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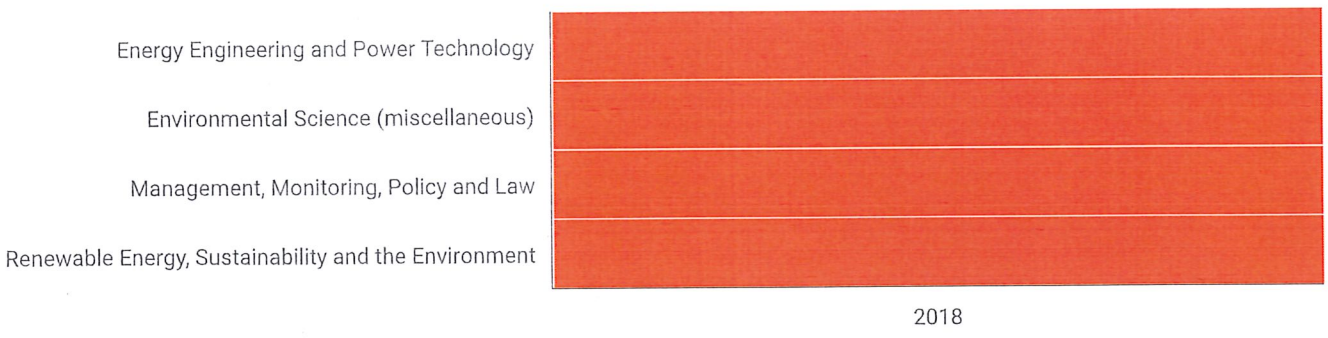

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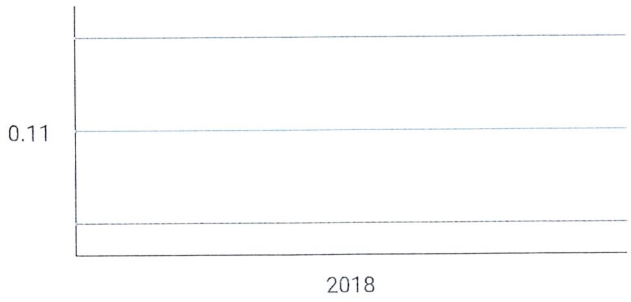

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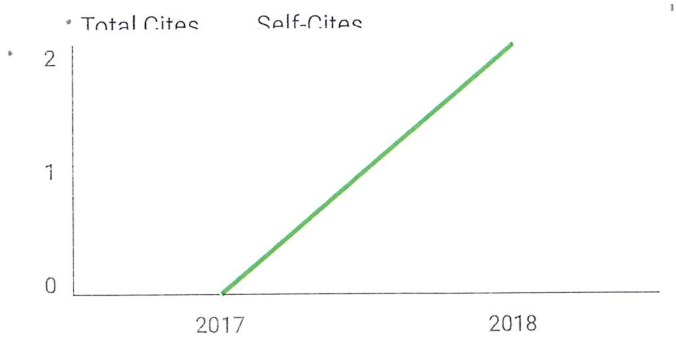

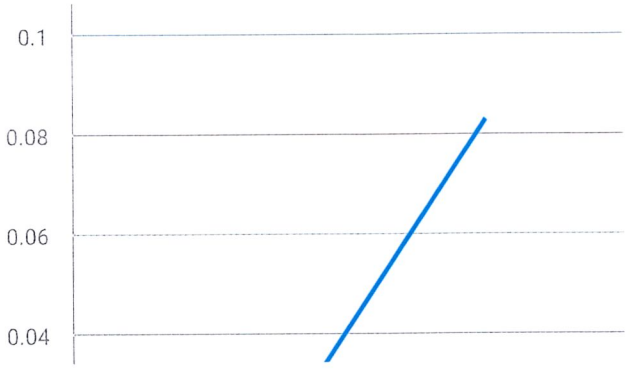

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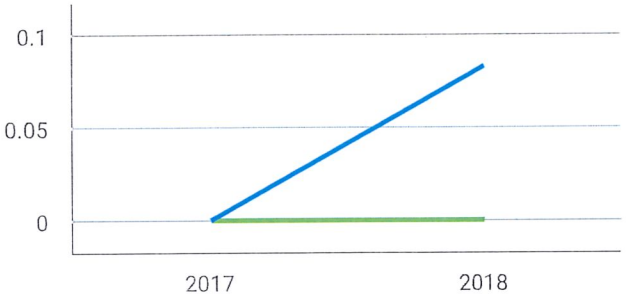

