ISSN (Print) : 0974-6846
Indian Journal of Science and Technology, *Vol 8(24), DOI: 10.17485/ijst/2015/v8i24/80245, September 2015* ISSN (Online) : 0974-5645

A Study on Effects of Creativity to Organizational Innovation

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Abstract

Creativity and innovation are globally emphasized as key competences that can dramatically change organizations. In particular, creativity is perceived as a starting point that brings innovation to organizations, and thus many studies have been conducted on the topic. However, existing research covers only a couple of factors at the individual creativity level, thereby making it difficult to determine organizational innovation at the group level or the organizational level. This study examines creativity that affects innovation at all three levels. In other words, this study aims to analyze the effects of individual creativity, creativity in groups, and creativity in organizations on organizational innovation, and confirm the biggest impact factors among the sub-factors for each variable. From the analysis results: Individual creativity had an effect on creativity in groups; creativity in groups had an effect on creativity in organizations; and, ultimately, creativity in organizations had a significant effect on organizational innovation. Just as, organizational innovation has been linked to the process, as individuals, groups, and organizations reveal creativity through sequential steps. On the other hand, individual creativity and creativity in groups did not have a significant effect on organizational innovation, and individual creativity did not have a direct effect on creativity in organizations.

Keywords: Creativity in Groups, Creativity in Organizations, Individual Creativity, Organizational Innovation

1. Introduction

Recently, creativity and innovation have become recognized as important processes for organizations to survive and accomplish challenging goals[1]. Moreover, the significance of organizational innovation is gradually increasing as a precondition and key factor for organizations to enhance competitiveness[2].

In studying the relationship between creativity and innovation, Chang et al.[3] stated that it is necessary to develop a scale with established reliability and validity that can measure creativity in organizations in order to conduct a theoretical discussion and empirical research on creativity in organizations. They explained the background for approaching creativity by dividing the periodical process into individual characteristics of creative people at an early stage, and then the social environment faced by individuals, and the self-consciousness of members within the organization. In addition, there have been recent explorations of theoretically categorized models to determine the overall relevance of creativity factors, using an integrated approach that is multivariate or confluence[4].

Since the 1950s, studies on creativity that have been focused at the individual level tended to seek preceding factors that affect creativity in the work environment[5]. Recently, focus is switching to the integrated perspective that states that characteristics of individuals, groups, and the organizational environment must be mingled together[6]. Moreover, there is a need for research on the self-consciousness of members that may affect creative tasks performed in the organization[3].

However, there are not many studies on creativity as a preceding factor of innovative behavior, since research has not been actively conducted on the causal relationship

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between creativity in terms of individuals and innovation in terms of organizations, due to the difference in the level of analysis[7].

Previous studies only examined one aspect out of individual creativity, creativity in groups, and creativity in organizations, with limited research on creativity in organizations in general. This is because the concept of creativity in organizations is highly complicated and it is not easy to measure or understand its process. However, in order to enhance the level of creativity in organizations, it is necessary to begin by assessing how well current organizations manage creativity[8].

Based on the existing principles, this study was conducted with the following objectives with regard to factors that affect the causal relationship among the three levels of creativity. These three levels are individual creativity, creativity in groups, and creativity in organizations.

First, this study will examine whether individual creativity, creativity in groups, and creativity in organizations affect organizational innovation, and whether there is a flow connection.

Second, this study classifies creativity into three levels, individuals, groups, and organizations, and examines how the causal relationship among them is formed.

Third, from the results of this empirical analysis, measurement items of the sub-factors of creativity at the individual, group, and organizational level, will be examined for consistency with previous theories.

Moreover, the process and method of this study is analyzed by a statistic technique using structural equation modeling (SEM and SPSS) and by conducting surveys after designing a research model through previous research and literature review.

2. Theoretical Background

2.1 Creativity

Sternberg[9] defined creativity as the ability to produce original, unexpected, new, high-quality, useful, and suitable output that satisfies what is demanded from certain tasks. Furthermore, Amabile[10] argued that creativity is the ability to combine or link ideas in unique ways, while Scott et al.[11] referred to the term as the birth of new and useful ideas. Oldham et al.[12] defined it as a useful product, idea, or process produced at an individual level in terms of organization. Perry et al.[13] explained that

