

Investigating the Process of Revealing Individual Creativity through Exploration and Exploitation: Emphasis on Psychological Empowerment

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탐색적 활동과 활용적 활동을 통한 개인 창의성 발현 과정에 대한 연구: 심리적 임파워먼트를 중심으로

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Abstract The objective of this research is to suggest the creativity revelation model and to verify the relationships among knowledge capabilities and creativity processes including exploration and exploitation. Also, we investigate whether there are differences in creativity revelation processes from the perspective of psychological empowerment. To achieve the purpose of the research, a survey was conducted targeting employees of software development companies that require creativity in work performance. Empirical results show that knowledge capabilities have positive effect on creativity revelation processes. The notable point of the results is the role of psychological empowerment such that individuals with high psychological empowerment have more exploration–centric revelation, and those with low psychological empowerment have more exploitation–centric on the other hand. These results are interpreted that the behavioral patterns of organizational members may vary depending on the level of psychological empowerment in the creativity revelation, and therefore could suggest several managerial implications regarding creativity management and organizational development in an environment where convergence becomes more important.

Key Words : Creativity, Exploration, Exploitation, Psychological Empowerment, Absorptive Capacity

요약 본 연구의 목적은 창의성 발현과정에 대한 모형을 제시하고, 지식역량과 창의성 발현과정인 활용적 활동과 탐색적 활동과의 관계를 실증하는 것이다. 또한, 본 연구에서는 심리적 임파워먼트의 측면에서 창의성 발현과정에 차이가 있는지 조사하였다. 연구수행을 위해 업무에 창의성이 요구되는 소프트웨어 개발 기업의 직원을 대상으로 설문조사를 수행하였다. 분석 결과 지식역량은 이론적 가설과 동일하게 창의성 발현과정에 긍정적인 영향을 미치는 것으로 나타났다. 주목할 점은 심리적 임파워먼트의 역할인데, 심리적 임파워먼트가 높을 경우 탐색적 활동 중심으로, 심리적 임파워먼트가 낮을 경우 활용적 활동 중심으로 창의성 발현과정을 갖는 것으로 나타났다. 이러한 결과는 창의성 발현과정에서 심리적 임파워먼트의 수준에 따라 구성원의 행동패턴이 달라질 수 있다는 것을 나타내며, 융합능력이 점점 중요해지는 기업환경에서 창의성 관리나 조직개발과 관련한 다양한 시사점을 제공해 줄 수 있다.

주제어 : 창의성, 탐색적 활동, 활용적 활동, 심리적 임파워먼트, 흡수역량

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1. Introduction

As creativity is not only an important factor influencing corporate performance, but also an important source of convergence capabilities in modern companies[1], it has been at the center of attention how individual creativity of members could be enhanced and even maximized within an organization in the field of business management, organizational development and organizational design. Furthermore, the significance of team creativity or organizational creativity as well as individual creativity has been emphasized since creativity has been considered as one of important strategic resources to improve organization's competitiveness and competencies. The reason why various levels of creativity are emphasized is that organization's performances could be affected by the characteristics of working environment, business environment, as well as individual characteristics. Regarding how individual creativity could be enhanced or maximized, researches has been conducted with various perspectives. That is, researchers from various fields have studied about influencing factors on individual creativity from personal characteristics including psychological characteristics[2,3], environmental characteristics[4,5], problem solving perspective[6], and characteristics of interaction relations within organizational structure.

The main theories related to the creativity revelation are largely divided into componential theory of creativity and interactional model[7,8]. In the componential theory of creativity, the personal factors and environmental factors of creativity are identified and the influencing relationship among factors are explained[7]. In addition, the interactional model explains the creativity revelation as the interaction between the individual and the situation, and explains that the interaction of two influencing factors increase or inhibits the individual creativity[8].

