The Role of Affective Image in Stability and Change of Attitude after Fukushima Nuclear Accidents

Hyeonjong Kim
Ajou University, Suwon, S. Korea
Sung-Man Hong
Anyang University, Anyang, S. Korea
Seoyong Kim
Ajou University, Suwon, S. Korea
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1. Abstract

A lot of researches found that the stigma as emotional or affective image does the critical role in judging the risk perception. As the affective images outweighed the rational calculative thinking, it seemed to play a role in the attitude formation, persuasion or changes. Hence, our study will focus on the role of affective image in stability and change of attitude related with nuclear power after Fukushima nuclear accidents.

Like the Chernobyl accidents, the accident of Fukushima nuclear power station has been believed to change the attitude which people generally have in their mind. Also, the affective image will influence such attitude change. Hence, we test how much or which way affective negative image influences the attitude stability and changes. For this end, after we set up and measure the risk-to-benefit ratio about nuclear power as dependent variable, we provide the respondents with four different information cues—risk, distrust, benefit, risk/distrust as stimuli to change the respondents attitude. Then, we measure again the risk-to-benefit ratio and compare it with original state of risk-to-benefit ratio.

Moreover, to know relative explanation power of the affective image in judging the risk-benefit ratio before/after providing the five stimuli, we compare it with other independent variables such as perceived benefit, perceived risk and trust. Also, to know the consistence of attitude before/after providing the clues, we calculate the probability about how much each independent variable has impact on the attitude change by using probit analysis.

2. Research Background

This study will comparatively analyze the patterns and determinants of attitude change in risk judgment toward nuclear energy. Risk judgment—the ratio of perceived risk to perceived benefit about nuclear power in our researches—has been studies not only state of outcomes but also determinants variables which usually concern with demographical variable or social constructed variable. Psychometric
paradigm led by Paul Slovic has focused on the subjective side of risk judgment, not objective one. It has paid a attention to the variables at the perceptual level, such as perceived risk, perceived benefit, image and trust.

3. Purpose & Model

The purpose of this research is to analyze that what kinds of factors have impact on risk judgment related with nuclear power energy. We measured the risk-to-benefit ratio, after providing the respondents with four information cues, as stimuli such as perceived benefit, perceived risk, distrust and risk-distrust. We assume that those four information stimuli give different significant impacts on the risk judgement. We focus on finding out which factor is most persuasive cues in reducing the ratio of risk-benefit in order to decrease the risk which respondents holds.

Second, we checked the relative power of impact affective image on risk-benefit-ratio, we execute the normal regression and probit analysis after controlling the demographic variables and psychometric variables such perceived benefit, perceived risk. We assume that people make a different judgment and change their attitude, if providing the different information stimuli to them.

This study research model is as shown < Figure 1 >:

< Figure 1. Research Model >

4. Method and Data

1) Method
In order to find significant variables in attitude changes, we used regression analysis and ANOVA Test. After this process, to investigate the probability of attitude consistence, we used probit analysis.

2) Data

We used the survey data that were collected in Korea. This survey asked the Koreans about their risk judgment with nuclear energy. The total number of respondents was 1200.

5. Analysis

1) What kind of independent variables impact on the risk judgment?

To know which independent variables influence the judgement about risk-to-benefit ratio related with nuclear energy, we regressed it on nine independent variables as shown in Table 1.

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Before providing the information cues</th>
<th>After providing information cues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1 Normal</td>
<td>Model 2 Benefit Cues</td>
</tr>
<tr>
<td>Constant</td>
<td>2.317 ( .358)</td>
<td>-</td>
</tr>
<tr>
<td>Sex</td>
<td>.031 ( .052)</td>
<td>.017</td>
</tr>
<tr>
<td>Age</td>
<td>.007 ( .007)</td>
<td>.010</td>
</tr>
<tr>
<td>Education</td>
<td>-.049 ( .066)</td>
<td>-.025</td>
</tr>
<tr>
<td>Income</td>
<td>.026 ( .034)</td>
<td>.023</td>
</tr>
<tr>
<td>Perceived Benefit</td>
<td>-.244** (.050)</td>
<td>-.159</td>
</tr>
<tr>
<td>Perceived Risk</td>
<td>.190** (.045)</td>
<td>.131</td>
</tr>
<tr>
<td>Knowledge</td>
<td>-.005 (.007)</td>
<td>-.019</td>
</tr>
<tr>
<td>Trust</td>
<td>-.216** -.148</td>
<td>-.380* -.265</td>
</tr>
</tbody>
</table>

2 Table 1 : regression variables. >
Table 1 showed how independent variable have different impact on risk–to–benefit ratio in which higher scores mean that the respondents express more risk than benefit related with nuclear power energy. First, perceived benefit & trust factors have negatively impact on risk (to benefit ratio) in all cases. Second, perceived risk & negative image factors have positive impact on such risk judgment in all five models. Third, knowledge does not has impact on risk judgment. Especially trust and negative image variables are more effective variables than others are.

