). In the "Innovative Age" (Florida, 2004); persons who have new ideas, able to open a new vision for our industries, will be the talents urgently needed by all sectors. But, what really is the innovative capability concerned by design industry practitioners?

Innovative capabilities are being associated with perceptual and cognitive processes of an invention. In terms of the definition and meaning of innovative capabilities, most researchers would use the "Five Forces and Four Hearts" to illustrate the meaning of innovative capabilities: the Five Forces (capacities) refer to Sensitivity, Fluency, Flexibility, Originality, and Elaboration; while the Four Hearts (affective traits) refers to Risk-taking, Complexity, Imagination and Curiosity (Chen, 2005). These meanings show that innovative capability is closely associated with people's mental abilities. Therefore, the most commonly used innovative capabilities tests are also associated with the measurement of cognitive thinking abilities (for example, Torrance Tests of Creative Thinking). However, the biggest problem with innovative capabilities is the measurement of the construct (Kerr & Gagliardi, 2003; Chiou, 2005). Currently, diverse methods to measure innovative capabilities can be roughly divided into four categories: (1) creation process, (2) creators' traits, (3) behaviors and experience, and (4) measurement and assessment (Hocevar & Bachelor, 1989; Chiou, 2005).

Literature suggests that, in terms of current psychological theories and research, a measurement of innovative capabilities has its degree of difficulty, especially it is hard to clearly observe and measure innovative capabilities thinking (Amabile, 1983). Inventors with high innovative capabilities have certain personal traits (Davis, 1989). For example, Barron and Harrington (1981) have compiled and sorted out personality traits presented by inventors, including preferring complexity, independence, self-confidence, and enduring differences between oneself and others. Raudsepp (1981) believed that personal barriers in emotions and attitudes would affect the development of innovative capabilities. In addition, Basadur and Hausdorf (1996) found that values possessed by individuals play an important role in innovative capabilities because when a person puts importance to a new concept or idea, he/she is often able to have a better performance. Finally, Sternberg and Lubart (1996) believed that people with high innovative capabilities possess certain traits such as persistence when facing with obstacles, willing to take reasonable risks, willing to grow, enduring fuzzy state, accepting new experiences, and having confidence in themselves.

From the literature, it can be deduced that innovative capabilities-related personal traits cover a relatively wide scope, including personality traits, motivations, cognitive preferences, attitudes, abilities or experience factors, and so on. Thus, the development of many innovative personality measurement tools have been facilitated. Therefore, if these personal traits could be cultivated through different strategies, then there would be a great help to the stimulation of innovative capabilities, so this study has adopted personality traits as the main evaluation model for innovative capability.

METHODOLOGY

Research Design

The purpose of this study was to determine the factors that influence professional proficiency, employment attitudes, work efficacy, and innovative capability of Taiwanese design professionals. This research further scrutinized the effects of these factors on the innovative capabilities as well as the correlations among these factors. Figure 2 shows the conceptual for the study.

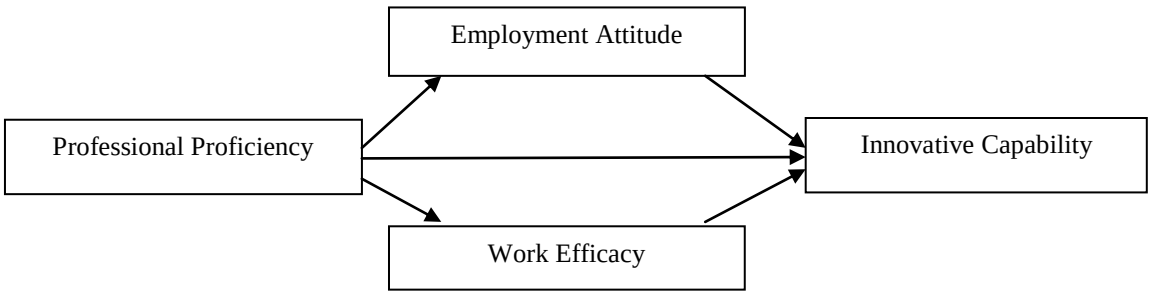

Figure 2: Conceptual framework

Research Hypotheses

Based on the research objectives, this study consequently proposed the following research hypotheses:

