

Moral Narratives of Practicing Engineers Across Industry Sectors for Engineering Ethics Education

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Abstract—This work-in-progress research paper reports on an ongoing research study which addresses two research questions: RQ1) What are the moral narratives of engineering practitioners across industry sectors? RQ2) How are the engineers' moral narratives influenced by the organizational cultures of their workplaces? As stories that support and sustain one's moral life, moral narratives influence one's ethical decision-making. While it is expected that a better understanding of engineers' moral narratives can be helpful for improving engineering ethics education, little is known about engineers' moral narratives. This paper explains the methodological approach we are taking to answer the research questions. This paper also describes potential implications of this study by introducing a new pedagogical approach called Scaffolded Ethics Autobiography for engineering ethics education.

Keywords—*moral narratives, moral foundations theory, engineering ethics, professional ethics education, scaffolded ethics autobiography*

I. INTRODUCTION

Engineering ethics is an essential component of the engineering curriculum, but traditional engineering ethics pedagogies may not be sufficient to help students internalize values and virtues as an engineer. To complement current pedagogical approaches, which typically use case studies and codes of ethics, we plan to develop a new pedagogy in which each student constructs a personal moral narrative that reflects engineering values and virtues. To establish fundamental knowledge for development of this pedagogical approach, we are first studying the moral narratives of engineering practitioners across various industry sectors.

Moral narratives are the stories that support and sustain each person's moral life. Engineers' moral narratives reflect visions and images of good engineering practices, guide engineers' ethical decision-making, and could serve an educational role for engineering students. We distinguish between two types of moral narratives – personal moral narratives and archetypal moral narratives. Personal moral narratives are individuals' personal stories related to their moral lives. Archetypal moral narratives are collective stories which represent common themes across personal moral narratives. Therefore, compared with personal moral narratives, there are a limited number of archetypal moral narratives in a society. And while individuals have unique personal moral narratives, these are not independent from archetypal moral narratives. Archetypal moral narratives

in a society influence personal moral narratives, and personal moral narratives collectively inform archetypal moral narratives, as well. We will explain the relationships between moral narratives in more detail in the next section.

Since organizational cultures and ethical norms vary across industry sectors, we additionally expect there to be several partially distinct archetypal moral narratives among engineers and other technical professionals who work in different sectors. To examine this idea, our study addresses two research questions: RQ1) What are the moral narratives of engineering practitioners across industry sectors? RQ2) How are the engineers' moral narratives influenced by the organizational cultures of their workplaces?

This study of moral narratives is the qualitative phase of a broader sequential triangulation mixed-methods research project. The earlier quantitative phase of this project investigates organizational cultures and moral values across industry sectors through the surveys with 515 engineering practitioners [1]. Based on the survey results, we are conducting follow-up interviews with 25 engineers across industry sectors, positions, and demographic attributes (e.g., age, gender). Each interview will last 90 to 120 minutes. The first half of the interview will follow the ethnographic interview approach [2] to investigate the organizational culture of the engineers' workplaces. The second half of the interview will follow the narrative inquiry approach [3] to investigate the moral narratives of the engineers. By coupling the ethnographic interview with the narrative inquiry, we can obtain insights into how individuals' moral narratives interact with the organizational culture of their workplace. The qualitative study aims to produce the personal moral narratives of individual engineers, archetypal moral narratives obtained by a synthesis of the personal moral narratives, and a description of the organizational cultures of the individuals' workplaces.

In this work-in-progress paper, we will describe the background and methodology of this study in detail, as a preliminary report. As we described in more detail below, we think that investigating the moral narratives of engineering practitioners can inform the development of a new pedagogical approach in engineering ethics education, which can in turn help engineering students internalize engineering values and virtues.