Table 1. Creativity's previous research

Construct	Factor	Measurement Details	Researcher & Literature
Individual creativity	Knowledge and experience	Level of knowledge, technique, and talent through experience in the relevant field, securement of expertise, etc.	[7, 9, 14, 15]
	Creative thinking skills	Constant initiative to seek new problems or possibilities with perspectives and ideas different from those given without giving up	
	Job motivation	Fundamental enthusiasm created from work itself, interest in work, and positive attitude in enjoyably performing tasks	
Creativity in groups	Diversity	Solving problems with various experiences, abilities, and perspectives of members	[16, 17, 18]
	Cohesion	Communication and effects among organizational members, indicating cooperation and solidarity based on trust	
	Autonomy	Freedom felt by members in making decisions about goal setting, task performance period, or method without assessment or monitoring	
	Leadership	Process in which the leader exerts influence over organizational activities within the group in order to achieve the goals of the group or team	
	Culture of an organization	Aim and support to achieve creativity and innovation within the organization such as forming organizational bonds, building a creative organizational culture, and admitting failure	
Creativity in organizations	Organizational resources	Flexibility of members in using resources necessary for work or projects such as flexibility to use funds or human resources, accessibility to resources, etc.	[8, 18, 19]
	Reward System	Economic and non-economic reward for the organization's creative ideas or task performance results	
	Creative management practices	How the interest and behaviors of all employees, such as clear perception of organizational vision and formation of creative bonds, support the organization's key objectives	

it is the approach that leads to novel and useful ideas, processes, or solutions. Moreover, creativity may be classified by level of analysis into individual creativity, creativity in groups, and creativity in organizations[14]. To achieve the purpose of this study regarding the three levels of creativity, constructs, factors, and measurement details were examined based on literature review and previous research. These are summarized in Table 1.

2.2 Innovation

Innovation refers to creative thoughts and new conceptions, and has been generally discussed as a series of processes such as suggesting, applying, and developing new ideas[20]. King et al.[21] classified innovation by level of analysis into innovation at the organizational level and innovation at the individual level, and Staw[22] categorized previous studies on innovation into three levels of analysis --- individual, group, and organization --- depending on the key unit of adoption or calculation of innovation. This is summarized in Table 2.

Therefore, organizational innovation refers to the way an organization changes. This change in the organization is related to not merely the development of the entire organization, but also the fulfillment of work competences or the new business ideas of individual members of the organization[28].

Furthermore, Calantone et al.[27] defined organizational innovation as the ability to accept new things relatively earlier than competitors, inside and outside the organization. This study will adopt organizational innovation as the dependent variable for analysis out of the three aspects of innovation.

2.3 Relationship between Creativity and Innovation

Kanter[17] stated that creativity is a basic condition of innovation, and Staw[22] also perceives creativity as a starting point of innovation from the perspective of the evolution theory, instead of separating creativity and innovation. Scott et al.[11] perceives creativity as a concept related to producing new and useful ideas, and innovation as a concept that includes not only producing but also adopting and implementing useful ideas. Moreover, Damanpour[29] argued that creativity may affect the outcome of innovation and help solve problems occurring through the process of innovation, but that it is only a single element that produces the outcome of innovation and a sub-process of the innovation process. Oldham et al.[12] stated that creativity is successfully implementing creative outputs. Creativity and innovation have been studied independently in the past, and while since the 1990s, some researchers began to argue that these two must be studied together[30], others argue that there are too many complexities in simultaneously studying creativity and innovation[31]. However, most researchers generally think of innovation as a concept broader than creativity, recognizing that creativity and innovation have a highly important and close causal relationship.

Table 2. Innovation's previous research

Division	Research contents and areas	Researcher
Innovation of Individual level	- Perception of support for innovation. - Motivation for individual's innovation behavior. - Type of innovative personality and individual desire. - Style and attitude of problem solving. - Quality of team-member exchange relationship. - King of ideas and person in charge of change. - Leader or decision maker, etc.	[1, 7, 10, 11, 23, 24]
Innovation of Group level	- Job tension for innovation. - Factors facilitating or hindering innovation. - Events of implementing innovation and decision making processes, etc.	[21, 24]
Innovation of Organization level	- Selection, expansion, and performance of innovation. - Size, structure, and culture of organization. - Functionalization, specialization, centralization, and decentralization. - Internal abilities such as strategies and R&D abilities. - Environmental factors such as competitor environment, etc.	[1, 23, 25, 26, 27]

3. Research Model and Survey Design

3.1 Research Model and Research Hypothesis

To analyze the effects of individual creativity, creativity in groups, and creativity in organizations on organizational innovation based on previous research and literature, this study presented the following research model (Figure 1.) and research hypotheses.

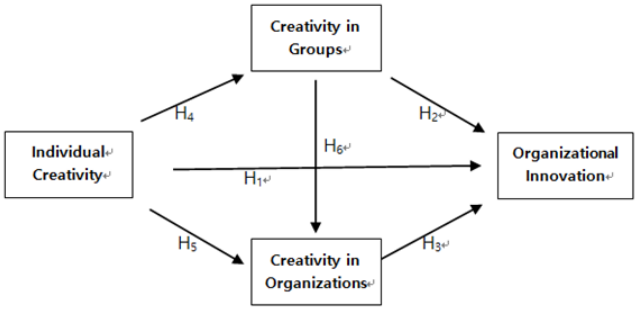

Figure 1. Research model.

3.1.1 Research Hypotheses

H_1: Individual creativity will be positively associated with organizational innovation.

$H_{1\text{-}1}$: Individual creativity Knowledge and experience will be positively associated with organizational innovation.

