Early-Career Engineers' Views on the Ethical Climate of Professional Engineering Workplaces

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Abstract

Understanding the ethical climate of professional engineering workplaces is essential to promoting integrity, accountability, and public trust in the profession. Ethical decision-making is a fundamental aspect of engineering practice; however, there is limited research exploring how engineers experience and define ethical climate within their respective fields using a qualitative analysis approach. This study uses thematic analysis with deductive codes from two widely used frameworks of ethical climate that have been previously utilized in quantitative approaches to studying ethical climate.

This research is part of a decade-long, NSF-funded longitudinal research project focused on understanding how engineering students and early-career professionals view ethics and related concepts, and how those perspectives change over time. For the study described in this paper, our data set came from semi-structured interviews with 29 early-career engineers across diverse industries at a single time point. The interviews covered a wide variety of concepts related to ethics, including ethical situations, moral exemplars, and the ethical climate of interviewees' workplaces.

In our analysis, we used two established ethical climate research frameworks (those of Victor and Cullen [1] and Arnaud [2]) to understand how participants described the ethical climates of their workplaces. From this analysis, several key patterns emerged. The ethical climate was most clearly expressed through the ethical dilemmas and conflicts participants faced, rather than direct descriptions of the workplace's ethical climate. Participants' experiences aligned well with the two ethical climate framework used, showing the robustness of these theoretical foundations when applied with a qualitative approach. Lastly, we observed that the ethical climate of early-career engineers is most directly shaped by their managers and peers. The responses of their coworkers, particularly their managers, when faced with ethical dilemmas in the workplace set the foundation for the ethical climate of the workplace.

Our findings have implications for understanding how ethical dilemmas are addressed within engineering industries by identifying both individual and institutional factors that influence the decision-making within companies and exploring how engineers define and evaluate their ethical climate. Our study also makes a theoretical contribution by applying two frameworks of ethical climate, which have most commonly been used in quantitative measures, to qualitative data from engineering workplaces. This approach reveals the complexities of the various ethical climates faced by early-career engineers in everyday practice. This research contributes to the ongoing effort to build more ethically resilient engineering cultures that safeguard the public and advance the well-being of society.

Introduction

As engineering and tech companies amass resources and societal influence, they also frequently find themselves at the center of ethical mishaps. The ethical climate of a workplace, defined as

the shared perceptions within an organization about appropriate ethical behavior and how ethical issues should be addressed in professional contexts [1], is often central to such ethical situations. Early-career engineers are particularly impacted by the ethical climates of their workplaces due to both their limited experience and lack of familiarity with ethical norms and professional codes.

In this work, we used two existing frameworks of workplace ethical climate (those of Victor and Cullen [1] and Arnaud [2]) to analyze interviews of early-career engineers' perceptions of and experience with the ethical climates of their workplaces. These frameworks have most commonly been used in quantitative analysis of ethical climate. One of the main contributions of this paper is demonstrating the use of these frameworks in qualitative analysis of interview data as a means of gaining a more nuanced understanding of workplace ethical climate.

We begin by giving an overview of prior work on ethical climate and the development of the two ethical climate frameworks used in our study. We then describe our study participants, data collection, and data analysis. We present the results of our work, showing how our data aligned with the two theoretical frameworks from Victor and Cullen [1] and Arnaud [2]. Finally, we discuss the implications of our findings, both as they relate to engineering ethics and research methods to characterize the ethical climates of engineering workplaces.

Conceptual and Theoretical Background

In organizational and engineering contexts, ethical climate has been shown to shape how employees interpret responsibilities, navigate ethical dilemmas, and make decisions that carry implications for safety, quality, and public welfare [3]. Rather than focusing on the character of one individual, ethical climate emphasizes the collective norms, practices, and expectations that influence ethical behavior in the workplace.

Victor and Cullen developed the first widely used framework for studying ethical climate [1]. In their work, they conceptualized ethical climate as a function of two dimensions: ethical criteria and locus of analysis. Ethical criteria describe the dominant moral reasoning applied within an organization – egoism, benevolence, or principle – while locus of analysis refers to the group engaged in the ethical decision-making, ranging from the individual to the organization to society more broadly. Victor and Cullen's framework described five ethical climate types: caring, instrumental, independence, rules, and law and code.

