

Feasibility Study on the Development of Index that Shows Social and Cultural Acceptance of Nuclear Power

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1. Introduction

Energy involves not just national-level issues but personal-level issues as it is the foothold for both national competitiveness and people's lives. Therefore, an individual retains a public right to have a voice in the process of determining energy policy, which should be determined in accordance with principles and procedures acceptable by the public.

In this context, it is necessary to manage and develop an index that can measure the level of public acceptance by establishing the terms of social/cultural public acceptance of nuclear power in a practical manner and by identifying influential factors of public acceptance. Developing an index itself is not intended to increase the public acceptance of nuclear power.

This study intends to contribute to determining energy policy acceptable to the public by estimating the level of potential social conflicts related to nuclear power policies with eligible evaluation criteria on social/cultural acceptance and by reducing relevant social costs.

2. Methods and Results

This study identifies influential factors of social/cultural acceptance using four different research methods.

First, "influential factors of social/cultural acceptance of nuclear power" were analyzed after theoretical consideration of major concepts including public acceptance, nuclear power, public acceptance of nuclear power, reliability on safety, etc.

A big data analysis was conducted upon comments written on social media including Twitter and blogs to identify the public acceptance of nuclear power. Influential factors were used as major keywords for the analysis.

Based on public perception of accepting nuclear power identified by the big data analysis, each different survey targeted to experts and general public was conducted. A hypothetical model, then, was validated through statistical analysis on the survey results.

2.1 Theoretical discussion on social/cultural acceptance of nuclear power

Theoretical discussions on developing an index for social/cultural acceptance of nuclear power fall into four different categories: discussion on acceptance, discussion on the acceptance of nuclear power, discussion on the risk/benefit perception of nuclear power and discussion on reliability of nuclear safety. Discussion results are summarized as follows.

Table 1: Theoretical discussions on social/cultural acceptance of nuclear power

Acceptance	Acceptance is used extensively with three following meanings: - embracing something different in kind or level such as different culture, art, or goods, - requiring individual judgment or decision on matters that are new and external, - requiring decision of public institution at a higher level and social consensus.
Acceptance of Nuclear Power	Social/cultural acceptance of nuclear power is defined as the process and the result of communication created by - agreeing on legitimacy of procedures and validity of results and - sharing benefits and burdens even with existing difference in opinions or emotional discomfort regarding a certain policy and situation.
Risk and Benefit Perception of Nuclear Power	Composed of perception of risks and perception of benefits - Risk perception: personal judgment on the probability, scale and impact of potential risks - Benefit perception: personal judgment on direct and indirect benefits that can be gained in the present and in the future
Reliability of Nuclear Power Safety	Gives positive values to the nuclear power safety in line with entities that have the authority to determine on nuclear power safety even without full understanding about nuclear power safety at rational level.

2.2 Big Data Analysis

Focused on major relevant keywords found in the process of theoretical consideration, big data was analyzed to lay the foundation for identifying influential factors of social/cultural acceptance of nuclear power and to validate feasibility of index development. Sequence of the analysis and its key results are summarized as follows.

(1) Sorting out primary and specific keywords whose general meaning is related to acceptance and the word “acceptance” itself.

: Support, sympathy, social consensus, acknowledgement, allowance, consent, perseverance

(2) Collect communication cases using the primary keywords¹

: acceptance (96,102 cases), take (537,136 cases), sympathy and social consensus (994,100 cases), acknowledgement (480,216 cases), consent (19,546 cases), allowance (180,955 cases), perseverance (782cases)

(3) Search and collect communication cases using combination of the primary keywords and nuclear power, nuclear power plant, nuclear, and radiation²

: nuclear + take (3,421 cases), nuclear + support (2,654 cases), nuclear + sympathy (2,058 cases), nuclear + recognition (2,436 cases), nuclear + consent (52 cases), nuclear + allowance (1,491 cases)

In line with the results of big data analysis, it was conceptualized that social/cultural acceptance of nuclear power is acknowledging the use of nuclear power even though nuclear power does not fit into one’s personal value, because there exists preferred values shared at the individual or social level. In addition, big data analysis made it possible to confirm the meaning and judgment criteria on the acceptance of nuclear power in a broad range, which is divided into 10 stages (Table 2).