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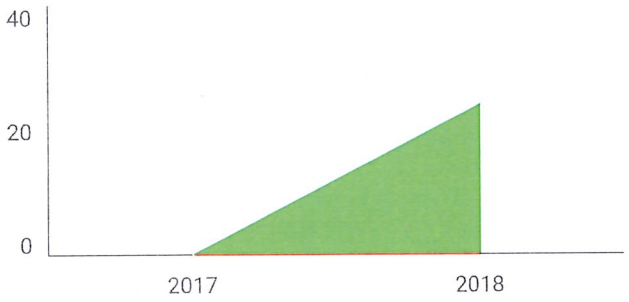

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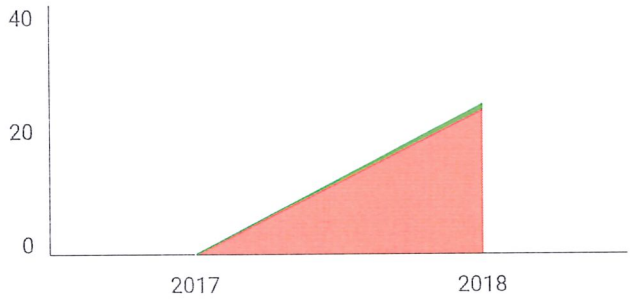

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Innovative Organization and Creative Thinking Development for Undergraduate Students of the University with Creative Identity in Thailand

Sirichai Deelers, Panjai Tantasanowong, and Somnuk Aujirapongpan*

Abstract— *The study aims to develop indicators of the creative thinking development process, analyze factors which affect levels of creativity of undergraduate students and study the relationship between the innovative organization and the technological innovation which have an impact on the creative thinking process and the levels of creativity of undergraduate students in Silpakorn University, Thailand. The findings revealed that there were 5 stages of creative thinking development process: knowledge development, attitude and skill development, thinking creation, thinking application, and identity development. The creative thinking development process could be explained by an innovative organization. The factors which affect undergraduate students' creativity included mothers' income, fathers' occupation, programs, faculties, and curriculum.*

Keywords— **Creative thinking, higher education, innovative organization, creative thinking process, creativity development.**

1. INTRODUCTION

The importance of creativity is well recognized as a top of the interest with design research and has been extensively studied by researchers from many disciplines [1]. The aim of this study is to investigate the relation between creative thinking development process and creativity of undergraduate students. The University need for creative development from professional professor to enhance creativity. The theoretical arguments for the role of context and creative process have been building over the past 20 years or so.

An Educational psychologist is concerned with the learning, thinking, teaching, problem-solving, creative development, and other process-even the personality development process [2]. Creativity researchers need a broader conceptual framework for considering the developmental nature of creativity. Higher education institutions are still the primary environmental source of creativity modeling and release, which can further be described as serving as a frame of expectations upon which much human action regularly depends [3]. Higher education needs to see creativity within the important role it plays in preparing people for an uncertain and ever more complex world of work; a world that requires people to utilize their creative as well as their analytical capacities of creativity in higher education and how we might encourage change towards a culture that is more valuing of students' creative development [4]. It is believed that supporting students with enriched instructional environments and challenging strategies and/or tools for improving creative ability are particularly essential.

Our paper offers a theoretical framework for developing indicators of creative thinking development process. Furthermore, analyze factors which affect levels of creativity of undergraduate students. We present several links between the relationship of the innovative organization and the technological innovation which have an impact on creative thinking development process and the levels of creativity of undergraduate students.

Objectives

(1) To develop indicators of the creative thinking development process.