To operationalize this framework, Victor and Cullen developed the Ethical Climate Questionnaire (ECQ), a survey instrument designed to measure employees' perceptions of ethical climate across organizations [1]. The ECQ has been widely used and adopted across a wide variety of workplace contexts, including engineering, healthcare, and business settings [3], [4]. The majority of studies that use the ECQ framework take a quantitative approach to identify dominant ethical climates, examine their prevalence, and explore relationships between ethical climate and other individual and organizational outcomes such as ethical behavior, job satisfaction, and organizational commitment.

Building on the foundation of Victor and Cullen and responding to some of its critics, Arnaud [2] extended ethical climate theory by introducing a four-component model of ethical work climate derived from Rest's 1994 model of ethical decision making [5]. Arnaud conceptualized ethical decision-making as a collective organizational capacity encompassing moral sensitivity, moral judgment (which served as the foundation of Victor and Cullen's work), moral motivation, and moral character. Moral sensitivity is further split into two subcomponents: norms of moral awareness and norms of empathetic concern. Moral judgment is similarly split into a focus on others and focus on self. As a whole, Arnaud's framework and its six subcomponents emphasize how organizations recognize ethical issues, reason about ethical choices, and act on ethical commitments.

Together, the frameworks developed by Victor and Cullen and Arnaud have established ethical climate as a robust and theoretically grounded construct. Quantitative approaches using survey instruments have been effective in identifying collective ethical climates, validating factor structures, and examining correlations between ethical climate and organizational outcomes [3], [6]. However, while these methods provide important insights into what ethical climates exist, they offer more limited insight into how ethical climates are interpreted, negotiated, and experienced by employees in everyday work contexts.

Ethical climate is inherently social and interpretive. Employees do not merely respond to ethical rules or norms; they actively interpret organizational expectations, navigate gray areas, and reconcile conflicts between personal values, professional responsibilities, and organizational priorities [7]. Survey-based instruments, by design, constrain responses to predefined categories, which may obscure ethical tensions, contradictions, or contextual nuances – particularly in engineering environments where ethical decisions often involve trade-offs between safety, cost, schedule, and authority [8].

The present study builds directly on the ethical climate frameworks developed by Victor and Cullen [1] and by Arnaud [2], while addressing a methodological gap in the literature by relying on qualitative data instead of quantitative data. Instead of administering survey instruments, this study translated the survey items developed by Victor and Cullen and Arnaud into open-ended interview prompts, which allowed participants to describe ethical climate in their own terms. As described more in the following section, we then used the survey constructs and definitions from both frameworks to guide the analysis of the semi-structured interviews.

Methods

In 2022 and 2023, our research team interviewed 33 early-career professionals and graduate students, all of whom had studied engineering as undergraduates. This sample was composed of 20 participants who were initially recruited for a longitudinal study of undergraduate engineering students that started in 2015 [9] and 13 newly recruited participants who did not participate longitudinally. The semi-structured interviews were approximately 60-75 minutes in length and included a range of questions related to their perceptions of engineering ethics and social responsibility, experiences they have had with ethics since completing their bachelor's degrees, and the ethical climate and policies of their workplaces or graduate institutions.

For the study described in this paper, we used a subset of 29 interviews, which were conducted with engineering graduates now working in industry or other professional settings. We did not analyze the graduate student interviewees, as our work here is focused on the ethical climates of professional workplaces. More information can be found on the larger study in [10].

Table 1: Demographic information of interview participants gathered from surveys administered prior to the interviews. Blank entries indicate where a participant did not respond to the corresponding survey question.

