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Explaining the Role of Motivation in Opposition to Nuclear Power Energy

- Focusing on EIV (Expectancy, Instrumentality, and Valence) in Expectancy Theory -

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Abstract

In the age of information society, the internet is full of useful information which individuals can utilize for their critical decision making, such as the judgment on nuclear power energy. Based on the internet information, individuals can take actions for or against nuclear power energy. In this process, motivation plays a critical role in taking counteraction against nuclear power energy. Based on the survey data collected from 1,572 internet users in Korea, this study examines the impacts of the information-related motivation factors on opposition action online. We applied the Victor Vroom's expectancy theory that used EIV (Expectancy, Instrumentality and Valence) as main motivation factors. We compared the explanatory power of EIV with that of psychometric paradigm as a direct explanatory variable, and analyzed the role of EIV as a moderator.

Key words: Vroom's expectancy theory, EIV(Expectancy, Instrumentality and Valence), opposition action to nuclear power energy

Ⅰ. Research Questions & Background

The purpose of this study is to analyze how the motivation related with information has impact on the opposition action toward nuclear power energy in online. Among various motivation theory, we adopted Vroom's expectancy theory as main theoretical background. Our study starts from research backgrounds as follows.

First, we pay attention to the importance of information and its motivational base in decision making process in internet age. Today, internet changes people's everyday life. All of values are created, developed and innovated in the internet space. As people become heavily dependent on internet, they use the information in internet as main source for making decision making. Those situations apply to the judgment in case of nuclear

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power energy. Although motivation has been key important factor for making action, there were few studies over its impact on the opposition in case of nuclear power energy. Therefore, our study will examine direct and indirect role of motivation in influencing the opposition to nuclear power energy.

Based on internet information, individuals tend to decide pro- or anti-action for nuclear power energy. If information contributes to peoples' decision making, next question is why people get the information related with nuclear power energy from internet. We want to get the answer from fundamental side of human behavior, i.e., motivation. We focused on the motivation because it is impossible to make decisions and actions without it. Every human behaviors have the reasons and motives for themselves. Therefore, we assume that in this decision making, motivation factors related with information play a critical role in directing the opposition to nuclear power energy. To examine the motivational base of information seeking and analysis at the internet, we applied EIV(Expectancy, Instrumentality and Valence) theory among a motivation theory. EIV theory is suggested by Vroom, organizational theorist. EIV is an expectancy theory. Expectancy theory examined cognitive process of motivation, which stressed three-party relationships between the effort they put forth at work, the performance they achieved from that effort, and the rewards they received from their effort and performance (Lunenburg, 2011).

Second, in terms of theory, motivation theory can be supplement for limits of psychometric paradigm. The psychometric paradigm is one of dominant theoretical instrument for explaining the risk perception related with nuclear power energy. This paradigm argued that people's subjective perception, i.e., perceived risk and benefit, influences the decision making toward nuclear power energy. In analysis, we compared EIV to psychometric paradigm in predicting the opposition action toward nuclear power energy in the internet. Moreover, we analyzed EIV's role as moderator.

Therefore, this study sets up the psychometric paradigm and EIV theory as main theoretical framework in order to analyze the opposition behavior toward nuclear power energy issues in the internet. Next section, we will review the previous study over two theories; psychometric paradigm and expectancy theory.

II. Theoretical Background

1. Psychometric Paradigm

Psychometric paradigm, so called risk perception one, has served as an important discipline in explaining the acceptance of nuclear power energy. It stressed subjective evaluation of risks rather than the objective size of risks; The degree of risk perceived by individuals, mainly depends on their mental calculation about it. In particular, subjectivity of risk is constructed and defined through a wide array of psychological, social, institutional, and cultural factors (Slovic, 2016). It regarded the judgment about the nuclear power energy as the matter of social construction based on the subjective calculation, not the objective probability.

Risk perception paradigm analyzed the role of the perceived risk. The original idea of started from

Fischhoff, *et. al.*(1978)'s seminal research work. They found dread risk and unknown risk were main components of magnitude of risk. Dread risk is defined as the potential of dread or fatal consequences and a perceived lack of control of novel technologies, whereas unknown risk refers to the perceived novelty, low scientific knowledge, and delay of effects associated with a activity or technology (Siegrist, *et. al.*, 2005a, b; Marris, *et. al.*, 1997). This paradigm adopted psychometric scaling methods to examine quantitative state of risk perception. After original research by Fischhoff, *et. al.*(1978), many scholars have tried to find the conceptual components and determinants of risk perception. For example, laypeople use qualitative information, such as perceptions of dreadfulness and newness, not simply statistical information, such as probability, in their intuitive risk assessments (Siegrist, 2010: 600). No only two variables, i.e., dread and unknown, but also perceived risk, perceived benefit, and affective image have been observed as critically influential variables in judging risk objects. Therefore, this paradigm has focused on five variables; perceived benefit, perceived risk, trust, stigma and knowledge.