These previous researches explain well the relationships between personal factors and environmental factors that affect the creativity revelation of organizational members, but they do not seem to provide a detailed explanation about the behavioral patterns related to the creativity revelation process in organization. Meanwhile, the research on exploration and exploitation mainly started as a cognitive process for problem solving and decision-making at the individual level[9]. But, the research area has been expanded and is now positioned as a central concept for organizational learning process and technological innovation process[10]. These concepts of exploration and exploitation can be regarded as behavioral patterns or behavioral strategies for individuals or organizations in the process of creating performance. Therefore, this research consider exploration and exploitation as behavioral patterns or behavioral strategies of organizational members in the creativity revelation process, and investigate the relationship between these creativity revelation process and the factors affecting the creativity revelation that have been previously studied. That is, this research try to verify effect relationship of exploitation and exploration as creativity revelation processes, and how these creativity revelation processes could affect individual creativity[11].

Specifically, this research focused on verifying empirically how personal characteristics could affect individual creativity and creativity revelation processes. Firstly, we tried to analyze the effect relationship among personal characteristic factors and creativity revelation processes with empirical study. Secondly, we also tried to verify whether there were distinct differences between two groups in the personal characteristic perspective - more specifically, highly psychologically empowered group and lowly psychologically empowered group. This

research considered individual knowledge and absorptive capacity as knowledge capability among influencing factors on individual creativity. Also, we tried to analyze differences on the stage of creativity revelation processes by comparison based on psychological empowerment.

As such, this research has significance in two aspects compared to the previous studies. Firstly, this research attempted to explain the process of creativity revelation, which was unclear in the previous studies. Secondly, this research explained the process of creativity revelation from the perspective of organizational members' behavioral patterns or learning strategies by introducing exploration and exploitation.

2. Literature Review and Hypotheses

2.1 Influencing Factors and Revelation Process on Creativity

Creativity and its affecting factors have been studied for long time by researchers from various research fields since Gilford(1956)'s monumental article[12]. Especially regarding individual level creativity which this research focuses on, several researchers have addressed influencing factors and causal relations among those factors. For example, Woodman et al.(1993) explained that affecting factors on the individual creativity could be typically include a person's cognitive awareness, personal characteristics, intrinsic and extrinsic motivation, and knowledge and expertise[13]. Regarding organizational level creativity, they explained that organizational cohesiveness, diversity, organizational culture, resources of organizations, and organizational structure could be affect to the organizational creativity. Moreover, Woodman et al.(1993) addressed that interaction relationships among influencing factors could be carefully considered because creativity had a strong tendency to be

revealed by interactions[13].

Also several researchers have focused on the revelation processes of creativity by the interaction relationships based on the organizational learning and organizational adaptation. More specifically, the concept of exploitation and exploration proposed by organizational adaptation theories has been paid attention to the creativity studies[14].

Meanwhile, the concept and definition of creativity has been used vaguely because researchers from various fields define its concept differently depending on their research objectives. Among various definitions, the definition of Amabile(1988) could be generally accepted by researchers[15]. That is, Amabile(1988) considered creativity as productive processes which create innovative outcomes and something new[15]. Regarding the analysis unit of researches, creativity research has been expanded from individual and personal characteristics level to work-unit level (team level) and organizational level[13,16].

This research mainly focuses on the personal characteristics individual knowledge, absorptive capacity among influencing factors on individual creativity and creativity revelation processes - exploitation and exploration.

2.2 Psychological Empowerment

Several researchers have addressed the relationship among creativity, organizational performance, and psychological empowerment[17,18]. For example, Bennis(1984) addressed that individual persons with empowerment could enhance their interest, challenge and creativity on their working tasks[19]. Meanwhile, Voget & Murrell(1990) took notice of decision making with psychological empowerment[20]. They addressed that highly empowered organizations had a tendency to have mission, values, trust, and responsibility of mutual acceptance. Furthermore, they could share information

efficiently and, in consequence, they could create high performances and expand decision making authority hierarchies. Psychological empowerment can be considered that individuals within organization have psychological power for performing tasks and making decisions. More specifically, individuals within organization can acquire power from self-efficacy which qualifies individuals for control power and influencing power of working tasks and working situations[21]. That is, psychological empowerment could be regarded as individual's motivation for power[22]. Therefore, researchers have stressed understanding of empowerment with psychological perspectives[22-24].