Table 2: Level of social/cultural acceptance of nuclear power

Social/Cultural Acceptance		Indicator	Description
High	Absolute Support	Expand the use of nuclear power	Nuclear power use should be expanded.
	Positive Support	Maintain the use at the current level	Nuclear power should be continuously used while maintaining the current level of demand and supply.
	Conditional Support	Apply proper regulations	Nuclear power can be useful on premises where safety regulation and principles are followed thoroughly.
	Reluctant Approval	Approval is inevitable	Nuclear power is inevitable as it is essential for daily lives despite the risks it brings.
	Conditional Approval	Approval is conditional	Nuclear power is allowed only when thoroughly monitored and managed as it is essential for daily lives despite the risks it brings.
	Pre-conditional Perseverance	Need to find alternative plans	Using nuclear power can be persevered until an alternative energy source is secured on the premise that the use of nuclear power is gradually reduced.
	Limited Perseverance	Need risk control	Nuclear power has fatal risks so its use should be limited under thorough risk control and gradually reduced.
	Conditional Rejection	Reduce the use of nuclear power	Phase-out plan of using nuclear power should be clarified and relevant measures should be established. Nuclear power use should be reduced as soon as possible.
	Active Rejection	Reduce the use rapidly	Use of nuclear power should be stopped as soon as possible with the phase-out of nuclear power as a top priority.
	Absolute Rejection	Immediate suspension of the use	Use of nuclear power should be suspended immediately at all costs.
Low			

2.3 Research model and hypothesis

A research hypothesis was established based on the public perception studied by theoretical considerations on social/cultural acceptance of nuclear power and big data analysis. Based on the hypothesis, a research model, “Influential Factors of Social/Cultural Acceptance of Nuclear Power”, was identified.

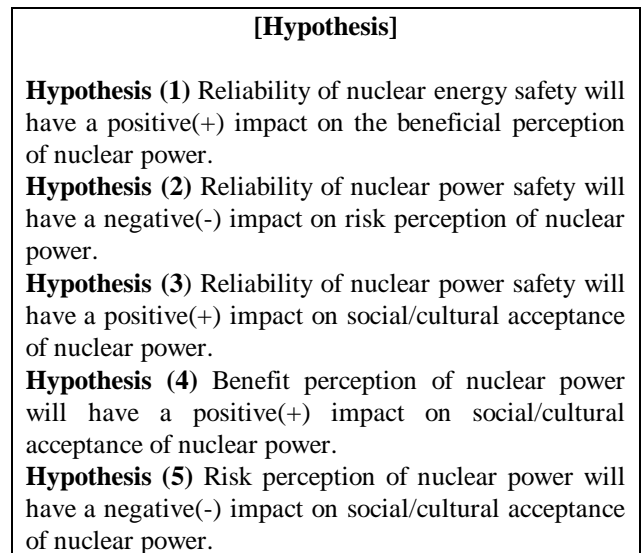
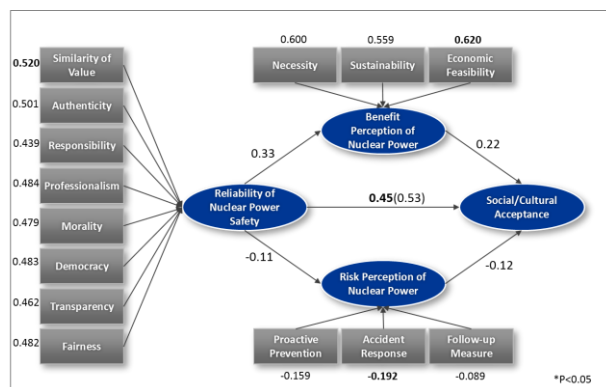


Fig. 1. Research model on the influential factors of social/cultural acceptance of nuclear power



¹ Analysis target includes about 5 million Twitter accounts and blog postings on major portal sites including Naver, Daum, T-story, Egloos, Yahoo, Cyworld and Paran (2014.11.1~2014.4.30)

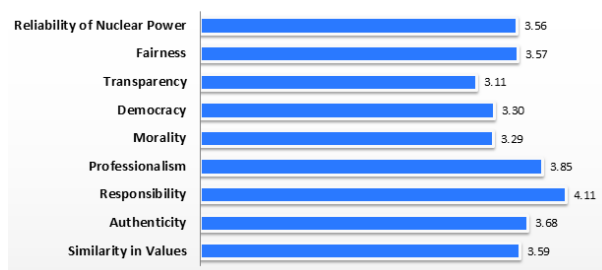
² Among the keywords related to “acceptance”, social consensus and perseverance are excluded from this research as the amount of search results are not sufficient.