First, perceived benefit and perceived risk take contrasting role in judgement of the acceptance about risk objects; the former increases the acceptance whereas the latter decreases it. In Japan, Tsujkawa, *et. al.*(2016) reported that the perceived benefits had the positive impact on the public acceptance. Visschers & Siegrist(2013) demonstrated that among Swiss participants, perceived benefits have negative impact on acceptance of nuclear power whereas perceived risks do positive impact on it in case of both before and after Fukushima. Guo & Ren(2017) showed that perceived benefit and risk significantly influence local acceptance of nuclear power: The former has positive impact on it whereas the latter has negative one on it. Alhakami & Slovic(1994) reported the inverse relationships between risks and benefits; A higher perceived risk decreases perceived benefit, whereas a lower perceived benefit increases perceived risk.

Second, trust has been analyzed as both a main direct and indirect variable to have impact on the acceptance of nuclear power. Among various subject and attribution of trust, lot of researches have focused on the actors, i.e., trustees. Yang & Cho(2017) showed that trust in the media (broadcasting), local government, and NGOs, increases the negative perception toward nuclear power whereas trust in the medical profession, the central government of South Korea, health policy, and society decrease it. Other objects of social trust included government entities(Huang, *et. al.*, 2013), scientists(Siegrist & Cvetkovich, 2000), the media (He, *et. al.*, 2013). and nuclear power enterprises (Siegrist & Cvetkovich, 2000),

About indirect role of trust, Siegrist, *et. al.*(2000) showed that social trust has negative impact on the perceived risks and has positive impact on the benefit of technology. Trust takes a role in case of devoid of other variables. Greenberg(2009), Siegrist, *et. al.*(2000), Siegrist & Cvetkovich(2000) and Whitfield, *et. al.*(2009) showed that the public rely on social trust to judge risks and benefits of nuclear power, when there is little comprehensive knowledge about technology and the probability of technology–related disasters,

Third, stigma is affective image. Slovic, *et. al.*(1991) showed that stigmatized affective images related with the nuclear power facility at Yucca mountain, might engender negative economic impacts on the local economy. Peters & Slovic(1996) showed that affective image predicts the increasement of risk perception about nuclear power energy. Therefore, as affect becomes more negative, the support for nuclear power decreases. Moreover, negative emotional identification is related with the reluctant acceptance of nuclear power(Corner, *et. al.*, 2011).

Fourth, knowledge is enlightening factor to make the individuals to do more precise and accurate decisions. Under higher uncertainty, individuals seek for more information. Generally knowledge increases the acceptance of nuclear power energy (McDaniels, 1988; Sjöberg & Drottz-Sjöberg, 1991; Katsuya, 2001; Sun & Zhu, 2014). After examining the public in USA, Stoutenborough, *et. al.*(2013) reported that people with higher level of knowledge about energy issues reveal the support for nuclear energy. In the other hand, Kuklinski, *et. al.*(1982) showed that not only did knowledgeable people consider more consequences, on the whole, but they also held expectations more favorable to nuclear power. Brown & White(1987) demonstrated that if public generally lack in knowledge of nuclear power, they do not understand the risk related with it. However, Guo & Ren(2017) showed that perceived knowledge cannot significantly influence local acceptance of risk object.

However, psychometric paradigms have limits. Recent researches show that there are lager individual difference in risk perception(Siegrist, *et. al.*, 2005). Moreover, Sjöberg(2006) pointed out the limit of psychometric paradigm as follow; (a) novelty carries little weight in risk perception, (b) "dread" has not been measured in an appropriate manner and is little powerful, and (c) social trust has a marginal influence as compared to trust in science, i.e., epistemological trust.

Moreover, since risk perception paradigm gave the priority on the perceptional factors, it did not consider other important factors such as motivation. Therefore, our study proposes that not only variables in psychometric paradigm but EIV influences the opposition toward nuclear power energy in online. Next section will review the theory of EIV.

2. Vroom's expectancy theory

Expectancy theory is a motivation theory first developed by Victor Vroom of the Yale School of Management. Vroom's expectancy theory assumed that the people's motivation is not content but process. Therefore, motivation depends on the series of psychological processes. This theory highlights how the people act through series of psychological processes. Vroom argued that most concepts of motivation have their origins in the principle of hedonism(1994: 11). Hedonism assumed that human behavior is influenced by needs of maximizing the pleasure and minimizing the pain. Organizational life is fill with the managerial instruments for pleasure (rewards, promotion, positive reinforcement and so on) and ones for pain (punishments, degradation, negative reinforcement).