$H_{1\text{-}2}$: Individual creativity Creative thinking skills will be positively associated with organizational innovation.

$H_{1\text{-}3}$: Individual creativity Job motivation will be positively associated with organizational innovation.

H_2: Creativity in groups will be positively associated with organizational innovation.

$H_{2\text{-}1}$: Creativity in-groups Diversity will be positively associated with organizational innovation.

$H_{2\text{-}2}$: Creativity in-groups Cohesion will be positively associated with organizational innovation.

$H_{2\text{-}3}$: Creativity in-groups Autonomy will be positively associated with organizational innovation.

$H_{2\text{-}4}$: Creativity in-groups Leadership will be positively associated with organizational innovation.

H_3: Creativity in organizations will be positively associated with organizational innovation.

$H_{2\text{-}1}$: Creativity in organizations Culture of organization will be positively associated with Organizational Innovation.

$H_{2\text{-}2}$: Creativity in organizations Organizational resources will be positively associated with organizational innovation.

$H_{2\text{-}3}$: Creativity in organizations Reward System will be positively associated with organizational innovation.

$H_{2\text{-}4}$: Creativity in organizations Creative management practices will be positively associated with Organizational Innovation.

H_4: Individual creativity will be positively associated with creativity in groups.

$H_{2\text{-}1}$: Individual creativity Knowledge and experience will be positively associated with creativity in groups.

$H_{2\text{-}2}$: Individual creativity Creative thinking skills will be positively associated with creativity in groups.

$H_{2\text{-}3}$: Individual creativity Job motivation will be positively associated with creativity in groups.

H_5: Individual creativity will be positively associated with creativity in organizations.

$H_{2\text{-}1}$: Individual creativity Knowledge and experience will be positively associated with creativity in organizations.

$H_{2\text{-}2}$: Individual creativity Creative thinking skills will be positively associated with creativity in organizations.

$H_{2\text{-}3}$: Individual creativity Job motivation will be positively associated with creativity in organizations.

H_6: Creativity in groups will be positively associated with creativity in organizations.

$H_{2\text{-}1}$: Creativity in groups Diversity will be positively associated with creativity in organizations.

$H_{2\text{-}2}$: Creativity in groups Cohesion will be positively associated with creativity in organizations.

$H_{2\text{-}3}$: Creativity in groups Autonomy will be positively associated with creativity in organizations.

$H_{2\text{-}4}$: Creativity in groups Leadership will be positively associated with creativity in organizations.

3.2 Construct and Measurement Items of Variables

Table 3 shows the setting of variables, such as the constructs and measurement items, used in this study. Measurement items for individual creativity, creativity

Table 3. Variable's construct and measurement items

Construct	Factor		Measurement Items	Previous Research
Individual creativity	Knowledge and experience	Icr11	Constant effort	[4, 7, 9, 14, 16]
		Icr12	Intellectual curiosity	
		Icr13	Knowledge and experience in the business	
		Icr14	Acknowledgment of expertise in the their fields	
	Creative thinking skills	Icr21	Eloquent expression	
		Icr22	Ability to flexibly combine thoughts	
		Icr23	Flexible thinking	
		Icr24	Original thinking	
	Job motivtion	Icr31	Job satisfaction	
		Icr32	Interest	
		Icr33	Enthusiastic performance	
		Icr34	Enjoyment in performance of duties	
Creativity in groups	Diversity	Gcr11	Different experience and career	[4, 10, 17, 18]
		Gcr12	Complementary functions	
		Gcr13	Various perspectives	
		Gcr14	Opportunity to create unique ideas	
	Cohesion	Gcr21	Mutual respect and trust	
		Gcr22	Affinity	
		Gcr23	Collaboration and solidarity	
		Gcr24	Cooperation and overcoming change or crisis	
	Autonomy	Gcr31	Autonomous decision at the level of	
		Gcr32	achieving goals	
		Gcr33	Autonomous task performance	
		Gcr34	Participation in business decision making	
	Leadership	Gcr41	Autonomy of organizational behavior Superiors' inducement to produce creative ideas	
		Gcr42	Encouragement for problem solving	
		Gcr43	efforts	
		Gcr44	Material and emotional support for career development	
		Gcr45	Effort to create a positive environment Presentation of clear goals	
Creativity in organizations	Culture of an organization	Ocr11	Ability to implement selected ideas	[4, 8, 18, 19]
		Ocr12	Challenging spirit in solving dilemmas	
		Ocr13	Culture of tolerating failure	
		Ocr14	Active atmosphere toward change	
	Organizational resources	Ocr21	Good use of human resources	
		Ocr22	Ownership of optimal funds	
		Ocr23	Sufficiency of facilities required for task performance	
		Ocr24	Provision of time for creative task process	
	Reward System	Ocr31	Fair evaluation of task performance	
		Ocr32	Reward for suggestion of ideas	
		Ocr33	Reward for creative performance	
		Ocr34	Promotion for task performance	
	Creative management practices	Ocr41	Employees' clear perception of vision	
		Ocr42	Formation of creative bond among employees	
		Ocr43	Atmosphere to voluntarily suggest opinions	
		Ocr44	System for sharing ideas	
		Ocr45	Resources for information sharing and use	
Organizational innovation		Inn1	Adoption and attempt at new ideas	[6, 27]
		Inn2	Pursuit of new task performance methods	
		Inn3	Creativity in task performance methods and operation	
		Inn4	Atmosphere to accept risks and encourage innovation	
		Inn5	Release of new products and services in the last five years	