(1) The professional proficiency of practitioners in the design industries has significantly positive effects on their innovative capability
(2) The employment attitudes of practitioners in the design industries have positive effects on their innovative capability
(3) The work efficacy of practitioners in the design industries has positive effects on their innovative capability
(4) The co-existence and interactive structures were obvious among these four factors in the of design industry

Research Participants

The practitioners in the design industry were the targeted population. Considering the research expense and participants' consensus, participants were selected from 168 companies in Taiwan. A random sample of 300 practitioners received four instruments for this study, and 261 returned the instruments (87% of return rate). The demographic analysis indicated that 136 (52.1%) practitioners were graduated from public universities and 125 (47.9%) were graduated from private universities.

Instruments

The research data were collected using the following four instruments: (A) The professional proficiency questionnaire was adopted from the Council of Labor Affairs in Taiwan (2006). It was employed to measure the level of professional proficiency. The questionnaire consisting of 16 professional proficiency items comprised two major domains of professional proficiencies: basic knowledge (8 items) and application techniques (8 items). The questionnaire using five-point Likert's scale ranging from 1 (highly disagree) to 5 (highly agree). (B) The employment attitudes questionnaire (Miner, 2002; Kopelman et al., 2010; Qiu & Xie, 2011) with 12 items consisted of two domains i.e., Theory X (6 items) and Theory Y (6 items) of 5-point Likert's scale. (C) The work efficacy questionnaire (Sherer & Maddux, 1982) with 17 items consisted of three domains, i.e., work confidence (7 items), ability perception (5 items) and adjustment and adaptation (5 items). This questionnaire also used 5-point Likert's scale (1=highly disagree to 5=highly agree). (D) The innovative capability questionnaire (Williams, 1972; 1980) with 18 items consisted of four domains; risk-taking (4 items), complexity (5 items), imagination (5 items), and curiosity (4 items). The internal consistency of the instruments using Cronbach Alpha Coefficients ranged from 0.68 to 0.88.

Data Analysis

The SPSS version 18.0 for Windows was used to evaluate the descriptive statistics, exploratory factor analysis, and demographic analysis of the respondents. AMOS for Windows was also used to take a two-step approach for the structural equation modeling (SEM) analysis. This study took a two-step approach to assess and evaluate the SEM (Anderson & Gerbing, 1988). First, the proposed model was examined by using both confirmatory factor analysis (CFA) to assess the effectiveness of the measurement model and SEM to propose a structural model. An attempt was made to closely examine the measurement model and assess the quality of the measurement model by testing the model fits, composite reliability, and convergent and discriminant validity of professional proficiency, employment attitudes, work efficacy, and innovative capability. Next, the SEM analysis was conducted to estimate all of the SEM parameters by using the Maximum Likelihood Estimation method. The direction and significance of the relationships were determined by simultaneously testing of all the null hypotheses.

RESULTS

Reliability and Validity

Table 1 shows the factor loadings, Cronbach α, average variance extracted, and composite reliabilities for the latent variables. All the reliability values in this study exceeded 0.60, demonstrating a relatively high internal consistency of the latent variables (Bagozzi & Yi, 1988; Hair et al., 2006). All factor loadings exceeded 0.5 with significance results ($t>1.96$, $p<0.05$) (Hair et al., 1998). Thus, providing evidences of convergent validity. Moreover, convergent and discriminant validity were evaluated by using the average variance extracted (AVE). On the basis of the test's criterion, each value of AVE should exceed 0.50 (Fornell & Larcker, 1981; Bagozzi & Yi, 1988). In this study, most of the AVEs were found to be near or exceeded the threshold of 0.50 indicated that the data have adequate levels of a convergent and discriminant validity. Additionally, all of the inter-correlations between pairs of constructs were less than the square root of the AVE estimates, and thus provided discriminant validity (Table 2) (Hair et al., 2006). According to these assessment indices, the instruments under this measurement model possessed acceptable validities and reliabilities.