Pseudonym	**Age**	**Gender Identity**	**Racial/Ethnic Identity**	**Bachelor's Degree**	**Industry Sector**	**Size of Organization**
Bagheera	20	Male	White/Caucasian	Manufacturing Engineering and Technology	Aerospace	> 3001 employees
Bart	26	Male	White/Caucasian	Chemical Eng.	Chemical	> 3001 employees
Beatrice	27	Female	White/Caucasian	Civil Engineering	Construction	51 - 250 employees
Benson	27	Male	White/Caucasian	Chemical Eng.	Oil and Gas	More than 3001 employees
Bosco	27	Male	White/Caucasian	Computer Eng.	Material Handling	1001 - 3000 employees
Braxton	24	Male	White/Caucasian	Computer Science	Utilities	1001 - 3000 employees
Brody	26	Male	White/Caucasian	Manufacturing Eng.	Consumer Goods	> 3001 employees
Cameron	24	Male	Prefer not to answer	Mechanical Eng.		
Carly	25	Female	White/Caucasian	Civil Eng.	Construction	1-50 employees
Chad	24	Male	White/Caucasian	Mechanical Eng.	Aerospace	> 3001 employees
Charlie	20	Male	White/Caucasian	Mechanical Eng.	Military/Defense	> 3001 employees
Cody	24	Male	White/Caucasian	Mechanical Eng.	Oil and Gas	501 - 1000 employees
Penelope	20	Female	White/Caucasian	Biomedical Eng.	Non-profit/NGO	1-50 employees
Penny	24	Female	Asian or Asian American	Electrical Eng.	Computer/ Electronic	> 3001 employees
Petunia	24	Female	White/Caucasian	Industrial and/or Systems Eng.	Machinery Manufacturing	> 3001 employees
Phoebe	25	Female	White/Caucasian	Electrical Eng.	Computer/ Electronic	251 - 500 employees
Sabrina	24	Female	Hispanic or Latino/a	Mechanical Eng.	Oil and Gas	> 3001 employees
Sadie	25	Female	Hispanic or Latino/a	Chemical Eng.	Industrial Gases	> 3001 employees
Samantha	24	Female	White/Caucasian	Electrical Eng.	Government	251 - 500 employees
Santiago	25	Male	Hispanic or Latino/a	Mechanical Eng.	Construction	> 3001 employees
Sarah			White/Caucasian		Medical Devices	> 3001 employees
Sasha	24	Female	White/Caucasian	Mechanical Eng.	Oil and Gas	1001 - 3000 employees
Scott	25	Male	Asian or Asian American	Mechanical Eng.	Chemical	> 3001 employees
Shawn	24	Male	White/Caucasian	Chemical Eng.	Pharmaceuticals	> 3001 employees
Sienna	26	Female	Asian or Asian American, Hispanic or Latino/a, White/ Caucasian	Civil Engineering	Construction	51 - 250 employees
Simon	25	Male	Asian or Asian American	Mechanical Eng.	Information Technology	> 3001 employees
Spencer	24	Male	White/Caucasian	Mechanical Eng.	Construction	1001 - 3000 employees
Stella	25	Female	Asian or Asian American	Mechanical Eng.		
Steven	25	Male	White/Caucasian	Engineering Physics	Energy Storage	251 - 500 employees

Codebook development and coding process

The codebook was developed using the ethical climate frameworks proposed by Victor and Cullen [1] and Arnaud [2]. As stated, both frameworks were operationalized as quantitative measures of ethical climate. Victor and Cullen's measure identifies five types of ethical climates [1]: law and code, caring, instrumentalism, independence, and rules. Arnaud's measure identifies six components and subcomponents of ethical climate [2]: collective moral sensitivity (divided into norms of moral awareness and norms of empathetic concern), collective moral judgment (divided between focus on self and focus on others), collective moral motivation, and collective moral character. The survey items developed from both frameworks were used as the basis for deductive coding of a total of 11 dimensions of ethical climate (five from Victor and Cullen and six from Arnaud). Each interview transcript was coded for these 11 ethical climate constructs. This approach allowed the analysis to remain theoretically grounded while systematically applying established ethical climate definitions to qualitative interview data.

The coding process occurred in multiple stages. First, all interview transcripts were imported into NVivo 12 and subjected to an initial coding pass focused on identifying segments related to participants' workplace experiences. This broad pass ensured that all relevant contextual and experiential data were captured.

In the second round of coding, the deductive codebook was used. During this stage, interview segments related to the ethical climate of the interviewee's workplace were examined to determine whether participants were describing individual-level views of ethics and ethical behavior or collective-level perceptions of ethics. Because this work was focused on ethical climate, we only included the latter in our analysis. If a participant described their personal view of the ethical climate at their workplace (rather than their perception of ethics or ethical behavior), this was not included in the analysis.