in groups, and creativity in organizations are adopted from previous research by[4], and measurement items for organizational innovation were adopted from previous research by[6,27], revised according to the purpose of this study.

4. Analysis and Results

4.1 Sample Surveys and Characteristics

This study conducted surveys, targeting executives and employees working at small and medium manufacturers with less than 300 people, in the capital area. The surveys took place for 15 days from January 26 to February 9, 2015, using the convenience sampling method and self-administered method. A total of 260 questionnaires were distributed, with 211 (81%) used in the final analysis after excluding inappropriate data. To test the hypotheses, this study applied Structural Equation Modeling (SEM). To verify the validity and consistency of the measurement items, Exploratory Factor Analysis (EFA) and reliability analysis were conducted using SPSS 19.0. Confirmatory Factor Analysis (CFA) was conducted to verify the scale's validity using AMOS 19.0.

The sample characteristics of this study are shown in Table 4, with males accounting for 77.3% and females 22.7%. In terms of age, people in their 30s (49.3%) and 20s (26.1%) represented at least 75% of the total, while in terms of company position, vice-chief/section management or

Table 4. Demographic characteristics of the sample

Division		Respondents	Rate (%)	Division		Respondents	Rate (%)
gender	male	163	77.3		10 years plus	30	14.2
	female	48	22.7		employee level	88	41.7
age	20s	55	26.1		agent level	38	18.0
	30s	104	49.3	position	vice-chief/section-mgt.	63	29.9
	40s	46	21.8		director level	15	7.1
	more than 50s	6	2.8		officer level	7	3.3
educational back-ground	high school or less	41	19.4	size	100 or less people	150	71.1
	2~3 year college	58	27.5		100~300 people	61	28.9
	4-year college	89	42.2		office	96	45.5
	master and doctor	23	10.9		production	29	13.7
tenure	less than 1 year	35	16.6	work	sales	18	8.5
	1~5 years	106	50.2		R&D	63	29.9
	5~10 years	40	19.0		other	5	2.4

Table 5. Individual creativity exploratory factor analysis and reliability analysis

Measurement Item	Factor Analysis				Reliability	
	Know. & exp.	Creative thinking skills	Job motivation	Communality	Alpha if Item deleted	Cronbach α
Icr13	1,874	.111	.187	.811	-	.860
Icr14	.842	.167	.236	.792	-	
Icr24	-.003	.760	.306	.672	.643	.730
Icr22	.400	.720	.141	.699	.614	
Icr23	.000	.712	.386	.656	.650	
Icr21	.362	.586	-.134	.492	.758	
Icr32	.023	.226	.760	.630	.768	.813
Icr33	.162	.176	.755	.628	.767	
Icr31	.242	.080	.750	.628	.759	
Icr34	.129	.080	.744	.577	.766	
Eigen-value	2.218	2.171	3.142			
Variance description (%)	18.48	18.10	26.19			

below represented approximately 90% of the total. This reflects the character of this study, which was to have more respondents in lower positions since such positions evaluate the leadership of those in higher positions. As for educational background, most respondents graduated from a four-year college (42.2%), while for tenure, 75.8% had been at the company less than 10 years. For type of work, office (45.5%) and R&D (29.9%) accounted for a large portion of all respondents.

4.2 Exploratory Factor Analysis and Reliability Analysis

Table 5 through 8 show the results of the EFA and reliability analysis using SPSS on the constructs presented in this

Table 6. Creativity in group's exploratory factor analysis and reliability analysis

Measurement Item	Factor Analysis					
	Diversity	Cohesion	Autonomy	Leadership	Communality	Cronbach α
Gcr12	.741	.116	.106	.150	.596	.715
Gcr13	.717	.339	.154	.110	.665	
Gcr14	.632	.264	.130	.281	.565	
Gcr11	.592	.037	.205	.118	.408	
Gcr22	.124	.804	.137	.258	.747	.859
Gcr21	.145	.762	.260	.187	.704	
Gcr23	.163	.734	.128	.367	.716	
Gcr24	.374	.620	.195	.361	.686	
Gcr32	.145	.028	.808	.264	.744	.795
Gcr34	.095	.389	.718	.118	.622	
Gcr33	.298	.168	.681	.248	.642	
Gcr31	.439	.265	.548	.134	.581	
Gcr44	.136	.268	.182	.776	.726	.869
Gcr45	.213	.163	.045	.776	.676	
Gcr43	.123	.292	.278	.687	.650	
Gcr41	.257	.270	.319	.667	.686	
Gcr42	.189	.273	.425	.594	.644	
Eigen-value	2.510	2.863	2.561	3.125		
Variance description (%)	14.76	16.84	15.06	18.38		