Table 1: Factor loadings, average variance extracted and composite reliability of the measurement model

Variables	Factor Loadings	Cronbach α	AVE*	CR**
Professional Proficiency		0.860	0.61	0.76
Basic Knowledge	.87			
Application Technique	.68			
Employment Attitudes		0.707	0.51	0.58
Theory X	.67			
Theory Y	.61			
Work Efficacy		0.903	0.55	0.79
Work Confidence	.69			
Ability Perception	.77			
Adjustment & Adaptation	.77			
Innovative Capability		0.895	0.49	0.79
Risk-Taking	.78			
Complexity	.75			
Imagination	.56			
Curiosity	.69			

Table 2: Correlation matrix of the latent variables

Latent variable	Professional Proficiency	Employment Attitude	Work Efficacy	Innovative Capability
Professional Proficiency	0.781			
Employment Attitudes	0.400**	0.641		
Work Efficacy	0.287**	0.258**	0.744	
Innovative Capability	0.332**	0.299**	0.507**	0.70

Note: Diagonal values indicated the square root of average variance extracted of each construct

Structural Model

The goodness-of-fit tests of the structural model, including the GFI, AGFI, NFI, NNFI, CFI, SRMR, RMR and RMSEA were also conducted in this study to determine the structure model fitness within the latent variables (Jöreskog & Sörbom, 1996; Diamantopoulo & Siguaw, 2000; McDonald & Ho, 2002). In this study, however, the χ^2 test (χ^2=163.887, df=39, p<0.001) could not determine the goodness-of-fit of the model. This could be due to the effect of the large sample size (Anderson & Gerbing, 1988). Nevertheless, other statistic results, including χ^2 /df (4.20), GFI (0.91), AGFI (0.84), NFI (0.91), NNFI (0.91), CFI (0.92), SRMR (0.08) RMR(0.022), and RMSEA (0.09) indicated an acceptable fit of the structural model (Table 3).

Table 3: Overall model fitness

Indices	Model Fitness	Criteria	Accept	References
Chi-square test				
Chi-square	163.887 (p<0.01)	p>0.05	No	Carmines & MacIver (1981)
Chi-square / df	4.202	<5	Yes	Teng & Fiedler (2002); Tippins & Sohi (2003)
Goodness-of-fit indices				
GFI	0.91	>0.8	Yes	Baumgartner & Homburg (1996)
AGFI	0.84	>0.8	Yes	Baumgartner & Homburg (1996)
NFI	0.91	>0.9	Yes	Bentler & Bonnett (1980)
NNFI	0.91	>0.9	Yes	Bentler & Bonnett (1980)
Alternative indices				
CFI	0.92	>0.90	Yes	Bentler (1990; 1992; 1995)
RMSEA	0.09	<0.1	Yes	Hu & Bentler (1999); Hair (1998)
SRMR	0.08	<0.08	Yes	Hu & Bentler (1999)
RMR	0.022	<0.08	Yes	

The results of SEM analyses indicated that the practitioners' professional proficiency was not significantly influenced by their innovative capability (γ= -0.16, p>0.05) (see Figure 3). Thus, the Hypothesis I was rejected. On the other hand, the practitioners' employment attitudes have significant positive impacts on their innovative capability (γ=0.70, p<0.001). Therefore, the Hypothesis II was accordingly accepted. In addition, their work efficacy created a significantly positive impact on the innovative capability (γ= 0.39, p<0.001). This finding accepted the Hypothesis III. The analyses focusing on the systematical relations among the factors revealed the significant mediation effects of both employment attitudes (b×c = 0.434) and work efficacy (d×e = 0.183) on their innovative capability.