Each interview segment related to ethical climate was then coded for alignment with one or more of the 11 dimensions of ethical climate drawn from the two frameworks. This second round was done primarily by the first author, though in consultation with the second author at the start of the coding process and when dealing with an excerpt that was difficult to code. More than one code was applied to an excerpt if the interviewee mentioned more than one of the 11 ethical climate dimensions. A third round of coding, also carried out by the first author, was conducted as a verification pass to ensure completeness and consistency across transcripts and to identify any relevant data segments that may have been missed during earlier coding stages.

Memo development and consensus building

Following the coding process, both authors independently wrote analytic memos for each of the 11 dimensions of ethical climate based on the excerpts that were coded as such. These individual memos were compared and discussed to identify areas of agreement and divergence. Following these discussions, the authors developed consensus memos for each ethical climate dimension, which served as the basis for the results presented in the following section.

Results

We organize our results around the two frameworks of ethical climate that were the focus of our analysis. We present first our findings related to Victor and Cullen's five types of ethical climate [1]: law and code, caring, instrumentalism, independence, and rules. Then, we follow by our findings from the six components and subcomponents of Arnaud's ethical work climate [2]: collective moral sensitivity (divided into norms of moral awareness and norms of empathetic concern), collective moral judgment (divided between focus on self and focus on others), collective moral motivation, and collective moral character. As we discuss further below, we observed extensive overlap between Victor and Cullen's dimension of instrumentalism and Arnaud's subdimension of focus on self; hence, we combine the results from these two codes into a single subsection below.

Law and code

Law and code is defined by Victor and Cullen as the external regulations, legal requirements, and professional standards that govern engineering work, most often imposed by government agencies or professional organizations [1].

Across interviews, participants described strong adherence to law and code within their organizations, particularly when decisions involved public safety or legal liability. For example, Brody described navigating contractual obligations within his team related to a software package which his organization no longer required, but for which they were still under contract. Brody emphasized the importance of honoring existing contracts even when organizational priorities shifted. He explained that when he and his colleagues engaged in conversations about how to minimize financial losses regarding the software, his recommendations were consistently framed around what was legally permissible. Brody stated that if the company chose to discontinue use of one software system, "we would still need to include fulfilling the contractual obligations to the one company." He described attempting to keep decisions "black and white" by either continuing use of the equipment or formally writing it off.

Bart provided several examples of law and code in the context of environmental regulations and hazardous waste compliance. He described routine ethical tensions that arise when working near regulatory limits, noting that while it could be easy to "sweep things under the rug," his role required ensuring full compliance with environmental law. Bart recounted a specific incident in which unusually high chlorine levels were detected in a tanker. Although the issue could have gone unnoticed, Bart and a coworker flagged the discrepancy and worked with compliance teams to verify that permit limits had not been exceeded, reporting the issue when necessary. This example highlights adherence to law and code through deliberate verification and reporting processes tied to external regulatory standards.

One less positive description related to the law and code dimension of ethical climate was described by Chad, who outlined situations in which schedule-driven pressures led clients to request that testing steps be skipped or deferred. Chad explained that while company standards and protocols emphasize safety and quality assurance, engineers are sometimes encouraged to exercise "engineering discretion" to meet delivery timelines. He noted that "both paths are

supported," describing a tension within his organization between strict adherence to established standards and situational flexibility. Chad explained how on "numerous occasions, a program would typically push us for the sake of scheduled time or money." This case highlights an internal ambivalence around law and code in which external standards remain present but are, at times, violated depending on project context and needs. We note that both Bart and Chad's workplace experiences with ethics were used as the bases for the development of two case studies related to professional ethics and early-career engineers, which we describe further in [11].

Overall, law and code emerged as a notable and clearly articulated ethical climate dimension, particularly in situations involving safety, contracts, and regulatory oversight. Participants consistently framed ethical decision-making within their companies in relation to external standards and legal accountability, with most organizations demonstrating strong institutional commitment to complying with laws, engineering professional codes, and government regulations.

Caring

Victor and Cullen defined the caring dimension as an ethical climate that values the well-being of other co-workers and/or work efficiency (two things which sometimes seemed in conflict or distinct from each other as we coded) [1]. Across interviews, caring most often manifested through interpersonal support, concern for colleagues' well-being, and an emphasis on safety and respect. These descriptions overlapped substantially with the Focus on Others code from Arnaud's framework (as revisited below), particularly where that code reflected concern for coworkers rather than society at large.