(2) To analyze factors affecting the levels of creativity of undergraduate students.

(3) To study the relationship between the innovative organization and the technological innovation which have an impact on the creative thinking development process and the levels of creativity of undergraduate students?

2. LITERATURE REVIEWS

Innovative Organization and Technological Innovation

Liao and Wu [5] proposed about innovative organization that influencing organizational innovation by behavior innovation, product innovation, market innovation, and strategic innovation. Hu [6] studied linking organizational learning fully mediates the relationship between efficiency-centered business models and technological innovation performance. Camisón and Villar-López [7] assessed organizational innovation favors the development of technological innovation capabilities can lead to superior firm performance.

Hypothesis 1: innovative organization are positively related to technological innovation

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Innovative Organization and Creative Process

The proposition of innovative organization value has positive effect upon creative process. Yao, Wang, Dang, and Wang [8] proposed the role of individualism-collectivism in the individual creative process that both horizontal individualism and horizontal collectivism had positive influences on idea generation. Pera [9] proposed the role of social factors in the creative process that the cognitive and motivational processes which lead to creative idea, the role of collaboration and context in creativity.

Hypothesis 2: innovative organization are positively related to creative thinking development

Technological Innovation and Creative Process

Zheng, Chanaron, You and Chen [10] proposed the key performance indicator system for technological innovation audit at firm's level with innovation input performance and innovation process performance and innovation output performance. Verdu, Tamayo, and Ruiz-Moreno [11] proposed technological innovation are related to innovation in processes and products and to use of resources especially dedicated to the capacity to innovate by the percentage of new technology-based products or services has increased rapidly. Binz, Truffer and Coenen [12] studied on technological innovation systems (TIS) concept to divide between TIS structure and process and synthesized a TIS most successfully creates and diffuses new technologies.

Hypothesis 3: technological innovation are positively related to creative thinking development process

Creative Thinking Development Process and Creative thinking

Fürst, Ghisletta, and Lubart [13] proposed creative process in visual art by model of creativity and creative process to investigate how mood and personality variables can influence to the creative process and which of these variables are the best predictors of the creative product. Snider, Culley, and Dekoninck, [14] analyzing creative behavior in the later stage design process by classifying the tasks that designers complete throughout the design process, analysis has demonstrated two different approaches to creative behavior in later stage design. Laisema and Wannapiroon [15] proposed a collaborative learning with creative problem solving process learning activities consisted of five stages to develop creative thinking skill.

Hypothesis 4: creative thinking development process are positively related to creative thinking

All research of creative process have many stages and various researchers to propose about creative thinking and process but creative thinking development process has some research to investigate in student but in University or higher education. We propose to investigate creative thinking development process in a creative university that was originally established as the first School of Fine Arts in Thailand [16].

3. METHODS

This research is an integrated research by using mixed method, i.e., in-depth interviews and questionnaires. 26 in-depth interviews of professors and administrators was conducted to develop creative thinking development process from grounded theory to confirm our proposed by quantitative method with questionnaires based on developing the indicators of creative thinking development process to the evaluation of the innovative organization, technological innovation and creative thinking.

Data Collection

The sample of the questionnaires included lecturers of each program of each faculty who act as a representative of each curriculum (295 lecturers). The well-being questionnaire consists of three components, including Innovative Organization, Technological Innovation and Creative Thinking Development Process from grounded theory. These three components are arranged in a 69 items questionnaire are surveyed though a 5 point Likert scale. To test the internal consistency reliability, Cronbach's coefficient alpha test was performed (the overall Alpha value of items is 0.96). The items are greater than 0.6 of index of Item Objective Congruence (IOC). Moreover, undergraduate students in the academic year 2014 were the samples who provided data to evaluate the levels of creativity of undergraduate students of each program (693 questionnaires). Questionnaire consists of two components, including family background, education and level of creative thinking by applied questionnaire from how creative are you? [17].

Data Analysis

The collected data were analyzed qualitative methods by grounded theory and quantitative analysis by using Mean, Standard Deviation (S.D.), One – Way ANOVA, Multiple Comparisons, Simple Correspondence Analysis, Confirmatory Factor Analysis (CFA) and Structural Equation Model (SEM) by LISREL.