Although such hedonism provides the basic arguments for motivation, it needs more precise models to explain human's motivation process. Vroom(1994) classified the motivation model into

two group of categories. First group focused on the historical lawful relations in which the behaviors at one point in time have structural relationships with events that have occurred at earlier points in time. The present choice is the consequences of the past experience; The behavior that was rewarded in past, will be repeated in the present. Second groups stressed the cognitive learning. For example, Tolman(1932), Lewin(1938) regarded behaviors as purposeful or goal directed. They see organism which tries to achieve positively valent objects or event and to avoid negatively ones. As behavior at a given time is regarded as depending only on events existing at the that, it is called as a ahistorical approach (Vroom, 1995: 16). This approach stressed not past habits past but present motives and cognitions.

Based on ahistorical views, Vroom(1995) stressed that the present cognitive works occur contemporaneously with the behavior. According to Vroom, human's behavior mainly depends on their expectations and its results. Vroom's expectancy theory composed three motivational factors: Expectancy, Instrumentality and Valence.

Expectancy is defined as a momentary belief concerning the likelihood that a particular act will be followed by a particular outcome. It can be described by its strength: The maximal strength is indicated by subjective certainty that the act will be followed by the outcome while minimal(or zero) strength indicated by subjective certainty that the act will not be followed by the outcome (Vroom, 1995: 20-21). The expectation is the belief in certainty of achieving the results. Its value ranges from zero, indicating no subjective probability that an act will be followed by an outcome, to 1, indicating certainty that act will be followed by the outcome. Valence is value that is refer to affective orientation toward particular outcomes(Vroom, 1995: 18). An outcome has a valence of zero when the person is indifferent to attaining or not attaining it. Vroom(1995: 33) suggested that person's choice depends on the relative strength of forces which the sum of products of the valence of outcomes and expectancies that the outcome will be possible. The valence of an outcome is monotonically increasing of the algebraic sum of the products of the valence of all other outcomes and conceptions of its instrumentality for the attainment of theses outcomes.

Instrumentality has value ranging frome -1, indicating a belief that attaining of the second outcome in certain without the first outcome and impossible with it, to +1 indicating that the first outcome is believed to be necessary and sufficient condition for the attainment of the second outcome (Vroom, 1995: 21).

In short, motivation for actions depends three variables; expectation, valence and instrumentality. Our research assumes that those variables can be applied to the judgement about information related with nuclear power energy. Expectation's target is the information about nuclear power energy in internet. If people feel the certainty in getting information about nuclear, the expectation can be enhanced. Valence is about how much people involve into and give value on the final outcome. In our case, the final outcome is the more understanding about nuclear power energy. Finally, instrumentality is the degree of linkage between expectancy about information and valence about understanding the outcome. If the information on internet contributes

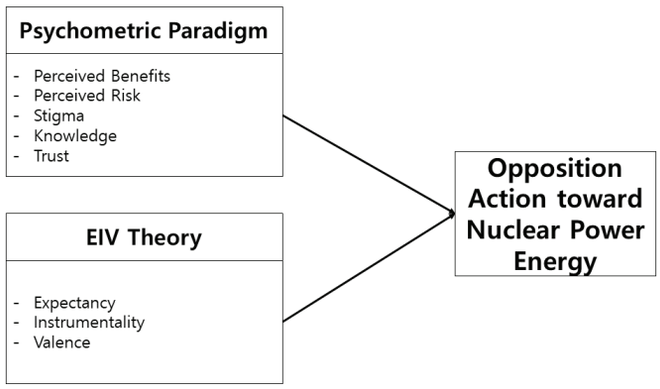


Figure 1. Research framework

to understanding the issues of nuclear power, the value of instrumentality will be increased.

Based on those discussion, we hypothesized that more expectation, valence and instrumentality will enhance the opposition toward nuclear power energy in online.

〈Figure 1〉 shows the research framework. In 〈Figure 1〉, control variables include gender, age, income and education. Psychometric paradigm includes variables such as perceived benefit, perceived risk, stigma, knowledge and trust. EIV model comprises expectancy, instrumentality and valence. We will explore not only direct effect of EIV but its indirect moderating effect on relationships between psychometric paradigm and the opposition action toward nuclear power energy.

Ⅲ. Research Design

This study analyzed the survey data collected (April 13 to 21, 2016) by internet survey. The population is internet users in Korea. Survey respondents were selected through a proportional quota sampling method. Gender, age, and region are adopted for quota criteria. To meet the quota, 17,578 e-mail survey questionnaires in total were sent to targeted people through the automatic survey management system. Among them, 5,983 opened the e-mail, 2,569 started the survey, and 1,572 respondents finally completed it (26.3% response rate).

Final samples consist of 813(51.7%) males and 759(48.3%) females. Regarding education level, 15.0%(N = 236) were high school graduates or below, 70.5%(N = 1108) were above attaining the university graduate, and 14.5%(N = 228) were about graduate school. The mean age was 43.26 years. The measures are shown in 〈Table 1〉. Except for affective image (stigma) and trust, all measures used a five-point scale(1 = strongly disagree and 5 = strongly agree). Stigma was measured by evaluating five pairs of affect adjectives (e.g., 1 = clean and 5 = dirty). Respondents were asked to choose the points to represent their perception of nuclear power energy. Trust was measured using a five-point scale(1 = strongly distrust and 5 = strongly trust).