Cameron exemplified a caring ethical climate when he described his workplace as a place where "everybody seems to really care about each other ... and doing the right thing" and where coworkers are motivated to help one another improve rather than compete in harmful ways. He emphasized a collective orientation toward growth, noting that people seek to "push my team to do the best that they can, so we can all grow together." Similarly, Sabrina summarized her organization's ethical climate by stating that people "care about others and care about the quality of the engines that we produce, as well as just the quality of life of others."

Several participants also explicitly used the language of care when describing their organizations in general. Phoebe characterized her workplace as "a lot more employee-centered ... people seem to care about each other more." She described organizational efforts to foster community, inclusivity, and philanthropy through a culture committee that encouraged employee participation and broader social engagement. Bosco similarly described his company as "very family-like," emphasizing respectful treatment across hierarchical levels and frequent interpersonal interaction between leadership and frontline employees.

A recurring feature of a caring climate was a strong emphasis on safety as an expression of concern for others. Bart described safety as central to ethical decision-making, noting efforts to ensure that work processes "aren't going to do anything that's gonna get anybody hurt or in

danger." Shawn described management practices that encouraged employees to stop work and consult others when uncomfortable, reinforcing a "safety first, quality always" mindset.

Victor and Cullen's definition of a caring ethical climate also emphasizes the employees' commitment to work efficiency. Participants did not explicitly use terms such as "work efficiency" in their interviews, but the idea was still prevalent in describing the ethical climate. For example, Santiago described a situation where he was tasked to design light fixtures but was behind due to the outcome not meeting the safety standards. He was then pressured by his supervisor to "no matter what, we need to jerry rig something to get this light fixture out," despite concerns that the fixture could fail and injure someone. Ultimately, Santiago used his engineering discretion and said no despite his supervisor's response, where his supervisor then reacted and said, "'Aren't you guys engineers? I don't know why we have you here. […] Your job is to do this.'" We can see how the supervisor values work efficiency over the customer's safety in this dilemma.

Instrumentalism

In Victor and Cullen's ethical climate framework, instrumentalism is defined as situations in which organizational decision-making prioritizes benefits to the company, most often related to cost, schedule, profit, or resource efficiency, sometimes at the expense of broader ethical considerations [1].

Several participants explicitly described company cultures in which financial outcomes were implicitly prioritized. Steven summarized this perspective succinctly, stating, "What's important to the company? […] Obviously, money is going to be the number one." Phoebe similarly described her previous workplace as "very cost, like money driven," emphasizing that the culture prioritized financial performance over employee-centered considerations.

Instrumentalism also appeared in more ethically consequential scenarios involving safety trade-offs. For instance, Sabrina described a situation in which her bosses and senior engineer proposed reducing the frequency of "reviewing every engine" to save resources. Although this change would have lowered costs, Sabrina resisted, explaining that skipping reviews increased the risk of missing critical issues that could later cause harm, stating, "we could miss something and cause something to blow up later on." She ultimately advocated for continuing full reviews, stating that she was unwilling to "put my name stamp on that design" if it meant risking safety. Chad used an analogy of a black and white cookie to describe the instrumentalism at play in his aerospace company, which does both military and commercial work. On the white side of the cookie, the company emphasized ethics in order to produce high-quality products for their clients. But on the black half, it discouraged interrogating the industry that they were a part of:

> At work, you're kind of expected to, like, put in all your ethical motivations towards the white side of the cookie, which is like the near term, like, create good work. Like if we're sending a satellite up into space, you only get to launch it once. […] If anything happens, like you're always encouraged to report it versus not saying anything. Because like, creating like a good end result or a good end product that's going to survive launch really involves taking responsibility for a lot of things that you see and or do. […] And there is

> a very uneasy discussion that occasionally happens regarding the end result of some of the work that we do, and that's the dark half of the cookie. […] I would say [those conversations] are only supported if it's in line with the company's beliefs and values and their industry. And any discussion that even like vaguely deviates from the company's morals is typically like shied away from or not talked about.

Chad's company seems to be taking an instrumental stance, holding to ethical behaviors when it serves itself (the white side of the cookie) while minimizing or discouraging ethical perspectives that could hurt its bottom line (such as questioning the company's role in defense applications).

