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Professional ethnocentrism and ethical risk management efficacy: How engineer's emotional openness mediates this complex relationship☆

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ABSTRACT

Professional ethnocentrism is an important issue in developing an ethical approach to risk management in engineering. It may impede engineers from acknowledging and valuing the plurality of legitimate perspectives in risk management, which usually challenge their technical point of view. It is therefore crucial to understand what may influence such ethnocentrism. In this study, 178 professional engineers were asked to rate their agreement on several statements regarding professional ethnocentrism and emotions. In the same questionnaire, they also rated their confidence in their ability to carry out specific tasks promoting an ethical approach to risk management. Our results suggest that engineers with higher ethical risk management efficacy are less subject to professional ethnocentrism, and that this relationship is fully mediated by emotional openness. Therefore, we argue that engineering education should promote emotional reflection, as developing this skill could help engineers to transcend their technical perspective on risk. Engineers who are more sensitive to the complex and ethical dimensions of safety will be more likely to take an interdisciplinary and deliberative approach to risk management. To further this aim, we argue, professional training should specifically aim at enhancing engineers' self-efficacy in ethical risk management.

1. Introduction

The increasing complexity of engineering projects requires the collaboration of professionals from many different disciplines, particularly when such projects form part of sustainable development and corporate social responsibility initiatives. Now, more than ever, engineers must acknowledge and value the perspectives of both "hard" and "soft" science. The social acceptability of risks has also become a central aspect of industrial developments. Several recent projects have generated intense controversy, leading to major delays or even cancellation—all of which could have been avoided if communities' concerns had been properly considered from the beginning. Examples include the Oakville gas-fired power plant (2010), the Energy East (2015) and Northern Gateway (2016) pipelines in Canada, the Dakota access pipeline in the U.S. (2016) (since reactivated by executive order), and the new airport at Nantes in France (2016).

These new considerations call for engineers to embrace a broader conception of what risk management is. According to Power (2004, p. 11), "Risk management is much more than a technical analytical practice; it also embodies significant values and ideals, not least of accountability and responsibility." Thus, engineers engaged in risk management should take a broader view than the purely technical aspects of projects to grapple with the complex and ethical dimensions of safety.

Traditional engineering curricula do little to encourage students to adopt multiple perspectives. To address this, several authors have advocated using multidisciplinary approaches in engineering education (see, for example, Bucciarelli and Drew, 2015; Downey, 2005; Gunn and Vesilind, 1983; Mitcham, 2014; Richter and Paretti, 2009). Although very relevant, these suggestions are mostly grounded in an analytical-rational point of view, which usually neglects or disregards the role of emotions in engineering practice. However, a growing body of literature acknowledges emotions' importance in risk management, particularly in terms of the perception and acceptability of technological risks (see, for example, Roeser, 2006, 2012a; Sjöberg, 2007; Slovic, 2000). Emotions, particularly in engineering, are often perceived as a source of biases to rational thinking, which should be avoided to enhance objectivity. On the contrary, we argue that emotions, while not infallible, are legitimate sources of information to be considered in moral judgment (Nussbaum, 2001). Since emotions may

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allow engineers to be more aware of complex and ethical dimensions in risk management, they should be valued in safety engineering (Roeser, 2006, 2012a).

Finally, as we will discuss later, several studies have investigated the relationships between self-efficacy and risk management on one hand, and emotional intelligence on the other. Therefore, in this paper, we mobilize this concept of self-efficacy to connect these different dimensions and empirically address two research questions: (1). How far does the self-perception of one's ability to approach risk management ethically influence professional ethnocentrism? and (2). What role do emotions play in this relationship?

In the next section, we argue how acknowledging and valorizing multiple legitimate risk perspectives may contribute to an ethical approach to risk management in engineering, and how professional ethnocentrism may then impede such an approach. We then discuss how self-efficacy and emotional reflection may influence professional ethnocentrism when applied to risk management, while setting forth our research hypotheses and theoretical model. Next, we explain the quantitative methodology used to verify our model in detail. Finally, we present our results and discuss their implications.

2. Professional ethnocentrism and ethical risk management

Engineers usually perceive risk management as a value-neutral and non-normative activity. Moreover, they consider risks to be objective features of technologies or processes (MacLean, 2009; Wendling, 2014), technically quantifiable as the product of the probability of an event's occurrence and the severity of its consequences. However, science and engineering are not value-free (Bucciarelli, 2008; Lekka-Kowalik, 2010; Vesilind and Gunn, 1998). Technological design and development are value-laden processes in which engineers are asked to consider their responsibility (Van Gorp and Grunwald, 2009). In particular—and usually in contradiction to positivist approaches—the whole process of risk management is deeply value-laden, from risk identification to data collection, communication, evaluation, and making decisions on risk acceptability (Mayo and Hollander, 1991; Roeser et al., 2012). This process requires normative judgments (MacLean, 2009; van de Poel and Fahlquist, 2012).