To know the attitude change before/after providing five information cues, we calculated the mean of before/after risk–benefit ratio (four-point scale), as shown in <figure 2>.

< Figure 2 : change of mean in risk judgment scores >
‘Mean before providing cues is value when respondents do not receive any cues in order to change the risk judgment. ’ Mean value after providing cues’, is scores of risk-benefit ratio after ’ providing the four cues. Except benefit cue, all of them increase the perceived risk to benefit ratio. Especially risk cue increases the risk-to-benefit ratio more than any other stimuli information do. But perceived benefit cue has impact on decreasing the risk judgment.

In short, when respondents make a risk judgment, they are affected by information cues.

2) What variations of attitude changes exist among respondents?
ANOVA-test results show that there are the significant differences in risk-to-benefit ratio between before and after providing cues

< Figure 3 : Gender ANOVA-test >
Female has a higher degree of risk regardless with before/after providing cues. Likewise previous studies, female shows higher perceived risk to benefit than male does.

* Figure 4 : Education ANOVA-test *

Education doesn’t have significant different scores between higher and lower groups in education before/after providing cues.

* Figure 5 : Knowledge ANOVA-test *
Knowledge shows the significant differences between low and high groups before/after providing cues. But medium group and high group do not show the significant different except providing the trust & risk cues.

< Figure 6 : Income ANOVA-test >

Income doesn’t bring out significant difference among three groups.

< Figure 7 : Age ANOVA-test >
Age shows the significant difference between three groups. Especially, those between 40-50 group and more than 60 group are more significant difference in attitude change before/after cues.

3) How much do people have the probability of risk judgment?

We analyze the probability of risk-to-benefit ratio through probit analysis. Table 2 shown:

<Model 1> in case of not providing cue, has high probability that respondents revealed higher probability of having the risk more than benefit. In <model 2>, On other hands, when providing the benefit cue, respondents decrease the probability of having the more risk than benefit.

<Model 3> demonstrated that the distrust cue reduces the probability of risk-to-benefit ratio. In <model 4>, if providing risk cue, respondents have higher risk than benefit related with nuclear power.

<In Model 5>, if providing trust and risk cues at once, respondents show the lower risk against benefit than Model 1 did. Regardless of providing risk, role of trust is more effective than that of risk does.

<Table 2 : regression variables>

<table>
<thead>
<tr>
<th></th>
<th>Probability of risk judgment (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before providing the cue</td>
</tr>
<tr>
<td>Model 1</td>
<td>Normal</td>
</tr>
<tr>
<td>Risk-to-benefit ratio</td>
<td>57.05</td>
</tr>
</tbody>
</table>

In short, in order to decrease perceived risk about nuclear power, positive factors(benefit, trust) will more effective instrument for persuasion.

4) If independent variable change, how much does probability of perceived risk ratio to benefit change?
After probit analysis, we note, perceived risk and negative image increase probability of risk-to-benefit judgment. But other cues have positive impact on judgment.

<Model 1>, if negative image changes one standard deviation, probability of risk judgment increases 14.55 against original probability. But perceived benefit is changed, probability of risk judgment deceases 10.66.

<Model 2>, if there is the change in one standard deviation of negative image, it increases 12.64% more than average mean of probability in risk. The most influential variable in decreasing the risk is trust, 12.72%.

<Model 3>, negative image increases the risk-to-benefit ratio, 10.92% more than normal average value whereas trust decreases 10.57%.

<Model 4>, perceived risk increases 8.23% whereas trust decreases 8.54%. <Model 5>, negative image increases 13.06% whereas trust decreases 13.93%.

The probit analysis shows that negative image and trust is crucial variables to influence the probability of risk-to-benefit ratio; the former gives more impact on risk than the latter does.
5) How consistent is risk-benefit-ratio across various cues?

Above figure show how consistently respondents answer benefit or risk across five models. The percent of consistence in risk show twice times that of benefit. This means that people who felt risk toward nuclear showed more consistent attitude than those who felt benefit toward it.

6. Research findings and policy Implications

We find out the role of perceived benefit, risk, trust and negative image. They have the independent impact on the risk judgment (risk-to-benefit ratio) about the nuclear energy. The trust and negative image take a important role in determining the risk judgment about nuclear energy.

Demographical variables such as gender and age are significantly impact on risk judgment.

If providing different various cues, respondents show attitude changes. If providing positive cues such as benefit and trust, decreased the risk-to-benefit ratio but perceived risk and negative image increases it.

Respondents who felt risk toward nuclear showed more consistent attitude than those who felt benefit toward it at the initial time.

Those results suggest that different variables and cues take a important role in changing the risk judgment about nuclear power. Therefore, policy makers in nuclear energy consider these facts in order to make more effective risk communication.