2.4 Survey on the general public

Questionnaires were developed to validate the research model on Figure 1. Questionnaires fall into 4 different categories to validate the hypothesis presented above : (1)reliability of nuclear power safety, (2)risk perception of nuclear power, (3)benefit perception of nuclear power, and (4)social/cultural acceptance. With preliminary questionnaires identified, a survey on face validity was conducted among experts in academia and people working for the nuclear industry through written interviews. A survey targeted to general public was conducted using the final questionnaire built after the written interviews. As of June, 2014, an online survey was conducted targeting 1,000 male and female adults aged over 19 across the nation with a confidence level of 95% \pm 3.1 percent point.

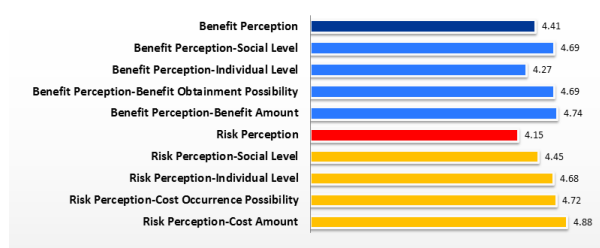
Survey results show that the building blocks for the reliability of nuclear power safety are similarity in values, authenticity, responsibility, professionalism, morality, democracy, transparency and fairness. Except for responsibility (4.11), evaluation of other elements appears to be closer to negative than positive. Relatively positive evaluation was given for professionalism (3.85).

Fig. 2. Comparison of elements composing reliability of nuclear power safety(on a scale of 7 points)



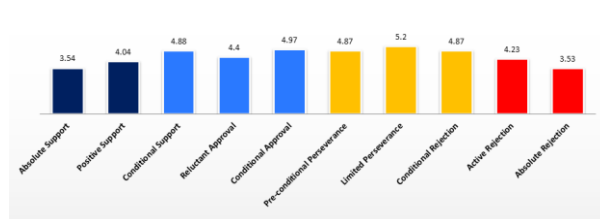
Meanwhile, the comparison between risk perception and benefit perception of nuclear power show that benefit perception(4.41) recorded relatively higher points than risk perception(4.15) did. When looking at the figures at the social and individual level, benefit perception is higher at the social level(4.69) than at the individual level(4.27), and risk perception is higher at the individual level(4.68) than at the social level(4.45). It can be determined that when the public makes a judgment on risks and benefits, they make judgments in consonance with oneself (individual).

Fig. 3. Comparison of risk and benefit perception of nuclear power (on a scale of 7 points)



The survey was conducted to organize and analyze the social/cultural acceptance from a realistic perspective by dividing the level of acceptance into 10 stages. The survey result leads to an interpretation that the public acknowledges the service of nuclear power itself and the risks of using nuclear power at the same time, so the public demands a thorough compliance with safety regulations and principles and risk monitoring and management as a prerequisite for the use of nuclear power. Overall, it can be determined that the public expects a gradual decrease in the use of nuclear power.

Fig. 4. Comparison of level of social/cultural acceptance of nuclear power (on a scale of 7 points)



In addition, acceptance on an abstract level, approving continuous use of nuclear power at the national level, recorded 4.00 on a scale of 7 points. On the other hand, acceptance on a specific level, approving construction of a nuclear power plant near one's house recorded 2.76 showing a significant gap. It means that if the construction of a nuclear power plant becomes a personal issue, acceptance is viewed from a different perspective, and this phenomenon is in line with the aforementioned interpretation that judgment criteria on risk and benefit perception of nuclear power are originated from individuals.

Based upon frequency analysis, technical statistics analysis, factor analysis, feasibility analysis, correlation analysis, and structural equation, variables' appropriateness and confidence level and suitability of research model route were conceded resulting in the adoption of the research model and hypothesis regarding influential factors of social/cultural acceptance of a nuclear power.

3. Conclusions

Key conclusions and proposal of this research are as follows. First, the influential factors of acceptance are reliability of nuclear safety, risk perception of nuclear power and beneficial perception of nuclear power. Among them, reliability of nuclear safety appears to have the most influence. In addition, benefit perception of nuclear power at the social level is significantly higher than that at the individual level.

However, in relation to risk perception, a gap between experts and the public is found as nuclear industry premises that accident does not occur while the public premises that accident may occur. The public considers it a fact that nuclear power is risky and should be used under certain conditions particularly requiring safety prerequisites. This study is meaningful in that the building blocks of social/cultural acceptance, the prerequisite for energy policy determination acceptable by the public, are identified.

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