4. RESULTS

This study found that there are five stages of creative thinking development process by Grounded Theory.

(1) Knowledge Development is approach of each major in difference field: Fine Arts is cultivate skill that demonstrate identity and concept of project designed by master to peer. Applied Arts is learning about basic drawing and basic of art. Social Sciences and Humanities are learning about theory and fundamentals but append creative subject's related field, and Science and Technology are leaning basic and fundamental in sciences and systematic thinking by practice in laboratory.

(2) Attitude and Skill Development are approach for attitude, skill, practice, thinking by knowledge etc. For Fine Arts is practice for advance skill and demonstrate projects by knowledge and creative process and concept that logical thinking to support projects'. And learning

by study visit art environment and art gallery. Applied Arts is learning by knowledge and project base learning using thinking imagination and apply knowledge in design. Social Sciences and Humanities are motivate learning and thinking by peer to peer and master to peer for problem solving, error in knowledge, study visit and selected specific approach. Science and Technology are learning skill for problem solving by logical thinking and scientific process that relate results of experiment. The Outputs of learning are analytic thinking and knowledge mindset of science.

(3) Thinking Creation is knowledge generation and adaptation to change by monitor thinking of student by theory and comprehensives in knowledge. Fine Arts is concentrate practice and individual study by art work and approve by master to peer. World view of student is demonstrates by artwork by compare thinking, communication that associated with concept of thinking by group learning. Applied Arts learning by logical thinking, analytical thinking and critical thinking for identity development by presentation project. Social Sciences and Humanities learning by using knowledge for diary life by fieldwork study, formulate assumption, and leaning by expert in field study for in-depth knowledge and inspirations of knowledge. Science and Technology learning thinking process and problem solving skill and technique by planning before doing and constrain and try to solve problem to successful by teacher monitoring.

(4) Thinking Application is improving personal development, social and cultural need, self-realization learning to ability and competency in field. Fine Arts learning by mixed between creative thinking and context. Using mind set of student to create project by observation, monitoring, problem of knowledge, perspective of problem: Selecting topic of student by interest individual study: Applied arts learning problem solving and feasibility of project that associate with concept and analytical 360 degree. The project of student is associate time and space by problem based learning research based learning and area based learning. Social Sciences and Humanities learning by individual interesting of student for ability and competency using presentation and discussion for practice analysis and selecting topic by monitor concept and problem solving methodology. Science and Technology learning by cultivate thinking in science, skill analytic by reading research paper, confront problem, challenges in knowledge, pyramid of knowledge and self-learning and apply in daily life.

And (5) Identity Development is generate dispersed among individuals to apply project with space and time of students. Fine Arts learning by analyzing problem that present all around detail by logical thinking. The presentation is demonstrated by concept and emotional of student by using technique, pattern, methodology, content, component, that approve by professor: Applied Arts learning specific approach that approve by professor that role model for student. Student can apply between knowledge and social that associate time and space. Social Sciences and Humanities are leaning by development mindset of student that supporting logical thinking and academic principle. Science and Technology leaning by student can formulate problem and using knowledge for proving it and associate social and context and update by presentation her/his concept. The creative thinking was added in the learning process differently. Further, administrators, professors, staff, equipment, learning atmosphere, personal interest and students' attention were main factors supported and influenced to learning and teaching relating to creative thinking development. In conclusion, creative thinking development process proposed to illustrate in Figure 1.