2.3 Research Model and Hypotheses

This study investigated the causal relationship between influencing factors on creativity and creativity revelation processes. Furthermore, we tried to find out whether there were distinct differences of creativity revelation processes between two groups in the perspective of psychological empowerment. <Figure 1> presents the research model of this study, which consists of six constructs - individual knowledge and

absorptive capacity in the perspective of knowledge capability, exploitation and exploration in the perspective of creativity revelation processes, and lastly individual creativity. Based on the previous researches, our research model assumes that knowledge capabilities of individuals - individual knowledge and absorptive capacity - have positive effect on creativity revelation processes exploitation and exploration. Furthermore, creativity revelation processes also have positive effect on individual creativity. Notable point of our research model is the moderating effect of psychological empowerment between highly psychologically empowered group and lowly psychologically empowered group. That is, our research model assumes that the group with high psychological empowerment has a tendency to focus more on exploration and the group with low psychological empowerment has a tendency to focus more on exploitation in the perspective of creativity revelation processes.

Meanwhile, Amabile(1996) addressed that creativity could be integrated by knowledge of domain, creative thinking skill, intrinsic motivation[7]. Knowledge of domain means the

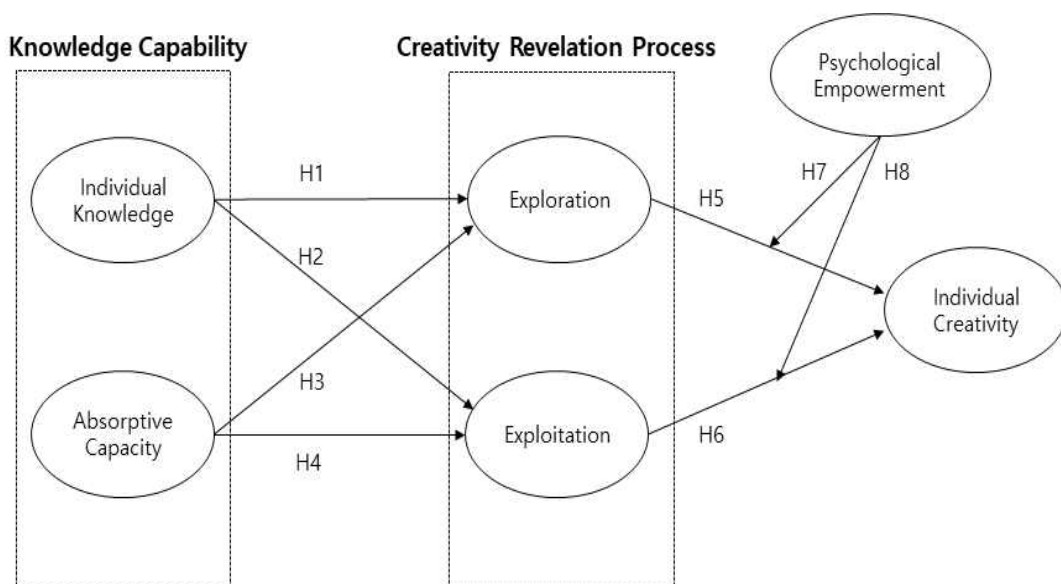


Fig. 1. Research Model

degree of knowledge accumulation, abundance, and a unique talent. And creative thinking skill means how to approach to problems flexibly, which could be interpreted as capability for exploring flexibly personal expertise knowledge in the perspective of cognitive process. And intrinsic motivation means positive characteristics such as interests, desire, pleasures on task itself. Brand(1998) insisted that main resources for creativity revelation included knowledge, technique, and expertise which individuals hold[25]. Therefore, we could derive the following two hypotheses regarding the relationships among individual knowledge and creativity revelation processes – exploitation and exploration.

- H1. Individual knowledge has positive influence on exploration.
- H2. Individual knowledge has positive influence on exploitation.

The ability to absorb outside knowledge is important factor for innovative processes and creativity processes[26]. Researchers in the field of cognitive psychology and behavioral science have studied absorptive capacity could increase new knowledge creation in the perspective of memory development, acquisition of knowledge[27]. When we consider the creativity processes this study focus as the processes of something new and innovative, we can derive the following hypotheses with regard to absorptive capacity and creativity revelation processes – exploitation and exploration.

- H3. Absorptive capacity has positive influence on exploration.
- H4. Absorptive capacity has positive influence on exploitation.