Table 7. Creativity in organizations exploratory factor analysis and reliability analysis

Measurement Item	Factor Analysis					Reliability	
	Culture of organization	Organizational resources	Reward System	Creative mgt. practices	Communality	Alpha if Item deleted	Cronbach α
Ocr13	.755	.033	.268	.165	.670	.677	.701
Ocr12	.746	.319	-.002	.123	.674	.543	
Ocr11	.505	.496	.084	.250	.571	.598	
Ocr23	.183	.720	.244	.112	.624	.679	.754
Ocr22	.371	.671	.088	.048	.598	.738	
Ocr21	.094	.663	-.006	.449	.650	.667	
Ocr24	.026	.557	.256	.480	.607	.704	
Ocr32	.118	.113	.905	.083	.852	.664	.801
Ocr33	.183	.097	.851	.242	.825	.607	
Ocr34	.004	.193	.524	.432	.498	.873	
Ocr43	.051	.151	.268	.762	.677	.812	.848
Ocr42	.302	.252	-.020	.760	.734	.807	
Ocr44	.185	.049	.366	.706	.669	.811	
Ocr41	.415	.168	.039	.636	.607	.826	
Ocr45	.122	.230	.257	.633	.535	.829	
Eigen-value	2.112	2.698	2.502	3.734			
Variance description (%)	12.43	15.87	14.72	21.97			

study: Individual creativity, creativity in groups, creativity in organizations, and organizational innovation.

The results of the analysis indicate that the sub-factors of individual creativity were consistent with previous research[4]; the three factors knowledge and experience, creative thinking skills, and job motivation. However, among the four measurement items of the knowledge and experience factor, Icr11 (Constant effort) and Icr12 (Intellectual curiosity) could not be incorporated into the same factor and were thus eliminated (Table 5). Sub-factors of creativity in groups were classified into four factors, diversity, cohesion, autonomy, and leadership, and no measurement items were eliminated (Table 6). Sub-factors of creativity in organizations were classified into four factors: Culture of organization, organizational resources, reward system, and creative management practices. However, Ocr14 (Active atmosphere toward change) from culture of organization and Ocr31 (Fair evaluation of task performance) from reward system could not be incorporated into the same factor and were thus eliminated (Table 7). Finally, for organizational innovation, all measurement items were properly loaded (Table 8).

Furthermore, as a result of measuring Cronbach α coefficients to test reliability, all constructs turned out to be 0.7 or higher, indicating that there was suitable reliability.

4.3 Convergent Validity and Discriminant Validity

This study conducted a CFA to determine the validity of the data to see whether the constructs were well explained with regard to the measurement items of individual creativity consisting of three sub-factors, creativity in groups consisting of four sub-factors, creativity in organizations consisting of four sub-factors, and a single organizational innovation factor, and to validate the

Table 8. Organizational innovation exploratory factor analysis and reliability analysis

Measurement Item	Factor Analysis		Reliability	
	organizational innovation	Communality	Alpha if Item deleted	Cronbach α
Inn2	.845	.715	.799	.848
Inn3	.810	.856	.811	
Inn1	.806	.649	.813	
Inn5	.774	.599	.822	
Inn4	.712	.507	.839	
Eigen-value	3.126			
Variance description (%)	62.52			

Table 9. Convergent validity analysis

Factors	Measurement items	Unstandardized estimates	S.E	C.R	P	Standardized estimates (β)	AVE	CCR
Individual creativity	Know. and exp.	.866	.128	6.783	.000	.557	.567	.792
	Cr. Think. skills	.652	.094	6.906	.000	.569		
	Job motivation	1.000	-	-	-	.797		
Creativity in groups	Diversity	.771	.071	10.925	.000	.714	.749	.923
	Cohesion	.891	.074	11.970	.000	.768		
	Autonomy Leadership	.849	.073	11.689	.000	,74		
		1.000	-	-	-	.819		
Creativity in organizations	Culture of org.	.841	.077	7.784	.000	.713	.670	.888
	Organ.'s resources	.891	.075	11.874	.000	.767		
	Reward System Cr.	.716	.092	10.851	.000	.536		
	Mg. practices	1.000	-	-	-	.804		
Organizational innovation	Inn1	.940	.094	9.996	.000	.757	.600	.882
	Inn2	1.044	.099	10.522	.000	.802		
	Inn3	1.034	.102	10.176	.000	.772		
	Inn4	.795	.096	8.245	.000	.616		
	Inn5	1.000	-	-	-	.698		

previous theories once again. The results of the analysis are summarized in Tables 9 and 10. In general, CFA verified the validity of the constructs in the two following steps.