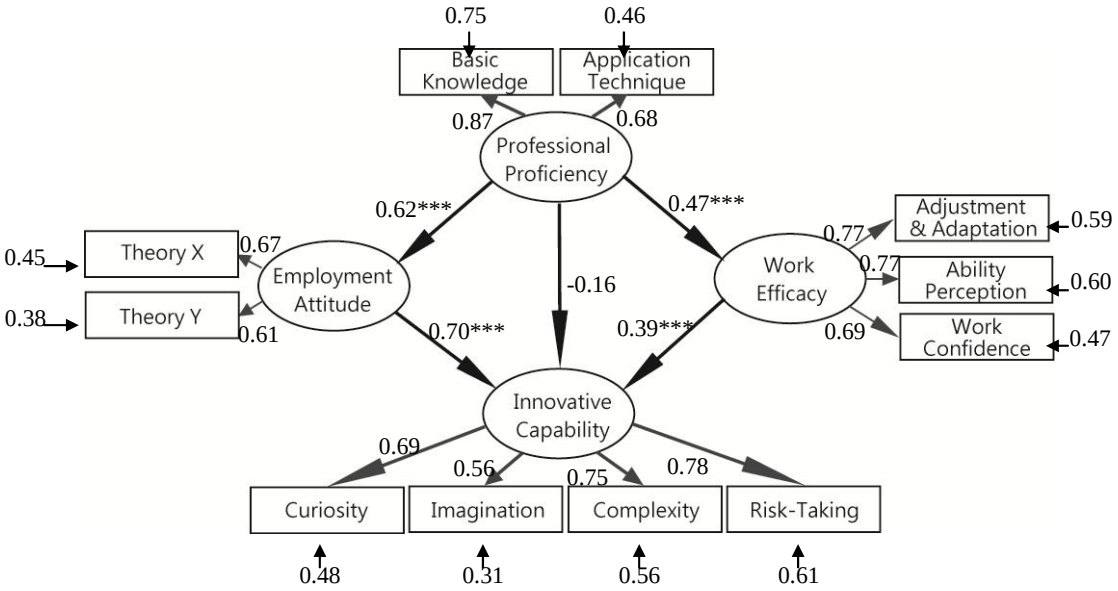

Figure 3: Structural model
Note: **: p<0.01; ***: p<0.001

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Academic circles have been interested in the study of intelligence very early, while the study of creativity was not gotten attention until 1950s (Chiou, 2005). After six-decade of investigation, although many controversies concerning connotations, mechanisms and related issues of innovative capability still exist, at least the conclusion that innovative capability and intelligence are different is established, and also that the manifestations of innovative capability in different knowledge fields are different, and their important influencing factors are different as well (Runco, 2004). Therefore, how to make use of individual innovative capability to accumulate and update organizational knowledge has been the concern of innovative capability researchers. This study aimed to investigate the causal model among the four latent variables, namely profession proficiency, employment attitudes, work efficacy, and innovative capability. Based on the empirical data and limitations of the study, these conclusions could be drawn:

1. Design field professionals generally have adequate profession proficiency, employment attitudes, work efficacy and innovative capability.

In terms of current research, all the scales used in this study are five-point scale, and it was found that, the means for the items for profession proficiency ranged from 2.95 to 4.88. For employment attitudes, the means ranged from 2.68 to 4.85. The means for work efficacy ranged between 2.86 to 4.86, and the means of 3.84 to 4.90 for innovative capability. Therefore, it is concluded that the respondents generally possessed good profession proficiency, employment attitudes, work efficacy, and innovative capability.

2. Highly interdependent and interactive structural relationships exist among the four variables - profession proficiency, employment attitudes, work efficacy, and innovative capability.