II. LITERATURE REVIEW

A. Moral Narratives

McAdams and Pals [4] defined three levels of personality: dispositional traits (level 1), characteristic adaptations (level 2), and life narratives (level 3). Dispositional traits refer to relatively stable individual traits such as reflected in the Big Five personality model (extraversion, agreeableness, openness, conscientiousness, and neuroticism) [5]. Characteristic adaptations involve a relatively more malleable level of personality, such as values and beliefs. Life narratives refer to the stories that support one's life, which are often constructed post-hoc. These stories play a central role in one's identity. The three levels of personality are interdependent and situated in the culture surrounding the individual. Based on this three-level conceptualization of personality, McAdams [6] defined the concept of *moral personality*. Moral personality refers to a specific aspect of the three-level personality that characterizes one's moral life. Moral narratives are thus stories that "best support and sustain [one's] moral life" [6, p. 23]. In the context of moral personality, the term "moral narrative" refers to personal moral narratives.

As briefly discussed above, personal moral narratives are influenced by archetypal moral narratives in society. Randazzo and Haidt [7] introduced examples of archetypal moral narratives, although they did not use the exact term. They perceived moral narrative as what influences one's value judgments and shapes their substantive conclusions on specific societal issues (e.g., public policy issues). They illustrated their idea with the example of two distinct moral narratives about capitalism: in story 1, capitalism is exploitation, and in story 2, capitalism is liberation. They argued that U.S. economists, at least partially, think of capitalism in line with one of the two stories. Randazzo and Haidt [7] further explained that the economists who perceive capitalism as exploitation are more likely to favor expanding both the welfare and regulatory functions of the state, while economists who perceive capitalism as liberation are more likely to favor shrinking these functions. In other words, economists' public policy opinions and their moral narratives are closely related. Here, the two distinct moral narratives of economists are archetypal moral narratives. While individual economists would have distinct personal moral narratives, their personal moral narratives as economists would be linked to one of the two stories about capitalism.

There have been other studies focusing on narratives in the moral domain, but without necessarily using the term *moral narratives*. By starting from the question, "why people vary in their visions of the good society," Haidt et al. [8] introduced four distinct clusters of *ideological narratives* (i.e., secular liberal, libertarian, religious left, and social conservative) developed based upon responses to their Moral Foundations Questionnaire [9]. For example, the secular liberal narrative says that traditional societies harbor deep-rooted inequality and exploitation. This narrative calls for autonomy and equality to "dismantle the powerful vestiges of inequality, exploitation, and repression" [8, p. 116]. In contrast, the social conservatives' narrative says that traditional American values such as fidelity, personal responsibility, and family have become undermined by the public policies of liberals. Therefore, they conclude that

Americans should "take their country back from those who sought to undermine it" [8, p. 117]. Haidt et al. [8] argued that ideological narratives are different from personal life stories in that an ideological narrative is shared by members of a group. Therefore, we consider an ideological narrative as an example of an archetypal moral narrative, like the two capitalism stories. Since by its nature they are shared stories in a society, "only a small number of major ones is circulating in a society at any given time" [8, p. 115]. Some examples of the ideological narratives can be found in campaign biographies of presidential candidates and in the manifestos and mission statements of political parties.

Archetypal moral narratives are also often used to educate people. Dehghani et al. [10] used the term *cultural narratives* and suggested they are "instrumental in teaching core cultural moral values" [10, p. 1912]. Religious texts and folk stories are some examples of cultural narratives. Dehghani et al. also showed that individuals' decisions when encountering moral dilemmas are influenced by how the situations are analogically accessible to core cultural narratives of the society. For example, when a moral dilemma is structurally similar to a cultural narrative of a given society, people are likely to select an action that is described as moral in the cultural narrative because they reason by analogy.

As we have discussed so far, previous studies have examined archetypal moral narratives, which are shared by many people in a society, reflect the visions of good society, and guide opinions on public policy. Archetypal narratives also serve an educational role in society. However, while prior studies have focused on society at the national level, few studies have investigated the moral narratives of specific groups embedded in the larger society, such as engineering professionals.