When we make the multiple items into one composite scale, we use their mean values. Before creating the composite scale, we checked the reliability based on Cronbach's α. As shown in 〈Table 1〉, Cronbach's α for all measures meets the standard of being higher than .60.

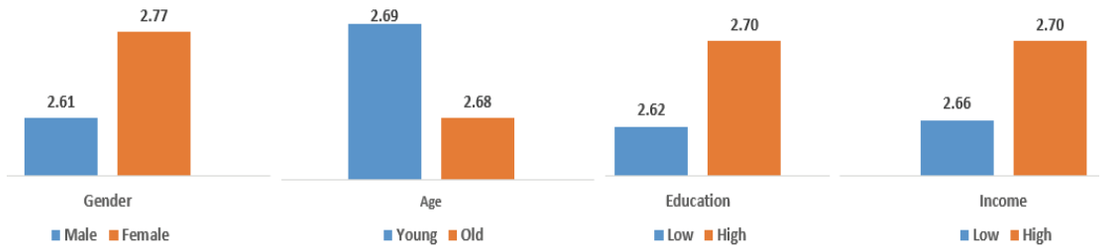
Table 1. Measure and reliability

Type	Concept	Measurement questions		Cronbach α
Opposition action		q19-15	I am willing to participate in an online signature campaign against nuclear power energy	0.817
		q19-16	I plan to write replies or comments against nuclear power energy in internet	
Psychometric paradigm	perceived benefit	q1-1	Nuclear power energy will contribute to solving the present climate change problems	0.835
		q1-2	Nuclear power energy will solve the environment problem	
		q1-3	Nuclear power energy is cheap and provide stably	
		q1-4	Nuclear power contributes to the economic development	
	perceived risk	q1-5	I personally feel the life threat from nuclear power	0.726
		q1-6	Nuclear power produced the hazardous waste	
		q1-7	Nuclear power is harm to people's health	
		q1-8	Nuclear power station is dangerous	
		q1-10	A nuclear power plant gave me personal damage	
	knowledge	q1-11	I know to some extent the law system about safety regulation about nuclear power	0.858
		q1-12	I can explain the issues about nuclear power well to other people	
		q1-13	I well know the policy and issues related with nuclear power	
	Stigma (negative image)	q15-1	bright → dark	0.91
		q15-2	clean → dirty	
		q15-3	progressive → retrogressive	
		q15-4	good → bad	
		q15-5	positive → negative	
		q15-6	warm → cold	
		q15-7	hopeful → pessimistic	
		q15-8	friendly → unfriendly	
		q15-9	like → dislike	
	trust	q17-1	Government	0.917
		q17-5	Ministry of Trade, Industry and Energy	
		q17-6	Ministry of Science and ICT	
		q17-8	Nuclear Safety and Security Commission	
VIE	Expectancy	q20-33	There will be more qualified information about nuclear power on the internet that I want	0.869
		q20-34	There will be a lot of information about nuclear power that I want to on the internet	
	Instrumentality	q20-35	Nuclear information found through the internet can help us understand the issues related to nuclear power	0.861
		q20-36	Nuclear information found via the internet can help identify the core issues of the nuclear power	
	Valence	q20-37	It is important for me to know well about issues about nuclear power	0.898
		q20-38	It is meaningful for me to understand the issues of nuclear power well	

Ⅳ. Analysis & Findings

The purpose of this study is to analyze the effects of variables in the psychometric paradigm and EIV on the participation in the opposition to nuclear power issues. Before causal analysis, it analyzed the mean differences according to control variables(gender, age, education, income) and psychometric paradigm (perceived benefits, perceived risk, knowledge, stigma, trust) and EIV on the opposition action toward nuclear power energy issues.

〈Figure 2〉 shows the opposition by demographic



	Gender	Age	Education	Income
F	13.592	.079	1.438	.568
p	.000	.778	.231	.451

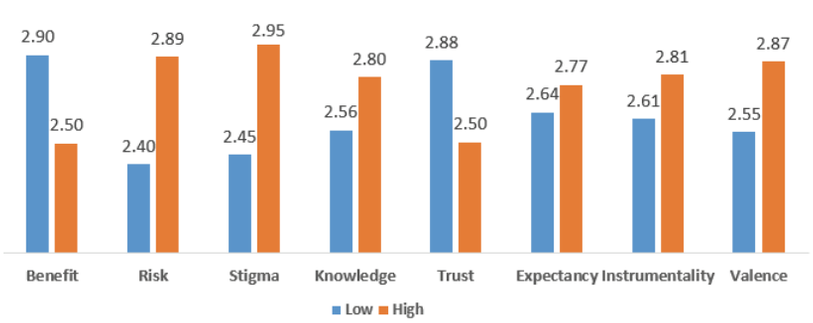
Figure 2. Anova-test: Difference in opposition by demographic variables

variables. Among various variables, only gender shows the significant difference in opposition; Females reveal more opposition than males.