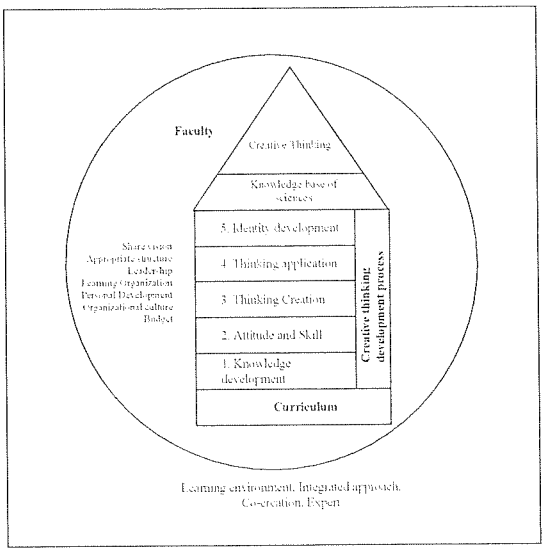

Fig. 1. Creative thinking development process from Grounded Theory
Source: Authors' research

Creative thinking level and the factor affecting to creative thinking of undergraduate students in higher education institute with creative identity

The data were analyzed by percentage, mean, standard deviation, One – Way Analysis of variance, Multiple Comparisons, Simple Correspondence Analysis.

The result found that the most undergraduate students in Bachelor of Arts, Applied Arts and Applied Science have average in Creative thinking (64.3 per cent).

The factor affecting to creative thinking are mothers' income (F=2.395, Sig.=0.020), fathers' occupation (F=3.626, Sig.=0.002), curriculum(F=1.907, Sig.=0.031), programs (F=1.633, Sig.=0.002), and faculties (F=3.278, Sig.=0.000), were significant at level of 0.05.The finding revealed with simple correspondence analysis that mothers' income has a relationship of creative thinking (x^2=32.85, df = 21, p = 0.048) and it associates 92.7 per cent that low income has average creative thinking, high income has good creative thinking. The factor of Fathers' occupation has relationship creative thinking (x^2=25.556, df = 15, p = 0.043) is supported by value 88.7 per cent that occupation: own business, commerce, agriculture have average creative thinking and official occupation has good creative thinking and state enterprise has excellence creative thinking.

Confirmatory factor analysis of Creative thinking process development with maximum likelihood was employed to assess how well the data fit the both model. Each subscale represented a latent variable and each item was an indicator variables. Three models seemed to fit the data well. the $x^2$was significant in creative thinking process development model fit indices are: x^2= 2.34 df = 2 p=0.311 GFI=0.99, RMR=0.016, AFGI=0.90, RMSEA=0.049 (p <0.01) and Bartlett's Test of Sphericity = 316.518 df = 10 p=0.000 KMO = 0.844. Confirmatory factor analysis was employed to verify that each item loads onto one single component factor of the construct, the convergent validity of the construct is supported. And model depict in Fig. 2.

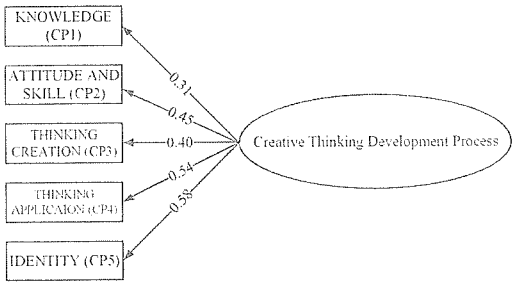

Fig. 2. CFA of Creative Thinking Development Process.

The results of the multivariate test of the structural model are presented in Table 1.

Fig.3. shows the standardized model as estimated by LISREL. Each of the observed variables is displayed in rectangle, and each of the latent constructs is displayed in an oval. The evaluation of goodness of fit indices supported the model the x^2 test provides that model generated x^2 = 111.35 df = 99 p = 0.19. The other goodness-of-fit index (GFI) is acceptable at 0.84, the adjust goodness-of-fit index is acceptable at , root mean square error of approximation 0.043, and comparative fit index (CFI) is acceptable at 0.98.

Path hypothesis 1: (i.e., innovative organization are positively related to technological innovation) was supported with an optimal level at t = 5.86 (p < 0.01) and beta = 0.89.

Path hypothesis 2: (i.e., innovative organization are positively related to creative thinking development process) was supported with an optimal level at t = 2.66 (p < 0.01) and beta = 0.85. Many studies have supported a causal relationship support between innovative organization and creative thinking process development: Andriopoulos and Gotsi [18], Li-Hua, Wilson, Aouad and Li [19].