Since risks are inherently multi-dimensional, risk analysis also has many faces: ecological, technological, sanitary, economical, etc.—although the intermingling of these areas makes such distinctions ever more blurry. In addition, the diverse definitions and perspectives on risk that are used by scholars, including engineers (Aven and Renn, 2009; Renn, 1992), have led to what Funtowicz and Ravetz (1993, p. 739) called a "plurality of legitimate perspectives" on risks. This pluralism raises important ethical questions for risk analysis and management, such as: What are the values and basic assumptions structuring each perspective? In view of this plurality, who can be deemed a "risk expert," and which of these perspectives are necessary and sufficient for sound and ethical decision-making regarding risks?

To address these questions effectively, in both research and practice, engineers need to challenge their own perspective. Cooperation with non-technical scientists, especially social scientists, can help them identify the values and assumptions that underpin their own perspective on risk management (Wendling, 2014). However, because engineers usually prefer (or are more used to) a technical approach to risk management, it may feel unnatural for them to integrate a constructivist perspective and expand their responsibility outside a narrow technical execution (Kermisch, 2012; Wendling, 2014). Indeed, while interdisciplinary and ethical competences are now required to be developed by engineering education (see ABET, 2015), engineers still seem to struggle to valorize diverse legitimate perspectives, especially if non-technical. Richter and Paretti (2009) have argued in a case study that engineering students, suffering from disciplinary egocentrism, usually "fail to understand the value of multiple perspectives and approaches […] [which] limit individuals' ability to integrate and synthesize differing epistemologies and value systems in addressing complex problems" (p. 38). In line with these scholars' observation, and inspired by their concept of disciplinary egocentrism, for this study we define the concept of *professional ethnocentrism* (PE)[1] as the propensity for an engineer to mostly valorize perspectives from members of the engineering profession, neglecting the opinions of other experts as well as laypeople. The items used for this measure are presented in Table 3, in the Results section.

As we suggested in the introduction, public voices on risk perceptions and acceptability are gaining more leverage nowadays, especially since the rise of the internet and social media. They are, however, usually perceived as misinformed, irrational, and biased, and hence disregarded by scientists, such as engineers, who are engaged in a technical approach to risk management (Lidskog and Sundqvist, 2012). Such rejection, however, raises serious ethical questions, such as prior consent to accepting risk, or justice and fairness in the distribution of risk (Beck, 1986; MacLean, 2012; Shrivastava, 1987). Numerous authors have therefore argued for the legitimacy, seriousness, and richness of public perspectives on risks, and for the necessity of integrating them in a deliberative process to promote an ethical approach to risk management (for example Checker, 2007; Cotton, 2009; Herkert, 1994; Slovic, 2000; Stern and Fineberg, 1996). Of course, this does not mean that the public is systematically right about risks, that their judgment cannot be distorted or manipulated by "alternative facts," or that theirs is the only view that should be considered. It does mean, however, that determining the legitimacy of public opinion is an ethical debate in itself, and one that should be integrated in the risk-management process.

For Van Gorp and Grunwald (2009), deliberative democracy (Barber, 1984; Habermas, 1985) should serve as a normative framework for the responsibility of engineers in design processes. They argue that all these considerations certainly call for an interdisciplinary and deliberative approach to risk management to morally justify industrial activities that impose risk (MacLean, 2012). Acknowledging and valorizing this diversity of value-laden perspectives from other disciplines and laypeople, if done efficiently, would allow for a mutual enrichment and a better consideration of the complexity of risk management, and therefore contribute to a more ethical approach to this practice. Professional ethnocentrism, then, raises an important issue, since it could specifically impede engineers from benefiting from such enrichment and, therefore, limit them in the development of an ethical approach to risk management. Understanding how far professional ethnocentrism may be influenced by self-efficacy—a major concept in behavioral science, with strong theoretical and research foundations—could help address this issue.

3. Self-efficacy in risk and safety management

Self-efficacy is defined as an individual's perceived ability to carry out a desired action with ambiguous, unpredictable, and often stressful dimensions (Bandura, 1977, 1981). Individuals with a higher perception of their self-efficacy for a given action are likely to be more motivated and persistent in their engagement in such an action, and to set higher standards of realization for themselves and higher outcome expectations (Bandura, 2001; Schunk, 1995). Self-efficacy is not a fixed characteristic of an individual, and is influenced by performance accomplishment, lived or vicarious experiences, social persuasion, or emotional arousal, among other factors (Bandura, 1977).

Self-efficacy has been associated with safety and risk management, particularly within the medical and public-health fields, and especially

[1] In our work, we privilege the word "ethnocentrism" over "egocentrism," since we understand that engineers will judge—and eventually neglect—other perspectives relatively to the assumptions or values of their own discipline, which are at the group level and not just the individual level (Campbell, 2009).