〈Figure 3〉 shows the opposition by psychometric paradigm and EIV variables. The group with high perceived benefit shows the lower opposition behavior than the group with low perceived benefit. On the other hand, group with higher perceived risk shows higher anti-behavior than low group. This shows that perceived benefits and risks perform functions that are incompatible with each other. The opposition is more higher for those who having high negative stigma than for group with low negative image. Group with high knowledge shows a high level of opposition behavior. Those who reveal low-trust express more anti-behavior than those with high-trust group. Lastly, the group with high expectancy, instrumentality, and valence groups show more opposition behaviors. This is evidence that motivation factors are important variables affecting nuclear anti-nuclear behavior.

Next, to know the basic relationships between variables, we executed the simple correlation analysis.

In the second column, there is a correlation between opposition action and other variables. Opposition action has a positive correlation with perceived benefit and trust, but negative correlation with perceived risk, knowledge, and stigma. Out of the psychometric paradigm variables, the greatest coefficient is the perceived risk, followed by stigma and perceived benefits. The lowest coefficient value



	Benefit	Risk	Stigma	Knowledge	Trust	Expectancy	Instrumentality	Valence
F	88.282	132.483	142.880	31.715	76.012	7.445	20.186	53.677
p	.000	.000	.000	.000	.000	.006	.000	.000

Figure 3. Anova-test: Difference in opposition by psychometric paradigm and EIV variables

Table 2. Correlation analysis

		1	2	3	4	5	6	7	8
	1. Opposing action								
Psychometric paradigm	2. Perceived benefit	−.330***							
	3. Perceived risk	.375***	−.371***						
	4. Knowledge	.144***	.166***	−.015					
	5. Stigma	.350***	−.544***	.465***	−.126***				
	6. Trust	−.256***	.393***	−.326***	.152***	−.435***			
EIV	7. Expectancy	.130***	.073**	.021	..182***	−.103***	.136***		
	8. Instrumentality	.176***	.002	.074**	.174***	−.031	.047	−730***	
	9. Valence	.278***	−.041	154***	.261***	.077**	−.009	.297***	.298***

*p< .05, **p<.01, ***p<.001

appears in knowledge. These results indicate that the anti-nuclear behavior is mainly related to risk, benefit and affective image, which people have. It is noticeable that knowledge based on rationality is not effective. Oppositional behavior has a positive relationship with expectation, instrumentality, and incentives. The correlation between the opposition and valence is higher than on between ther former and the other two variables, i.e., expectancy, instrumentality. These results imply that individuals' sense of efficacy plays an important role in explaining the specific outcomes.

When examining the relationships among EIV, valence has positive correlation with expectancy (r=.297, p<.01) and instrumentality (r=.298, p<.01). Also, instrumentality has positive correlation with expectancy (r=.730 p<.01).

Next, to analyze determinants for opponents of nuclear power, we executed the regression analysis. 〈Table 3〉 shows the explanation power of three factors; sociodemographic factor, psychometric factor and EIV factor.

Model 1 includes sociodemographic variables as independent variables such as gender, age, education level and income. This model's fit by F-value is significant but its explanation power based on R-Square shows very low level, 12%. Gender and age have different impact on the opposition action. Females show positive attitude toward opposition whereas the old show negative attitude toward one. Generally, in general, women tend to oppose the nuclear power because they are more sensitive to risk than men. In addition, the fact that the higher the age, the lower the tendency to oppose nuclear energy, may be based on the ideological backgrounds that the old are more conservative than the young. Such conservatism tends to decrease the opposition behaviors.

Model 2 added psychometric paradigm variables such as perceived benefit, perceived risk, stigma, knowledge and trust to Model 1. As a result, the higher perceived risk, stigma, knowledge and stigma increase the opposition action. But, the higher perceived benefit and trust decrease the opposition action. When considering based on standardized beta values, knowledge is the variable with having the greatest impact on the opposition, followed by perceived risk, perceived benefits, and stigma. Trust has the lowest impact. It suggests that knowledge plays an important role in the opposition in online. The opposition in