First, convergent validity is an agreement between the construct and the item measuring it, and represents how well the construct is measured by the item. In other words, P-value must be 0.05 or below, standardized factor loading (β) 0.5 or above, Average Variance Extracted (AVE) 0.5 or above, and Construct Reliability (CCR) 0.7 or above.

Second, discriminant validity shows that there must be an indication of difference between two constructs. It is assumed that there is discriminant validity when AVE of each construct and the square root of the correlation coefficient between the two constructs is compared, and AVE turns out to be greater than the square root of the correlation coefficient.

The analysis results, in Table 9, show that the measurement items of all factors were significant at P<.0.05, and β (standardized factor loading) 0.5 or above, AVE 0.5 or above, and Construct Reliability (CCR) 0.7 or above in all cases, verifying the convergent validity. Moreover, as shown in Table 10, the greatest value out of the correlation coefficients among the constructs is 0.531, which is the square root of the correlation coefficient 0.729 between creativity in organizations and organizational innovation, and therefore, not greater than the AVE of the two factors at 0.670 and 0.600. Thus, this verified the discriminant validity as well.

4.4 Model Fitness and Research Hypothesis Validation

This study conducted an analysis using SEM in order to validate the hypothesis of the causal relationship of individual creativity, creativity in groups, and creativity in organizations that affects organizational innovation, as perceived by executives and employees at small and medium manufacturers with less than 300 people. The validation procedure for the fitness of the measured model must include verification as to whether it satisfies the following standard regarding the actual data. In other words, it must satisfy the requirements of x^2. Df. p>0.05, x^2/df<2, GFI, AGFI, CFI, NFI, IFI>0.9, RMR, RMSEA <0.05.

Table 10. Discriminant validity analysis

Division	Individual Cr.	Cr. in Groups	Cr. in Organs	Organizational Inn.	AVE	Remarks
Individual Cr.	1				.567	
Cr. in Groups	.563***	1			.749	(.729)2 = .531
Cr. in Organizations	.367***	.644***	1		.670	
Organizational Inn.	.394***	.552***	.729***	1	.600	

*** P<0.01

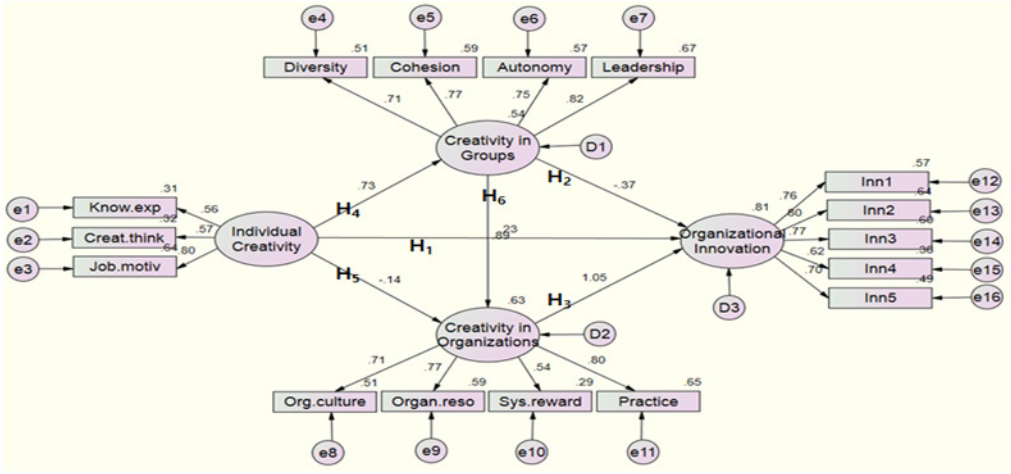

Figure 2. Structural Equation Modeling (SEM) analysis results.

Table 11. Amos's analysis results

Hypothesis	Paths	R.W (Estimates)	S.R.W (Estimates)	S.E	C.R	P-value	Dismissal/ adoption
H1	Individual Cr. → Organ's Inn	.258	.231	.142	1.815	.069	dismissal
H2	Cr. in Groups → Organ's Inn	-.494	-.369	.260	-1.901	.057	dismissal
H3	Cr. in Organs → Organ's Inn	1.146	1.054	.176	6.494	***	adoption
H4	Individual Cr. → Cr. in Groups	.612	.734	.089	6.853	***	adoption
H5	Individual Cr. → Cr. in Organs	-.146	-.142	.132	-1.110	.267	dismissal
H6	Cr. in Groups → Cr. in Organs	1.098	.890	.174	6.310	***	adoption
Research model fitness		CMIN(χ2)=170.426, df=98, P=.000, CMIN/df=1.739, GFI=.905, AGFI=.868 CFI=.953, NIF=.898, IFI=.954, RMR=.027, RMSEA=.059					