Table 1. Innovative organization and creative thinking development process in higher education

Dependent Variable	TECH_IN			CP			CT		
Independent Variable	Total	Indirect	Direct	Total	Indirect	Direct	Total	Indirect	Direct
IN_ORG	0.88		0.88	0.65	-0.28	0.93	0.35	-0.31	0.66
	(0.15)		(0.15)	(0.14)	(0.30)	(0.35)	(0.25)	(0.44)	(0.59)
	0.89		0.89	0.59	-0.26	0.85	0.34	-0.30	0.64
TECH_IN				-0.32		-0.32	-0.49	-0.04	-0.45
				(0.33)		0.33	(0.49)	(0.07)	0.48
				-0.29		-0.32	-0.46	-0.04	-0.42
CP							0.13		0.13
							(0.18)		(0.18)
							0.31		0.31

x^2= 111.35 df = 99 p = 0.19 CFI = 0.98 IFI = 0.98 RMR = 0.019 RMSEA = 0.043

variable	VISION	STRUC	LEADER	LO	TEAM	HR	CLIMATE	NETWORK	
reliability	0.25	0.61	0.27	0.56	0.58	0.47	0.60	0.63	
variable	PRODUCT	PROCESS	CP1	CP2	CP3	CP4	CP5	AttCT	ChaCT
reliability	0.53	0.98	0.64	0.69	0.70	0.94	0.87	0.21	0.84

	TECH_IN	CP	CT
R SQUARE	0.79	0.37	0.17

Correlation Matrix	TECH_IN	CP	CT	IN_ORG
TECH_IN	1.00			
CP	0.47	1.00		
CT	0.20	0.31	1.00	
IN_ORG	0.89	0.59	0.34	1.00

