

A causal model explaining Chinese university students' acceptance of nuclear power



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ABSTRACT

A causal model explaining Chinese university students' acceptance of nuclear power was tested. In our model, we hypothesized that perceived energy supply benefits, environmental benefits, and risks are determinants of Chinese university students' acceptance of nuclear power. We further assumed that trust affects perceived energy supply benefits, environmental benefits, and risk perception. In other words, trust indirectly affects acceptance. Structural equation modeling procedure was employed to test the hypothesized model, based on the data collected via a questionnaire survey of Chinese university students ($N = 506$). Results revealed that acceptance was mainly influenced by perceived energy supply benefits. In addition, perceived environmental benefits also had significantly positive impact on acceptance. Compared to the impact of perceived benefits on acceptance, perceived risks had a significantly smaller negative influence. Furthermore, trust strongly affected perceived energy supply benefits, environmental benefits, and risk perception. Therefore, emphasizing energy supply benefits of nuclear power seems to improve the level of acceptance when communicating to Chinese university students.

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1. Introduction

Nuclear energy has been recognized as one useful strategy to meet the increasing energy demand (Keller et al., 2012; Roth et al., 2009), as well as being an environmentally friendly energy source with extremely low carbon dioxide emissions (Dones et al., 2004; Kim et al., 2014; Lee and Jung, 2007; Rogers, 2009; Vaillancourt et al., 2008). For these reasons, it is indispensable for many countries to develop nuclear power (Chung et al., 2008). In recent years, growing interest in nuclear power has been expressed in some countries, and the increase in nuclear power is significant in Asia (Adamantides and Kessides, 2009; Kim and Chang, 2012). Specifically, in China, nuclear power has been vigorously pursued, and a series of ambitious nuclear power policies have been developed. Currently, 28 nuclear power units are operating, and 24 units are constructing in China (IAEA, 2015). Fig. 1 shows the number of nuclear power reactors in China.

However, the Chernobyl disaster, Three Mile Island accident, and the Fukushima Daiichi accident have resulted in a low level of trust, and people have concerned about the potential danger posed

by nuclear power plants (Melber, 1982; Nealey et al., 1983; Ramana, 2011; Renn, 1990; Rosa and Dunlap, 1994; Smith and Michaels, 1987; Yamano et al., 2008). Previous studies also revealed that a major nuclear accident had a strong effect on laypeople's perception of nuclear power (de Boer and Catsburg, 1988; Drottz-Sjöberg and Sjöberg, 1990; Eiser et al., 1990; Hughey and Sundstrom, 1988; Lindell and Perry, 1990; Peters et al., 1990; Verplanken, 1989). For example, the Three Mile Island nuclear accident which happened in 1979 strongly accelerated anti-nuclear movement (Adamantides and Kessides, 2009). Furthermore, general public consider nuclear facilities to be some of the most dreadful among various potentially hazardous facilities (Kraft and Clary, 1991; Siegrist et al., 2005; Slovic, 1987) because laypeople are usually not familiar with nuclear power, and consider that nuclear accident cannot be controlled and will lead to devastating damage (Fischhoff et al., 1978; Slovic, 2001). Thus, building nuclear power plants or nuclear waste repositories often encounter regional community opposition (Jenkins-Smith and Kunreuther, 2001; Slovic et al., 1991). In China, several protests against nuclear facilities have happened (See Table 1). With respect to nuclear power, in many nations, public perception is a critical factor determining whether nuclear power will be used to generate electricity in a country (Goodfellow et al., 2011; Yun, 2008). Furthermore, it is crucial to study public acceptance to make sound nuclear power policies (Siegrist and

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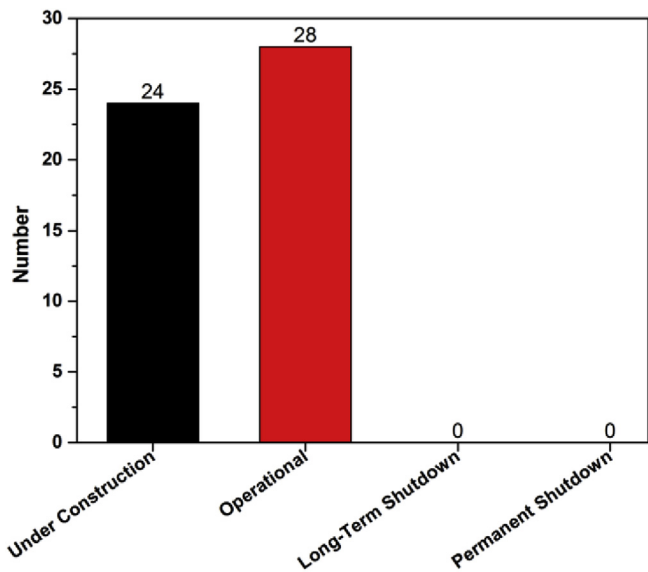


Fig. 1. Number of nuclear power reactors in China.

risk perception are both considered when studying determinants of people's acceptance of new technologies (Chung and Kim, 2009; Siegrist, 2000; Visschers and Siegrist, 2013).