B. Engineering and Moral Narratives

After World War II, when engineers became increasingly aware of the impact of engineering practice on society [11], professional societies including the National Society of Professional Engineers (NSPE) and Institute of Electrical and Electronics Engineers (IEEE) revised their codes of engineering ethics to emphasize the profession's responsibility for the health, safety, and welfare of the public [12]. Often, engineering ethics courses introduce the stories of engineers who exemplified that responsibility, including to encourage engineering students to be ethical in their work. In our terminology, such stories are personal moral narratives of engineers. For example, Pritchard [13] published stories of exemplary engineers and suggested that more such stories should be introduced in engineering classrooms to help engineering students develop as virtuous engineers.

We expect that, like ideological narratives and cultural narratives in society more generally, there are a few archetypal moral narratives of engineers. While we could speculate that those narratives may have been constructed around the core engineering values such as public health, safety, and welfare, to our knowledge no previous study has systematically investigated engineers' archetypal moral narratives. As explained, Pritchard [13] reported stories of good engineering practices, but those were personal stories; Pritchard did not identify archetypal moral narratives through meta-analysis.

Since the values of engineers are influenced by the organizational cultures of their workplaces [14]-[15], moral narratives may also differ across industry sectors and organizational cultures. The purpose of this study is to understand the various but representative moral narratives of practicing engineers across industry sectors.

III. METHODOLOGY

As our methodological approach, we are utilizing narrative inquiry [3] with elements of ethnographic interviewing [2]. The following sections provide more details about the methodology, elements of the interview protocol, our participant recruitment strategy, and the expected outcomes of the analysis.

A. Narrative Inquiry and Ethnographic Interviewing

Narrative inquiry is a qualitative research methodology whose primary data source consists of in-depth qualitative interviews of individuals. According to McAdams [16], narrative methods provide “tools and concepts for discerning the inner patterning and meaning of human lives” [16, p. 11]. These methods are particularly beneficial for “examining the particularities of the single case” [16, p. 14]. In contrast with other research methodologies, narrative inquiry involves personal storytelling to investigate the lived stories of individuals [17]. Therefore, in narrative inquiry, narrative is both the method and the phenomenon under investigation simultaneously [18]. As the RQ1 of this study aims for understanding engineering practitioners’ moral narratives, we chose narrative inquiry as a primary research methodology. However, since narrative inquiry is primarily a methodology for obtaining narratives from individuals, the results of the analysis will be personal moral narratives. Therefore, once we obtain the personal moral narratives of engineers, we will conduct a meta-analysis of the narratives to construct archetypal moral narratives of engineers.

To answer the RQ2, we will take an ethnographic approach to interviewing. An ethnographic study produces a systematic description of a culture developed through the researcher’s extensive immersion in the culture [17]. While we will not conduct a full ethnography to examine a particular culture, we will utilize the ethnographic interview technique to gather each participant’s perceptions of the culture of their organization and profession. In engineering education research, Buswell [19] took a similar approach to characterize each interview participant as an informant on their own lived experiences. As a further guide for this type of inquiry, Spradley [2] introduced three main types of ethnographic questions: descriptive questions, structural questions, and contrast questions. Descriptive questions enable researchers to collect the informants’ own language and understand significant features of the cultural scene. Structural questions enable researchers to discover the basic units in the informants’ cultural knowledge. Finally, contrast questions enable researchers to discover meaning making among informants as they distinguish events and objects in their world. We will ask all three types of questions in our interviews.

B. Participant Recruitment

We plan to conduct semi-structured interviews with 25 practicing engineers. The interview participants will be purposefully selected from the participants of our previous

survey study [1]. In our previous study, 515 practicing engineers completed a survey that included items from the Big Five Personality Inventory [5], Moral Foundations Questionnaire [9], and Organizational Culture Assessment Instrument [20]. Engineers working in various sectors including automotive, computer/electronics/IT, construction, healthcare, oil and gas/mining, and government participated in the survey. At the end of the survey, we asked whether they would be interested in participating in a follow-up interview. We will contact only participants who agreed to be interviewed.