Notably, several participants also described resistance to instrumental behavior, particularly when safety or professional responsibility was at stake. Sasha described a situation in which work was halted rather than rushed when a manufactured component did not meet specifications, explaining that "if you need to shut this down for today… that's just how it is."

In addition to instrumentalism, we decided to incorporate Arnaud's focus on self into this subsection because the two are closely related. Both ethical dimensions capture self-interested behavior; however, instrumentalism provides a broader lens due to also capturing individuals making unethical decisions for the company's gain as well. By contrast, focus on self specifically emphasizes situations where individuals prioritize their own personal convenience, benefit, or interests over their professional responsibilities. As an example of an ethical climate that includes focus on self, Charlie described a dilemma he observed with his co-workers: "I've noticed people start to take off work an extra half hour, hour early type of thing" and "people taking longer lunches." This example reflects an ethical climate where personal convenience is prioritized over professional responsibility – hence, it was coded for both focus on self and instrumentalism.

Independence

In Victor and Cullen's definition, independence refers to the degree to which individuals are able to rely on their own ethical beliefs, professional judgment, and discretion when making decisions in the workplace [1]. Independence appeared in our coding less frequently than other codes, which we believe may be due to the formal guidelines and policies companies put in place to avoid circumstances in which employees need to rely mainly on their own ethical discretion.

Chad, who used the black and white cookie analogy, went on to describe the ethical conflicts he felt working in the defense industry. He explained that, occasionally, "I don't morally agree with the output of my work," particularly that related to weapons development. While he felt unable to refuse assignments outright, he described respectfully requesting alternative work when possible, but noted that, "if you don't morally agree with it, a lot of times, if you say no, it's just a matter of quitting and leaving." Chad emphasized that although individual engineers can choose to walk away, they have limited power to prevent others from carrying out the work. His description of an organizational climate in which discussions of broader ethical implications are discouraged if they deviate from company values suggests that independence is conditionally supported only when aligned with institutional priorities.

In contrast, Shawn described a situation in which an individual's (un)ethical independence manifested as behavior that conflicted with organizational norms. Shawn recounted feeling uncomfortable during meetings in which a production operator made offensive or crude jokes, which had him "cringing the entire time." While Shawn believed the operator did not intend harm, he viewed the behavior as unethical and inappropriate. In this case, a manager intervened publicly, warning the operator to stop or face consequences. This example illustrates how organizational leadership can actively limit individual independence when personal behavior violates shared ethical standards.

Overall, independence emerged as a complex ethical climate dimension. Ethical outcomes often depended on how conflicts between individual values and organizational expectations were managed, with leadership playing a critical role in defining the limits of acceptable independence. It is also important to note that the participants in this study are early-career engineers, which may influence their decision-making in comparison to a more experienced, tenured engineer who has a more developed understanding of organizational norms and practices.

Rules

For Victor and Cullen, a rules-focused ethical climate is one where employees follow company rules and procedures, and which emphasizes "going by the book" [1]. In alignment with Victor and Cullen's work, we coded under the rules dimension of ethical climate when the interviewee emphasized procedures and rules internal to the company. By comparison, we coded for the law and code ethical climate when the interviewee referenced rules or standards set by entities external to the company (e.g., government regulators, ethical codes, etc.). Despite this distinction, these codes have many similarities, as company procedures often align with legal requirements and external regulations.

The rules code was one of the more prevalent ones across interviews. As may be expected, one of the places where employees were most impacted by a company's internal guidelines was in formal statements put out by the company, such as codes of conduct or value statements. However, the interviewees reported a spectrum of how effective such statements were in tangibly impacting the ethical climate of the workplace. As an example of a company where a formal statement was viewed as impactful, Petunia talked about how one of her company's slogans helped prevent unethical behavior when employees were faced with a cost-saving project that had to be dropped because it couldn't secure approval from environmental regulators:

> If someone was under that pressure, you know, they've been working on it for three years, it's a million dollars, how'd they, how'd they skip that? […] I think a lot of it has to do with the culture, probably, of where I work. […] One of our slogans is, "Do the right thing always." So like, that's really just kind of ingrained as part of, as part of that.