Typically, exploitation and exploration as creativity revelation processes originated in the

researchers from the area of innovation, organizational learning, and organizational adaptation[10]. That is, exploitation and exploration have been considered as critical processes of innovation, creative problem solving, and new knowledge creation[10,28]. Moreover, several researchers addressed that innovative activity and creative processes have strong relationships with creativity[29–32]. Thus, the following hypotheses can be derived with regard to the relationship among creativity revelation processes exploitation and exploration –and individual creativity.

- H5. Exploration has positive influence on individual creativity.
- H6. Exploitation has positive influence on individual creativity.

When individuals under working environment receive empowerment, they have a tendency to conduct their tasks more actively, and they could have work immersion and satisfaction as a result. Furthermore, highly empowered individuals of organizations have a tendency to respond creatively to the working environment changes[33,34]. According to the research of Gretz & Drozdeck(1992), highly empowered individuals could find best decision–making, problem solving method, and method for new idea generation[35]. We could find out psychological empowerment could enhance individuals challenge, interest, and creativity from the researches from Kinlaw(1995) and Bennis(1984)[19,36]. Meanwhile, we could infer that the degree of psychological empowerment can influence the types of creativity revelation. Therefore, we have derived the following hypotheses regarding the moderating effect of psychological empowerment on creativity revelation types. That is, the group with high psychological empowerment has a tendency to focus more on exploration, and the group with

low psychological empowerment has a tendency to focus more on exploitation in the perspective of creativity revelation processes.

- H7. Exploration has greater influence on individual creativity among the group with high psychological empowerment than among the group with low psychological empowerment group.
- H8. Exploitation has greater influence on individual creativity among the group with low psychological empowerment than among the group with high psychological empowerment group.

3. Research Methodology and Analysis

3.1 Sample and Data Collection

We conducted questionnaire survey in order to verify the research model and the hypotheses which this study suggested. Measurement items were adopted or re-developed based on the previous proven researches. The questionnaire with 7-point Likert-scale were distributed and collected for the professionals in the software development industry. The survey questions and related researches are summarized in the Table 1. We adapted nine questionnaire items based on the studies by Ettlie & O’Keefe(1982) and the research by Zhou & George(2001) in order to measure individual creativity[37,38]. Moreover, four items were adopted from the researches of Cegarra & Rodrigo(2007) in order to measure individual knowledge[39]. With regard to absorptive capacity, the measurement items from the study of Cohen & Levinthal(1990) and that of Jansen et al.(2005) were used[26,40]. Also the items from Prieto et al.(2009) were re-developed for exploitation and exploration[41]. Lastly, seven measurement items were re-developed from the research of Spreitzer(1999) for

psychological empowerment[42].

Table 1. Measurement

Construct (References)	Measurement Items
Individual Knowledge (Cegarra & Rodrigo 2007)	1. Motived to utilize own knowledge 2. Enough knowledge and skill for task 3. Innovative capability for task 4. Expertise and experience for task
Absorptive Capacity (Cohen & Levinthal, 1990; Jansen et al., 2005)	1. Good at finding information and knowledge 2. Acceptance of information and knowledge 3. Arrange materials and references for future needs
Exploration (Prieto et al., 2009)	1. Well-motivated to improve dissatisfied previous tasks 2. Create new solution about dissatisfied previous tasks 3. Utilize new knowledge and method 4. Useful and new knowledge creation
Exploitation (Prieto et al., 2009)	1. Combine the existing valuable knowledge for task 2. Apply competences from previous task 3. Combine new and existing method 4. Apply lessons learned from other organizations 5. Apply official outputs in my organizations 6. Utilize experience of colleagues and own
Individual Creativity (Ettlie & O’Keefe, 1982; Zhou & George, 2001)	1. Suggest new idea and method ahead of colleagues 2. Utilize new modes of existing tools and methods 3. Formulate appropriate plan and schedule for new idea execution 4. Propose new idea and method to achieve goal 5. Propose new method to achieve task objective 6. Draw new and practical idea to enhance performance 7. Explore ideas about new technology, process, method, and product 8. Propose new method to improve quality 9. Consider myself as a good source of creative idea
Psychological Empowerment (Spreitzer, 1999)	1. Assurance of job competence 2. Assurance of capability to perform task 3. Assurance of skills 4. Assurance of autonomy to decide method to perform task 5. Assurance of decision power for selecting method 6. Assurance of autonomy and independence to perform task 7. Assurance of control power for work boundary

335 respondents among survey participants were used for the research analysis. Furthermore, we divided all respondents into two groups based on the average (=5.266) of the average value of measurement items for psychological empowerment in order to compare the model between high psychological empowerment group and low psychological empowerment group. The demographic characteristics are summarized as seen in the Table 2.