1.2. Previous studies regarding trust, benefit perception, risk perception, and acceptance

Considerable literature suggested that trust in relevant authorities had an important influence on public acceptance of new technologies, such as antibiotics (Brookes-Howell et al., 2014), gene technology (Connor and Siegrist, 2010; Siegrist, 2000), genetically modified food (Gutteling et al., 2006), genetically modified field experiments (Siegrist et al., 2011), nanotechnology foods packaging (Siegrist et al., 2007), food technologies (Eiser et al., 2002), and other emerging technologies (Frewer, 1999; Lee and Song, 2013). Some studies on public acceptance of nuclear power have also highlighted trust as an important determinant of public acceptance (Ansolabehere and Konisky, 2009; Dunlap et al., 1993; Ibitayo and Pijawka, 1999). Specifically, regarding the radioactive waste disposal plant, Chung and Kim (2009) studied the impact of trust on people's acceptance in Korea. Fang (2013) conducted ethnographic empirical research to examine the Chinese local people's trust in nuclear regulatory agencies and public perception of nuclear risks. Many individuals are inclined to rely on trust in relevant authorities to make decisions and take action because they lack sufficient knowledge related to science and technology (Siegrist et al., 2000).

Additionally, considerable research has tested the relationship between benefit perception, risk perception, trust, and acceptance. Besides the direct effect on acceptance, trust also indirectly affects acceptance by influencing benefit and risk perception. Previous studies have indicated that trust had an important impact on benefit perception and risk perception (Chen and Li, 2007; Siegrist and Cvetkovich, 2000). Therefore, people who had a higher level of trust in the institutions related to technology perceived greater benefits and lower risks. Especially, past research has widely studied the relationship between trust and risk perception (Pidgeon et al., 1992; Renn and Levine, 1991; Slovic, 1993). In risk communication literature, trust is generally recognized as a critical factor influencing risk perception (Greenberg et al., 2007; Jungermann et al., 1996; Lofstedt and Cvetkovich, 2008; Poortinga and Pidgeon, 2005; Rosa and Clark, 1999; Slovic, 1999). Specifically, with respect to radioactive waste repository, trust in regulatory agencies had a strong influence on perceived risks (Flynn et al., 1992; Freudenburg, 1993; Slovic et al., 1993). Laypeople seem to rely on their trust in relevant authorities to determine benefit and risk perception because they lack sufficient knowledge related to technology (Viklund, 2003).

1.3. The hypothesized model

Past research has rarely examined how these factors influence Chinese public's acceptance of nuclear power. Thus, the present study aims to test the impact of trust, energy supply benefit

Visschers, 2013). Specifically, it is critical to study what determines the public's acceptance of nuclear power.

1.1. Previous studies regarding benefit perception, risk perception, and acceptance

The determinants of people's acceptance of nuclear power have been explored in many previous studies. In regard to nuclear power, benefit perception was regarded as an important factor that influences the level of acceptance. Benefit perception was positively related to acceptance (Liu et al., 2008). More specifically, perceived energy supply benefits positively influenced public acceptance of nuclear power (Visschers et al., 2011). Additionally, the relationship between perceived benefits for climate change and people's acceptance was also investigated (Bickerstaff et al., 2008; Rosa, 2005; Spence et al., 2010).

Risk perception, another important factor, has been found to be related to people's acceptance in broader risk literature (Eiser et al., 2002; Mankad and Tapsuwan, 2011; Robinson et al., 2011; Sjöberg and Drotz-Sjöberg, 2001). Specifically, risk perception appeared to reduce the level of acceptance of nuclear power (Bassett et al., 1996; Kunreuther et al., 1990; Song et al., 2013). Benefit and risk perception are both considered critical factors influencing people's acceptance. Furthermore, benefit perception played a bigger role in predicting people's acceptance of nuclear power than did risk perception in previous studies (Tanaka, 2004). In addition, the relationship between benefit perception and risk perception is significantly negative (Finucane et al., 2000; Frewer et al., 1998; Wallquist et al., 2010). For these reasons, benefit perception and

Table 1
Public protests against nuclear facilities in China.

Time	Public protests	Source
1980s	The construction of Daya Bay nuclear power plant led to public protests.	He et al., 2013
2007	In Shandong province, Rushan nuclear power project was debated, which demonstrated increasing public awareness of nuclear risks in China.	He et al., 2013
2011	Local people of Wangjiang County in Anhui province opposed Pengze nuclear power plant in Jiangxi Province. Environmental impact assessment report of Pengze NPP was questioned, and the project was suspended.	Sohu News, 2012
July, 2013	Local people opposed the Chinese government to locate a uranium-processing facility in Jiangmen city, Guangdong province of China. Finally, the Chinese government had to abandon the plan due to strong protests by local residents, which indicated that public acceptance is crucial for the government to implement nuclear power program.	Economist, 2013

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