*** P<0.01

Table 12. SPSS's analysis results

Hypothesis	Paths	b	S.E	β	t	P	VIF	Dismissal/ adoption
H_{1-1}	Know. & exp. → Organ's Inn Cr. th. skills → Organ's	.078	.059	.097	1.328	.186	1.325	dismissal
H_{1-2}	Inn	.066	.081	.061	.820	.413	1.367	dismissal
H_{1-3}	Job motivation → Organ's Inn	.311	.073	.314	4.246	.000	1.345	adoption
	fitness	R^2=.159, R^2_{adj}=.147, Durbin Watson=1.776, F=13.063, P-value=.000						
H_{2-1}	Diversity → Organ's Inn	.170	.080	.160	2.141	.033	1.672	adoption
H_{2-2}	Cohesion → Organ's Inn	.121	.083	.122	1.462	.145	2.078	dismissal
H_{2-3}	Autonomy → Organ's Inn Leadership → Organ's Inn	.264	.080	.259	3.289	.001	1.860	adoption
H_{2-4}		.120	.082	.128	1.473	.142	2.258	dismissal
	fitness	R^2=.311, R^2_{adj}=.297, Durbin Watson=1.845, F=23.210, P-value=.000						
H_{3-1}	Culture of org. → Organ's Inn	.302	.059	.295	5.113	.000	1.584	adoption
H_{3-2}	Org's resources → Organ's Inn	.155	.066	.149	2.358	.019	1.908	adoption
H_{3-3}	Reward System → Organ's Inn	.050	.049	.055	1.013	.312	1.408	dismissal
H_{3-4}	Cr. mgt. practices → Organ's Inn	.395	.062	.407	6.328	.000	1.971	adoption
	fitness	R^2=.568, R^2_{adj}=.560, Durbin Watson=2.099, F=67.692, P-value=.000						
	fitness	R^2=.354, R^2_{adj}=.344, Durbin Watson=1.986, F=37.751, P-value=.000						
H_{5-1}	Know. & exp. → Cr. in Organs	-.003	.047	-.005	-.065	.948	1.325	dismissal
H_{5-2}	Cr. th. skills → Cr. in Organs	.036	.065	.041	.546	.586	1.367	dismissal
H_{5-3}	Job motivation → Cr. in Organs	.309	.059	.385	5.220	.000	1.345	adoption
	fitness	R^2=.162, R^2_{adj}=.150, Durbin Watson=1.771, F=13.358, P-value=.000						
H_{6-1}	Diversity → Cr. in Organs	.123	.059	.143	2.093	.038	1.672	adoption
H_{6-2}	Cohesion → Cr. in Organs	.051	.061	.064	.838	.403	2.078	dismissal
H_{6-3}	Autonomy → Cr. in Organs	.186	.059	.225	3.318	.002	1.860	adoption
H_{6-4}	Leadership → Cr. in Organs	.259	.060	.340	4.297	.000	2.258	adoption
	fitness	R^2=.428, R^2_{adj}=.417, Durbin Watson=1.824, F=38.578, P-value=.000						

As a result of the aforementioned EFA to validate the fitness of the measured model, this study calculated the average of items in each sub-factor after eliminating the measurement items that could not be combined together as a single factor, and formed new variables to complete the SEM as shown in Figure 2. After that, Amos was used for validation of the model fitness and Hypothesis 1~ Hypothesis 6 (H_1~H_6), and the analysis results are shown in Table 11. Furthermore, SPSS was used for validation of hypotheses (H_{11}~H_{64}) regarding whether each of the sub-factors would affect the constructs. These analysis results are shown in Table 12.

First, the research model fitness is analyzed as shown in Table 11: x^2(170.426, df=98, p<0.001), x^2/df=1.739, GFI=0.905, AGFI=0.868, CFI=0.953, NFI=0.898 IFI=0.954, RMR=0.027, RMSEA=0.059. This is generally acceptable compared to the baseline fitness, and thus can be considered fit for explaining the causal relationship among the constructs in this study.

The validation results of Hypothesis 1(H_1) show that individual creativity did not have a significant positive effect on organizational innovation, and thus Hypothesis 1(H_1) was dismissed. However, job motivation among the sub-factors turned out to have a significant positive effect on organizational innovation, indicating that there were local effects.

For Hypothesis 2 (H_2), creativity in groups did not have a significant positive effect on organizational innovation, and thus Hypothesis 2 (H_2) was dismissed. However, diversity and autonomy among the sub-factors turned out to have a significant effect, indicating that there were local effects.

For Hypothesis 3 (H_3), creativity in organizations had a significant positive effect on organizational innovation, and thus Hypothesis 3 (H_3) was accepted. However, the reward system among the sub-factors turned out not to have a significant effect.

For Hypothesis 4 (H_4), individual creativity had a significant positive effect on creativity in groups, and thus Hypothesis 4(H_4) was accepted. However, creative thinking skills among the sub-factors turned out not to have a significant effect.