The results show that high interdependent and interactive structural relationships exist among the latent variables of profession proficiency, employment attitudes, and work efficacy. In some

literature, these three variables were combined and defined as "employability" (Atkinson, 1984; Hillage & Pollard, 1998; Harvey, Locke & Morey, 2002; Yu, 2011). Employability refers to a person's ability to cultivate long-term development in individual's professional field, and to effectively transfer the generic knowledge and skills into different fields. In addition, employability is not simply paying attention to the employment situation of graduates but it is more critical for the future competitiveness of graduates in the labor market. Employability is also a kind of responsiveness of being able to choose personal career and access to better career opportunities (Berntson, Näswall & Sverke, 2008). From these results, the following points could be summarized:

a. Profession proficiency affects work efficacy
The skills acquired from job opportunities and the development of learning potential will affect employment efficacy (Lane, Puri, Cleverly, Wylie & Rajan, 2000). The higher the self-efficacy, the more the career choices, and the longer sustainability in the career.

b. Profession proficiency affects employment attitudes
In addition to professional technical expertise, job seekers are still necessary to pay attention to the employability skills corresponding with employment attitudes and inter-personal relationships (Feng et al., 2005). Therefore, the employees should focus on enhancing employment attitudes of their workers.

c. Profession proficieny affects innovative capability
Innovative capability is regarded as the most valuable resource of human. It is used to enhance and promote the progress of individuals and the whole society. Innovative capability would be affected by professional knowledge. This means that people with profession proficiency are assumed to be more creative than non-professional people (Hung, Chen & Yeh, 2006). Innovative capability is a kind of mastery performance occurring in a particular field and a kind of interaction through making good use of creative skills. The relationship between creativity and innovation is mutually interactive with each other (Amabile, 1983).

d. Employment attitudes and work efficacy affect innovative capability
In dimensions of employment attitudes and employment efficacy, both exist a direct effect on innovative capability (Amabile, 1983; Hung, Chen & Ye, 2006). Amabile (1983) proposed the Creation Factor Theory, and she believes that the birth of a innovative product must rely on at least three basic ingredients: (1) domain-relevant skills, (2) creativity-relevant skills, and (3) task motivation. The domain-relevant skills constitute readiness state of creation, while creativity-relevant skills are related to the search for creative ideas. In addition, the high or low level of a person's task motivation would affect his/her learning and preparation on domain-relevant skills and creativity-relevant skills, and also would affect his/her cognition to task and searching for new ideas in his/her process of creation.

3. In the analysis of structural relationships, it was revealed that, employment attitudes and work efficacy are intermediary variables - they affect the influencing power of profession proficiency on innovative capability; and this reflects the importance of employment attitudes and values of design practitioners on their work duties.

Similar to the previous findings, the present study has once again shown that employment attitudes and work efficacy would affect innovative capability. Employment attitudes and work efficacy would affect individual's motivation in engaging in employment behaviors as well as the pursuit of certain innovative behaviors (Bandura, 1977; 1986). In summary, this study found that employment attitudes and work efficacy play critical role in enhancing innovative capability.

Recommendations

The creation of knowledge is the focus of an organization's ability to survive so if an organization can effectively produce and use knowledge, then the competitiveness of the organization will be greatly enhanced. The present study has found that in order to have a sustainable management of an

enterprize, employees' innovative capability has become a competitive advantage for the growth and sustainable operation of the enterprise; therefore, enhancing employees' innovative capability is very critical. Thus, innovative capability has even become a necessary condition for the success of the business organization. In recent years, statistical analysis techniques have been developed very quickly, through using high-level measurement and analysis techniques such as Item Response Theory (IRT) or Structural Equation Modeling (SEM). The assessment of measurement errors and potential constructs can be more effectively dealt with, and this is a potential research area for innovative capability assessment. In fact, CFA could be expanded to the examination of high-end, multi-level factor structures, and cross-validation study of validity review for different scenarios or objects. A further research on constructivist study on innovative capability assessment could be conducted in the future.

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