Table 3. Regression analysis

Concept	Variables	Model1			Model2			Model3		
		B	SE	beta	B	SE	beta	B	SE	beta
control variables	(cons)	2.649***	.110		1.481***	.215		.872	.223	
	Gender	.165***	.044	.095	.093*	.040	.054	.086*	.039	.50
	Age	−.030***	.018	−.045	.015	.016	.023	.001	.016	.001
	Level of Education	.067	.064	.027	−.014	.056	−.006	−.044	.055	−.018
	Income	.012	.043	.007	−.016	.037	−.009	−.039	.036	−.023
Psychometric paradigm	Perceived Benefit				−.166***	.026	−.172	−.158***	.026	−.164
	Perceived Risk				.273***	.033	.213	.231***	.032	.180
	Stigma				.160***	.033	.139	.159***	.033	.138
	Knowledge				.022***	.022	.217	.151***	.022	.158
	Trust				−.021***	.021	−.096	−.087***	.021	−.106
EIV Variables	Expectancy							.053	.037	.045
	Instrumentality							.085*	.040	.067
	Valance							.175***	.026	.160
F value		4.761***			56.091***			51.976***		
R^2		.012			.244			.286		

*p< .05, **p<.01, ***p<.001

cyberspace requires additional effort and work for participation and action, all of which demand the mobilization of knowledge

Model 3 includes EIV variables. Out of three motivation variables, only two variables show significant impact on the opposition. The higher instrumentality and valence increased the opposition action. However, expectancy did not show significant impact on the opposition. Among two significant variables, the valence has the stronger power in explaining the opposition behavior. The fact that expectancy is not significant variable whereas the valence is significant one, suggests that the opposition in online is driven by result-oriented incentives to performance rather than process-oriented outcomes. Among twelve independent variables, perceived risk shows the greatest impact on the opposition, followed by perceived benefit, valence, knowledge, stigma, and trust. F-value and R-Square notified that Model 3 explained 28.6% of variance for the opposition action.

To know the moderating effect of EIV between psychometric variables and opposition behavior, we made the interaction terms between EIV and psychometric variables, input them into regression model 5 and see the significance of them. Among fifteen interaction terms, five cases appear statistically significant (see appendix).

Next, five figures show how EIV intervenes the relationships between psychometric variables and opposition action in online. 〈Figure 4〉 demonstrates that the perceived risk increases the opposition. However, such increasing effect by perceived risk is more facilitated by expectancy. Moreover, expectation plays a greater role in making direction of impact of perceived risk. 〈Figure 5〉 shows that perceived benefit reduces the opposition behavior, in particular, when there is low level of perceived benefit. However, these effects are weakened as

perceived benefits increase. 〈Figure 5〉, 〈Figure 7〉, 〈Figure 8〉, show that trust decreases the opposition action. Such effect of trust is moderated by the EIV. When trust generally plays a role in reducing the opposition, these effects appear more in the group with low expectation, instrumentality, and incentives. However, when the trust becomes higher, EIV's moderation effect is the more convergent; the gap between high and low group opposition becomes narrowed.

From the above results, it is noticeable that expectation was not significant in the regression analysis but it played a significant role in the moderating effect. This suggests that the motivation does meaningful function in deciding the opposition action.

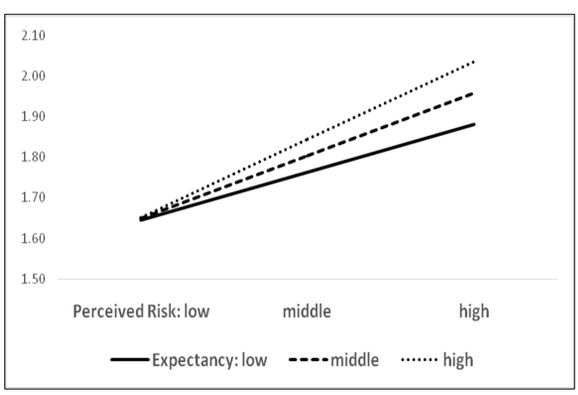


Figure 4. Perceived risk(Ⅳ) X Expectancy(M)

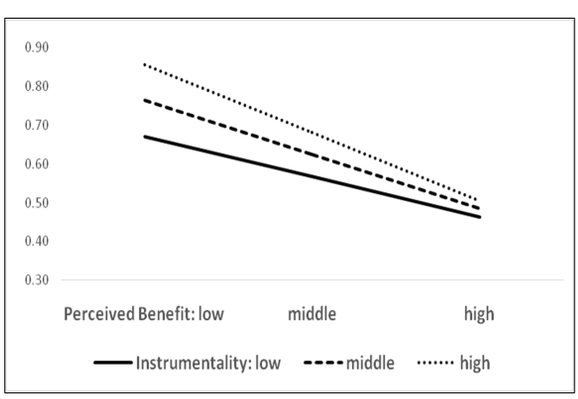


Figure 5. Perceived Benefit(Ⅳ) X Instrumentality(M)

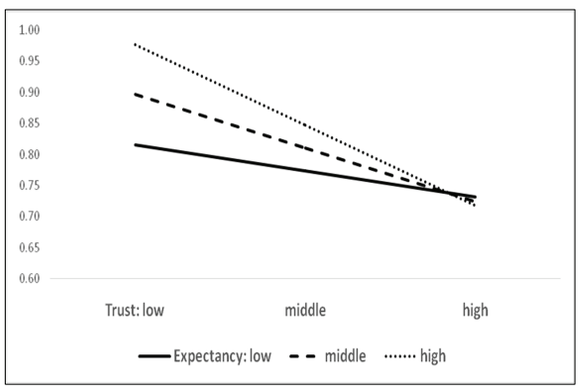


Figure 6. Trust(Ⅳ) X Expectancy(M)