Table 2. Demographics of Respondents

Category		N	Percentage
Gender	Male	275	82.1%
	Female	60	17.9%
Age	20 ~ 29	87	26.0%
	30 ~ 39	175	52.2%
	40 ~ 49	68	20.3%
	50 ~ 59	5	1.5%
Work Experience	Less than 5 year	144	43.0%
	5 year ~ 10 year	78	23.3%
	10 year ~ 15 year	62	18.5%
	15 year ~ 20 year	37	11.0%
	20 year ~ 25 year	5	1.5%
	More than 25 year	2	0.6%
	N/A	7	2.1%
Job Level	Junior	153	45.7%
	Advisory	75	22.4%
	Senior	98	29.3%
	Executive	9	2.7%
Profession	IT Consultant	62	18.5%
	Process Analyst	23	6.9%
	IT Planning	55	16.4%
	R&D Researcher	82	24.5%
	System Analyst	36	10.7%
	Requirement Analyst	39	11.6%
	Others	38	11.3%

3.2 Reliability and Validity

Regarding statistical analysis in order to verify our research model and the hypotheses, PLS(Partial Least Squares) were adopted, which could be considered as one of appropriate statistical methods for structural equation modeling where the theory and the relationships among constructs might be relatively weak. In this study, we used SmartPLS 2.0 software package and the research hypotheses were tested. With regard to reliability and validity of our research model, all six constructs have high internal consistency because the values of all Cronbach's alpha are higher than 0.7. Furthermore, convergent and discriminant validity were assured from the analysis based on the values of composite reliability, AVE(Average Variance Extracts), and correlation coefficients.

The convergent and discriminant validity results and the correlation matrix among five constructs are shown in the Table 3 and Table 4.

Table 3. Reliability and Convergent Validity

Construct		Cronbach's α	Composite Reliability	AVE
Entire Group	IK	0.895	0.935	0.827
	AC	0.856	0.913	0.777
	ER	0.892	0.925	0.755
	ET	0.888	0.923	0.749
	CR	0.949	0.958	0.739
High Group	IK	0.863	0.916	0.784
	AC	0.826	0.896	0.741
	ER	0.867	0.909	0.715
	ET	0.831	0.887	0.663
	CR	0.937	0.948	0.694
Low Group	IK	0.830	0.898	0.746
	AC	0.809	0.888	0.726
	ER	0.866	0.909	0.713
	ET	0.858	0.904	0.702
	CR	0.920	0.935	0.643

Note) High Group: Group with high psychological empowerment, Low Group: Group with low psychological empowerment, IK: Individual Knowledge, AC: Absorptive Capability, ER: Exploration, ET: Exploitation, CR: Individual Creativity

Table 4. Discriminant Validity

Construct		IK	AC	ER	ET	CR
Entire Group	IK	0.909				
	AC	0.662	0.882			
	ER	0.612	0.639	0.869		
	ET	0.635	0.718	0.722	0.865	
	CR	0.692	0.649	0.744	0.708	0.859
High Group	IK	0.886				
	AC	0.613	0.861			
	ER	0.503	0.527	0.845		
	ET	0.527	0.641	0.656	0.814	
	CR	0.570	0.520	0.649	0.585	0.694
Low Group	IK	0.864				
	AC	0.464	0.852			
	ER	0.452	0.619	0.845		
	ET	0.462	0.548	0.613	0.838	
	CR	0.553	0.544	0.619	0.684	0.802

* The value on the diagonal is the square root value of AVE of each construct.