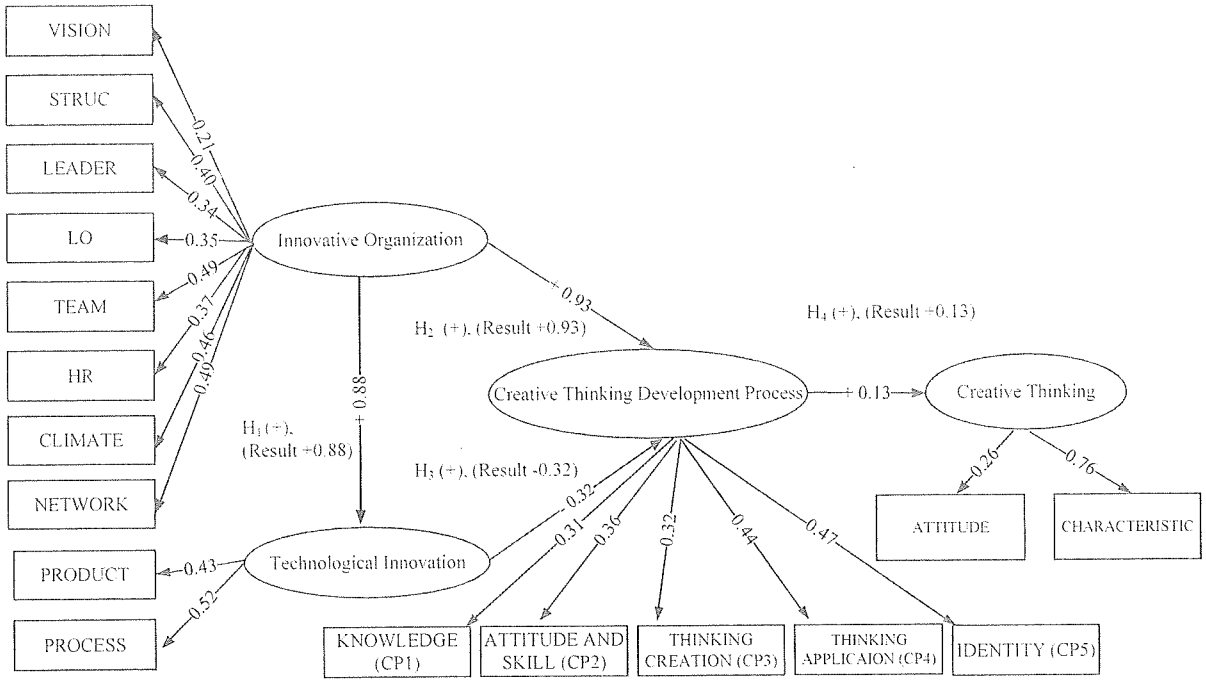

Fig. 3. Innovative organization and creative thinking development process

Path hypothesis 3: (i.e., technological innovation are positively related to creative thinking development process) was supported with an optimal level at t = -0.97 (p < 0.01) and beta = -0.29 but it are negatively relationship.

Path hypothesis 4: (i.e., creative thinking development process are positively related to creative thinking) was supported with an optimal level at t = 2.73 (p < 0.01) and beta = 0.13. Many studies have supported a causal relationship support Creative thinking process development e.g., [20], [21].

To sum up, the tests of structural model show that innovative organization are dominant factors affecting creative thinking development process. Creative thinking development process support has the effects on creative thinking of students. The data also shows creative thinking development process moderately affect creative thinking. The result also demonstrates the importance creative thinking development process in mediating the relationship of innovative organization on creativity of university students'.

5. DISCUSSION AND IMPLICATIONS

Contribution of the research

The results of this study can demonstrate from three aspects. First, family background is supported the creativity of university. Second, creative thinking development process can be constructed to 5 stages: knowledge development, attitudes and skills, thinking creation, thinking application and identify development. Finally, the better innovative organization will drive creative thinking development process to the creativity of university students.

The dimensions of innovative organization capability give a more creative thinking development process can be demonstrated by inverted pyramid depicted in Fig. 4.

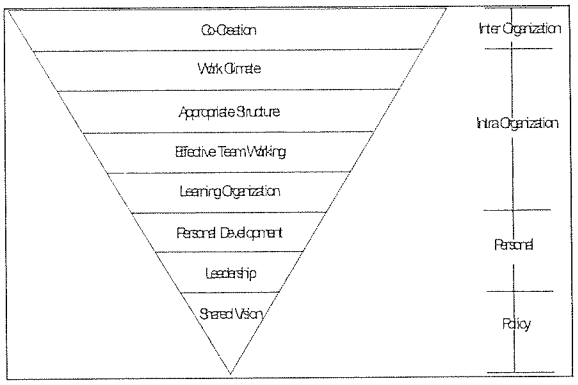

Fig. 4. Innovative organizations to effecting creative thinking development process
Source: Authors' research

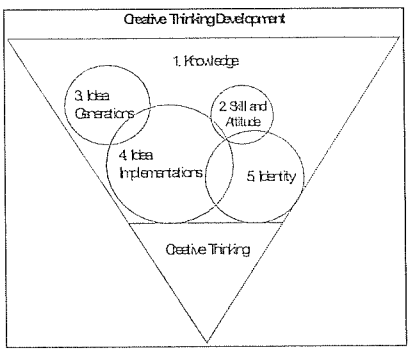

Fig. 5. Creativity thinking development process
Source: Authors' research

The creative thinking development process to identify the relative importance of creative thinking development process influential of university students' creativity with truly useful insights into the students creative thinking and gave us indications as to how to design a creative thinking development process as depicted in Figure 5.

The development of creative development processes is a study of qualitative research methodology and the theoretical framework partly from the study of work, theories and related research this process is a holistic study that is a generalized theoretical process generalization. Accordance with the creative process theory based on the theoretical concept that the researcher has obtained from qualitative data analysis and classified into 5 steps: 1) Knowledge development 2) Skill and attitude development 3) Creating ideas 4) Application of ideas and 5) Identity creation

The use of indicators for the development of creative thinking to develop creative should focus on the process of applying ideas and creating identity with a similar level of importance, because it is the use of knowledge in the field of science to apply in the context of society that requires principles and reasons to create thought processes and individual characteristics that are sensitive to problems with academic principles to present knowledge and creativity through work.

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