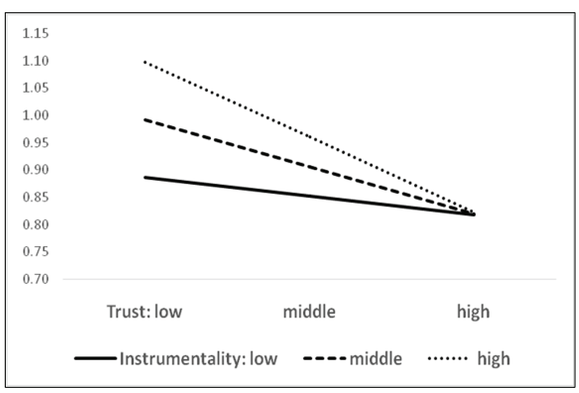


Figure 7. Trust(Ⅳ) X Instrumentality(M)

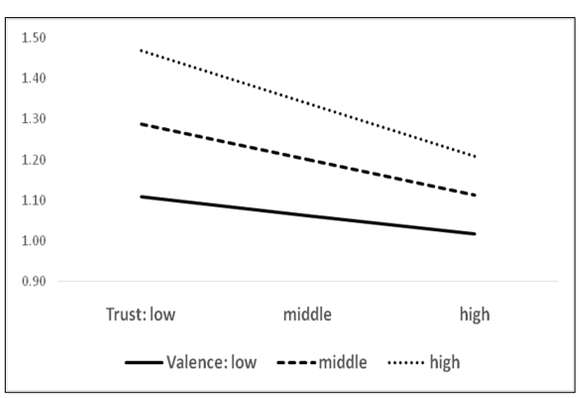


Figure 8. Trust(Ⅳ) X Valence(M)

Ⅴ. Conclusion and Implication

This study aims to analyze (1) how variables in the psychometric paradigm and EIV model, affect the participation in opposition action toward the nuclear power energy, (2) how the motivation factors moderate the relationships between

psychometric paradigm and the opposition to nuclear power. Main findings are following;

First, sociodemographic variables explained little parts of variance of opposition behavior. Only gender and age have significant impact on the opposition action; Females display positive attitude toward opposition whereas the older reveal positive attitude toward one. Such results come from the fact that the latter are more conservative than the young.

Second, the model based on the five variables psychometric paradigm variables explained the large variance of opposition action. The R^2 value changes from 1.2% to 24.4%. The higher perceived risk, knowledge and stigma increase the opposition action whereas higher perceived benefit and trust decrease it. It is remarkable that based on standardized beta values, knowledge has the greatest impact on the opposition. It suggests that knowledge plays an important role in the opposition in online space. Opposition in cyberspace requires additional work for preparing the participation. all of which require some efforts through mobilization of knowledge.

Third, final model includes EIV variables. Out of three motivation variables, instrumentality and valence show significant positive impact on the opposition; The higher instrumentality and valence about nuclear power issues increased opposition action. However, expectancy did not show significant impact on the opposition. The valence was statistically significant and greatest impact on the opposition. Such results imply that result-oriented incentives to performance is more important than process-oriented outcomes. Among twelve independent variables, perceived risk shows the greatest impact on the opposition.

Fourth, to know the moderating effect of EIV, when we made the interaction terms between EIV and psychometric variables and analyzed the significance of them. Among fifteen interaction terms, five cases appear statistically significant. EIV takes significant role as a moderator. The perceived risk increases the opposition. However, such effect depends on expectancy which facilitates the increasing effect by perceived risk. Moreover, perceived benefits reduce the opposition behavior, which effect is weakened by instrumentality in particular when perceived benefits increase. Moreover, when trust decreases the opposition action, EIV moderates such effect. It is noticeable that the expectation did not have direct impact on the opposition but did significant role in the moderating effect. This implies that the motivation does a meaningful impact on opposition behavior.

Our analysis showed that motivational factor takes significant role in inducing the opposition behavior. In particular, valence has strong impact on the opposition. Those findings imply that policy should consider which factors have impact on motivation. To consider the motivation, it needs to understand the motivational structure and its impact on the behavior. Our research provides the clues for basic causal structure in which EIV has impact on the opposition. We wished that our findings provide the new ideas for future studies.