Since the focus of this study is understanding how individuals experience the culture where they work, rather than understanding an organization’s culture in depth, we will not aim for interviewing 25-50 people from a single organization, which is typical in ethnographic study [21]. Rather, we will interview a few purposefully selected individuals in different sectors that have distinct organizational cultures. For example, according to the preliminary results of our survey study, the organizational culture in government differs greatly from the organizational culture in the computer and electronics industry. When we invite interview participants, we will also try to ensure diversity in their positions and demographic variables (e.g., gender), but the first priority will be on organizational culture.

C. Interview Protocol

Each interview will last about 90 to 120 minutes. After a quick background section, the first half of the interview will follow the ethnographic interview approach [2] to investigate participants’ organizational culture. To better understand their organizational culture, we will also ask some follow-up questions about the participant’s survey response to the organizational culture measure. The second half of the interview will follow the narrative inquiry [3] approach to investigate participants’ stories centered on their moral values as an engineer. The structure of the interview protocol and some example questions are as follows:

1) Section 1: Background

- a) Participant’s 30-second self introduction
- b) Pathway towards current organization and job role

2) Section 2: Organizational culture

- a) Sample descriptive question:
 - Think of a typical day in your company. Could you start at the beginning of a day and describe what goes on? What do you do when you first arrive your workplace, and what do you do next?
- b) Sample structural question:
 - You have described various things you do during a typical day. You do [interviewee’s daily tasks]. Would you say these are all the things you do at [interviewee’s current organization]?
- c) Sample contrast question:
 - I’m interested in the differences between some of your activities. What is the difference between [activity 1] and [activity 2]?
- d) Sample survey follow-up question:

- In the survey, you indicated your organization's dominant characteristic is [interviewee's survey answer]. Could you explain more about that?
- 3) Section 3: Moral narrative
- a) Moral narratives
- As an engineer, what are the important values for you? Throughout your engineering career, how have you developed such values?
 - What are important stories in your field that exemplify ethical engineering practice?
- b) Link to the organizational culture
- How are the important values in your organization related to the stories and the values you pointed out? What effort does your organization make to foster such values?

D. Outcomes of the Analysis

We will conduct a narrative analysis of the interviews. The outcomes of this analysis will be descriptions of each individual's organizational culture and their personal moral narrative, as well as their perceptions of the influence of organizational culture on their moral narrative. A few archetypal moral narratives will be also constructed through a meta-analysis of the personal moral narratives.

IV. EDUCATIONAL IMPLICATIONS

We expect that engineering ethics educators will benefit from the results of this study, namely by helping them better understand the organizational cultures experienced by engineering practitioners across various industries. Engineering ethics educators can also better understand the moral narratives of engineering practitioners across industries and job roles. To illustrate how this understanding can inform improvements in undergraduate engineering ethics education, we plan to design and test a new pedagogy called *Scaffolded Ethics Autobiography (SEA)*. The SEA pedagogy aims to help students shape their own personal moral narrative as an engineer and form their own professional moral identity, informed by the complex landscape of differing engineering moral cultures. We will use the engineering practitioners' personal and archetypal moral narratives that we are collecting in our current study to provide students with an opportunity to reflect on the moral narratives of practicing engineers. The SEA pedagogy is *scaffolded* because students will refer to practitioners' narratives to construct their own narratives.

During the SEA activity, students will first read all of the archetypal moral narratives, and then they will read selected personal moral narratives of engineers based on their preferences. For example, the students could choose personal moral narratives that are aligned with their career plans and values as aspiring professionals. Then students will be asked to answer reflection questions provided by the instructor. For example, what values are emphasized in the narratives? How are those aligned with your own? Students will individually integrate their answers into a personal moral narrative of about 1000 words.

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