3.3 Result of Hypotheses Test

<Figure 2> shows the test results of the

research model for all respondents in order to verify the research hypotheses with coefficients of path and R^2 . The results show that the values of each R^2 are higher than 10%, which could be considered that this model have strong causal relationships among constructs. The R^2 value of individual creativity, which is the last respondent variable explained by all independent variables turns out to be 61.5% and that of exploration was 47.2%, and that of exploitation was 56.1%. Table 5 shows the summary of the research hypothesis test results regarding from hypothesis 1 to hypothesis 6, by which all hypotheses were all accepted.

Table 5. Summary of Hypotheses Test Results

No	Hypothesis	Coefficient	t-value	Result
H1	IK → ER	0.337	4.936***	Accept
H2	IK → ET	0.284	5.728***	Accept
H3	AC → ER	0.416	6.762***	Accept
H4	AC → ET	0.530	11.366***	Accept
H5	ER → CR	0.486	9.524***	Accept
H6	ET → CR	0.357	6.400***	Accept

*** p<0.001

Note) IK: Individual Knowledge, ER: Exploration, ET: Exploitation, AC: Absorptive Capacity, CR: Individual Creativity

In order to verify whether there are distinct differences between two groups in the

perspective of psychological empowerment, we conducted hypotheses test regarding two divided cases. <Fig. 3-(a), (b)> and Table 6 show the hypotheses test results of each group’s model high psychological empowerment group and low psychological empowerment group. As same as the result of all participants model, all six hypotheses were all accepted in the both cases. With regard to the effect of creativity revelation processes exploitation and exploration - on individual creativity, we can find out that high psychological empowerment group has a tendency to focus more exploration than exploitation, and low psychological empowerment group intends to put their resources in exploitation.

Table 6. Summary of Hypotheses Test Results

Hypothesis		HPEG (n=176)	LPEG (n=159)	Result
H7 ER → CR	Coefficient	0.465	0.320	Accept
	Std. Error	0.070	0.090	
	t-value	15.995***		
H8 ET → CR	Coefficient	0.280	0.488	Accept
	Std. Error	0.080	0.074	
	t-value	-24.117***		

*** p<0.001

Note) HPEG: Group with High Psychological Empowerment, LPEG: Group with Low Psychological Empowerment, ER: Exploration, CR: Individual Creativity, ET: Exploitation