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원자력에너지 반대행동에서 동기의 역할에 대한 분석

– 기대이론에서 기대, 도구, 유인가를 중심으로 –

국문초록 정보화 사회에 진입과 함께 개인들이 의사결정하는 데 있어 인터넷상의 정보가 중요한 역할을 하고 있다. 이는 원자력 에너지의 판단과 관련된 상황에도 적용된다. 개인들은 인터넷상의 정보에 기초하여 원자력에 대한 판단을 결정하게 된다. 이 과정에서 정보와 관련된 '동기'는 원자력 에너지 찬반행동방향의 결정에 중요한 역할을 수행한다. 이와 같은 점을 고려하여 본 연구는 인터넷 사용자로부터 수집된 설문조사 자료(N=1,572)에 근거하여 정보와 관련된 동기적 요소가 온라인상의 원자력 반대행동에 어떤 영향을 미치는지 분석한다. 특히 본 연구에서는 동기이론으로서 Vroom이 제시한 기대이론에 주목한다. 본 이론은 동기요소에서 기대-수단-유인가(EIV: Expectancy, Instrumentality and Valence)에 초점을 둔다. 분석에서는 원자력에너지 반대행동에서 독립변수로서 EIV와 심리측정패러다임의 설명력을 비교분석하였으며, 아울러 조절변수로서 EIV의 역할을 분석한다.

주제어 : Vroom의 기대이론, 기대–수단–유인가(EIV: Expectancy, Instrumentality and Valence) 이론, 원자력 에너지 반대행동

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Appendix: Moderating effect of EIV on opposition to nuclear power energy

Table 4. Perceived risk (IV) X Expectancy(M)= Opposition to nuclear power energy (DV)

	B	SE	beta	B	SE	beta
Perceived Risk	0.231***	0.032	0.18	0.228***	0.032	0.178
Expectancy	0.053	0.037	0.045	0.054	0.03	0.047
Interaction Term	-			0.073*	0.034	0.047
F-value	51.976***			48.457***		
R^2	0.286			0.288		
R^2 Change	0.28			0.282		
Simple Slope Test	Law	B=0.173*** se=0.042 t=4.140				
	Middle	B=0.228*** se=0.0326 7.000				
	High	B=0.283*** se=0.040 t=7.033				
Effect Size	0.004					

Table 5. Trust (Ⅳ) X Expectancy(M)= Opposition to nuclear power energy (DV)

	B	SE	beta	B	SE	beta
Trust	−0.087***	0.021	−0.106	−0.080***	0.021	−0.099
Expectancy	0.053	0.037	0.045	0.049	0.037	0.042
Interaction Term	-			−0.055	0.022	−0.056
F-value	51.976***			48.651***		
R^2	0.286			0.289		
R^2 Change	0.28			0.283		
Simple Slope Test	Law	B=−0.040 se=0.028 t=−1.442				
	Middle	B=−0.081*** se=0.021 t=−3.909				
	High	B=−0.122*** se=0.025 t=−4.904				
Effect Size	0.006					

Table 6. Perceived benefit (Ⅳ) X Instrumentality(M)= Opposition to nuclear power energy (DV)

	B	SE	beta	B	SE	beta
Perceived Benefit	−0.158***	0.026	−0.164	−0.155***	0.026	−0.16
Instrumentality	0.085*	0.04	0.067	0.083*	0.04	0.065
Interaction Term	-			−0.058*	0.029	−0.043
F-value	51.976***			48.371***		
R^2	0.286			0.288		
R^2 Change	0.28			0.282		
Simple Slope Test	Law	B=−0.115*** se=0.034 t=−3.440				
	Middle	B=−0.155*** se=0.026 t=−5.926				
	High	B=−0.195*** se=0.031 t=−6.208				
Effect Size	0.004					

Table 7. Trust (Ⅳ X Instrumentality(M)= Opposition to nuclear power energy (DV)

	B	SE	beta	B	SE	beta
Trust	−0.087***	0.021	−0.106	−0.081***	0.021	−0.099
Instrumentality	0.085*	0.04	0.067	0.079*	0.04	0.062
Interaction Term	–			−0.071**	0.023	−0.066
F−value	51.946***			48.94		
R^2	0.286			0.29		
R^2 Change	0.28			0.284		
Simple Slope Test	Law	B=−0.033 se=0.027 t=−1.192				
	Middle	B=−0.081*** se=0.021 t=−3.918				
	High	B=−0.130*** se=0.025 t=−5.200				
Effect Size	0.008					

Table 8. Trust (Ⅳ) X Valence(M)= Opposition to nuclear power energy (DV)

	B	SE	beta	B	SE	beta
Trust	−0.087***	0.021	−0.106	−0.083***	0.021	−0.101
Valence	0.175***	0.026	0.16	0.173***	0.026	0.159
Interaction Term	–			−0.050*	0.021	−0.052
F−value	51.976***			48.547***		
R^2	0.286			0.288		
R^2 Change	0.28			0.282		
Simple Slope Test	Law	B=−0.043 se=0.028 t=−1.561				
	Middle	B=−0.083*** se=0.021 t=−4.013				
	High	B=−0.123*** se=0.026 t=−4.806				
Effect Size	0.004					