For Hypothesis 5 (H_5), individual creativity did not have a significant positive effect on creativity in organizations, and thus Hypothesis 5 (H_5) was dismissed. However, job motivation among the sub-factors turned out to have a significant effect, indicating that there were local effects.

Finally, for Hypothesis 6 (H_6), creativity in groups had a significant positive effect on creativity in organizations, and thus Hypothesis 6 (H_6) was accepted. However, cohesion among the sub-factors turned out not to have a significant effect.

5. Conclusion

5.1 Results Discussed

This study classified creativity into three levels, individual creativity, creativity in groups, and creativity in organizations, and analyzed the effects on organizational innovation statistically by collecting data through questionnaires.

This study conducted an EFA and CFA on each of the constructs and eliminated the measurement items that were not combined into factors. Then, it calculated the average of the measurement items of each of the sub-factors newly constructed, designed new Structural Equation Modeling (SEM), and validated the hypotheses using Amos and SPSS. The following matters come to light based on the analysis results.

First, individual creativity was dismissed as it did not have a significant positive effect on organizational innovation. This result is not consistent with previous research that argued that individual creativity must be preceded in order to achieve organizational innovation[7,10,12]. However, this result is consistent with the argument of another previous research study[32], indicating that no matter how excellent individual creativity is, there is a need for logical procedures in problem solving through communication or the organization in order to have an effect on organizational innovation[33–36]. Moreover, job motivation among the sub-factors turned out to be a factor that had a significant effect. Since job motivation is created when one has a fundamental interest, enjoyment, and enthusiasm in one's work, it may be a factor that has a greater effect on organizational innovation than great knowledge and experience or outstanding creative thinking skills.

Second, creativity in groups was dismissed as it did not have a significant positive effect on organizational innovation, however, diversity and autonomy, among the sub-factors, turned out to have a significant effect, indicating that there were local effects. This has significance, particularly in comparison to the fact that cohesion and leadership's factors did not have an effect

on organizational innovation. In other words, diverse experiences and careers, or an open atmosphere, increase creativity and affect organizational innovation, whereas there are limitations in collective behavior cohesion and unilateral leadership of superiors.

Third, creativity in organizations is accepted because it has a significant positive effect on organizational innovation. This is cwlosely related to the adoption details of Hypothesis 4 and Hypothesis 6. In other words, individual creativity has a significant effect on creativity in groups, while creativity in groups has a significant effect on creativity in organizations, resembling a road map in which creativity is manifested through sequential steps from the individual to the group (team), and the group (team) to the organization.

5.2 Implications and Limitations of the Study

The following implications can be discussed with regard to the aim of this study, presented in the Introduction. The first aim of this study was to examine how individual creativity, creativity in groups, and creativity in organizations affect organizational innovation and whether they are connected. The results showed that individual creativity and creativity in groups did not have a significant effect on organizational innovation, but creativity in organizations had a significant positive effect on organizational innovation. Second, the causal relationship among creativity at the individual, group, and organizational levels shows a series of sequential steps in which individual creativity affects creativity in groups, which then affects creativity in organizations, ultimately affecting organizational innovation. Finally, this study examines how the sub-factors of creativity at the individual, group, and organizational levels are consistent with previous theories. The results show that most previous research unified or simplified the factors of independent variables that affect organizational innovation, and thus cannot be discussed without comparable research data. However, a few important facts were discovered in this study.

First, job motivation factors for individual creativity have a significant positive effect on not only organizational innovation but also creativity in groups and creativity in organizations. As mentioned above, this indicates that intrinsic job motivation is a key preference factor for the manifestation of creativity, implying a contrary result to the reward system, a sub-factor of creativity in organizations that is not a significant effect factor in organizational innovation.

Second, this study proved that creative thinking skills among individual creativity sub-factors are non-preference factors that do not have a significant effect on any of the factors of organizational innovation, creativity in groups, or creativity in organizations. This indicates that eloquent expression, thinking skills or original thinking may be reflected as individual superiority on the outside, and thus are factors that require greater attention within an organization.

Third, cohesion in a group is analyzed as a factor that does not have a significant effect on organizational innovation or creativity in organizations. As this may seem negative, aside from the positive cohesion that is strictly necessary, this may be presumed as a factor that requires particular attention within an organization.

This study may have contributed to expanding research on creativity, previously focused on the individual level, to the group, and organizational level. However, it has a few limitations. First, there are limitations in region and size regarding the samples. The research findings cannot be generalized as this study failed to investigate conglomerates and firms or organizations of various industries in various regions. Second, the measuring range of organizational innovation was abstract or comprehensive, thereby failing to consider more specific and diverse elements. Therefore, it is necessary to overcome these limitations in the future and present more solid situational factors by expanding the scope of not only creativity but also innovation to the individual, group, and organizational level. Furthermore, it is necessary to establish a framework to build innovative organizations through practical diagnosis beyond academic analysis, thus providing a role model for management consultants that assess organizational innovation.

6. Acknowledgment

This research was financially supported by Hansung University in Seoul Korea.

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