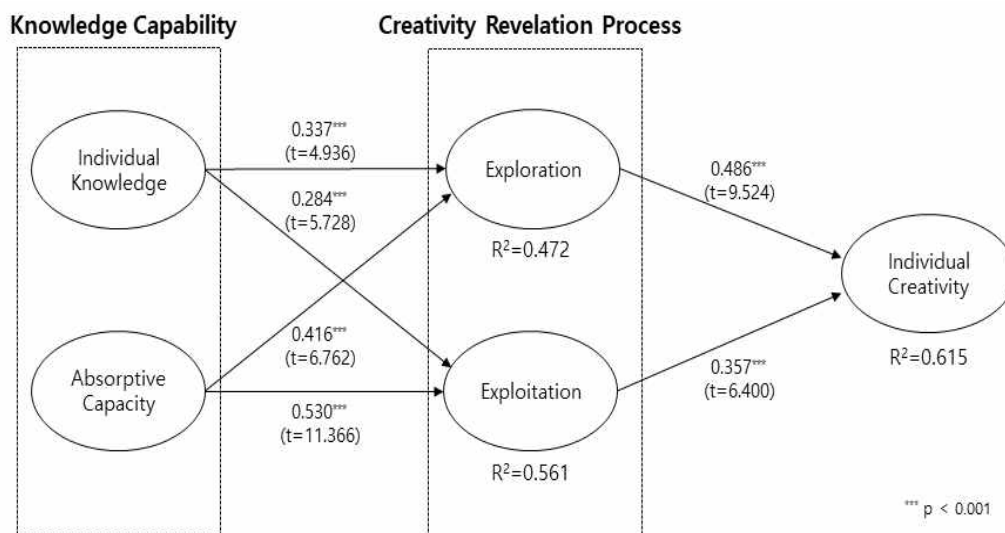


Fig. 2. Hypotheses Test Results of All Participants

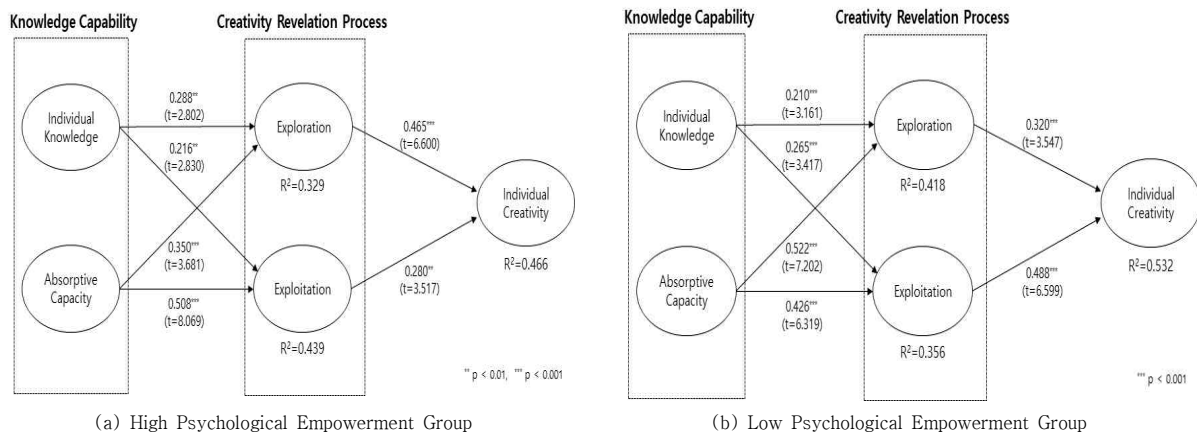


Fig. 3. Hypotheses Test Results by Psychological Empowerment Groups

4. Discussion and Concluding Remarks

This study suggested the individual creativity revelation model in the working environment, in which we mainly paid attention to the relationships among knowledge capabilities individual knowledge and absorptive capacity and creativity revelation processes – exploitation and exploration. In addition, we tried to find out whether there were distinct differences in creativity revelation processes in the perspective of psychological empowerment. Originally, we assumed that individuals with high psychological empowerment have a tendency to conduct exploration–centric creativity processes, and those with low psychological empowerment intends to have exploitation–centric creativity processes.

Empirical results showed that knowledge capability individual knowledge and absorptive capacity have statistically significant positive effect on exploitation and exploration which both are critical factors of the creativity revelation processes. Moreover, we re–verified that the creativity revelation processes exploitation/exploration could affect positively to individual creativity as same as the previous researches. The notable point of this study was the moderating effect of psychological

empowerment in the perspective of individual creativity revelation processes. As our original assumptions, there were distinct differences in the creativity revelation processes between two groups – high psychological empowerment and low psychological empowerment. That is, individuals with high psychological empowerment might have more exploration–centric creativity revelation processes, and those with low psychological empowerment have more exploitation–centric processes on the other hand. This may come from the fact that individuals are different in the effort or resources involvement through creativity processes according to the degrees of psychological empowerment. As they have high level of autonomy, individuals with high psychological empowerment intend to do new tries and put their effort and resources into exploring new knowledge and ideas during their creativity revelation. On the other hand, those with low psychological empowerment have a tendency to put their effort and resources into utilizing and enhancing existing known knowledge as they have low level of autonomy.

This study could suggest managers of organizations several managerial implications regarding creativity management and organization development. Firstly, managers

should consider knowledge capability including individual expertise/knowledge and absorptive capacity as foundation for improving creativity of members in working environment. That is, managers should build working environment which encourage members to increase their expertise, knowledge, and absorptive capacity for internal and external knowledge. Secondly, when we consider both exploitation and exploration as critical processes of creativity revelation, managers should have members to pursuit both of them with balanced sense in the perspective of ambidexterity. Lastly, managers should consider the psychological status of members when they assign and allocate resources and tasks to members as problem solving style and creativity processes may be different from individual to individual according to the degree of psychological empowerment.

Nevertheless, there exist several limitations for this study. Firstly, this study consider only a few influencing factors on individual creativity. In the further researches, we should consider more influencing factors addressing individual creativity and creativity processes such as psychological factors, interactions under working environment. Secondly, this study conducted limited survey from professionals of software development industry, which is limited to be generalized.

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