But more commonly, when interviewees acknowledged that their company had stated values or missions, they could not recall many of the specifics of the statements or documents. For example, Bosco admitted that his company's code of conduct had a very limited impact on his

daily work, saying, “They have a code of conduct. And I read it when I started my onboarding training. And I won't lie, I haven't read it since. So I couldn't tell you the specifics.”

Safety was also frequently included in mentions of internal procedures and rules. For example, Bart referenced a shift in his company’s climate towards emphasizing safety, saying, “The company is very, trying very hard to shift toward a […] safer perspective. So you can kind of see the contrast, and you can see the new safety elements coming out and the new pushes for safety.”

One interesting theme that came up repeatedly was related to the challenges of ensuring that contractors or external partners were aware of and followed the company’s internal rules. For example, Sadie explained:

> So the company that I work at definitely enforces safety as our number one priority over sales over profits. So if it takes time to just, you know, review that document one more time, then, that is more important than, than anything else. Also, in the field, it, we work with different people in the field, all from different various of experience. So, we also work with contractors, and contractors might not necessarily know the company's rules on, on or like standards of safety. So it's important when you're in the field, and you see someone not doing what they're supposed to do to just approach them and let them know look, like, maybe this was acceptable in other jobs, but here, we don't accept that.

In summary, the rules dimension of ethical climate frequently surfaced when interviewees described how company slogans influence daily work, the policies and conduct governing day-to-day tasks, and company safety guidelines, which was the most recurring theme in this ethical climate dimension.

Collective moral sensitivity – Norms of moral awareness

Shifting to Arnaud’s framework, moral awareness (a subcomponent of collective moral sensitivity) is conceptualized as noticing or being aware of ethical issues [2]. One representative example of an ethical climate that features moral awareness came from Brody:

> We have a product that we've had to redesign to meet a specific government regulation. And it deals with safety. So that's like, generically, what's going on. Now, when they did the initial build for this particular product, they found that there was an issue that could cause a very dangerous failure in the product. […] They kind of put a band-aid fix on it. And myself and a couple other engineers were like, you know, this is not a good idea. Like we're putting this product in people's homes. And it's something that, you know, everybody's going to use almost every day. […] The engineer that's driving it from the plant here really pushed back on it, and got some headway there. And I think she did the right thing and saying, you know, this is a product that families are going to use in their home, we have to absolutely make certain that we are meeting that government regulation, and that we're not causing any other collateral damage by redesigning the product in this way.

Here, Brody described an ethical climate in which a portion of his coworkers were very attentive to the impacts of their work and advocated for addressing what they perceived to be an ethical issue. Similarly, Cody's description of his company's stakeholder analysis processes also shows a systematic commitment to moral awareness within his organization:

> I'm not usually involved in the planning stage yet. But I know for the planning stage, they do have an entire section where they go over all the stakeholders involved, you know, the customers, you know, people who might live nearby, of course, the environment, they don't want them—they want to make sure that they're not to bringing in toxic materials or chemicals, or they're disposing of them properly. [...] As far as I know, not actually being involved in those meetings at this point in time, they make sure to go through all of the people who might be impacted by our construction in our work. They make sure to try to make things work out for everybody, I guess.

Two interviewees mentioned the role of group-based ethics reviews or meetings, which we interpreted as a clear demonstration of an institutional commitment to moral awareness. For example, Sadie described monthly team meetings to discuss safety that happen across her company: "In my group, we have these monthly meetings where our manager brings it up, this is everything that occurred in the field, and then they give us like a PowerPoint presentation that goes into more detail. So, we have that information readily available instead of having to look for it."

Moral awareness was also often referenced as an explanation for grave ethical failures. For instance, Sadie talked about the challenges of working with contractors who lack the same moral awareness as her workplace, which led to an object being dropped from an elevation platform and hitting a person on the head. In a similar example, Santiago described a grave safety incident at a supplier's plant, but one that he likewise felt showed a lack of moral awareness within his own company:

> Half of the engineers that I currently work with are from another country where I think they, I don't know, if they fear getting fired, or if it's, it's something, but they usually work much longer than people in the United States. […] There was an incident not too long ago, where a person fell in a vat of molten steel at […] one of their suppliers that they have to make the forge metal. […] They were saying that it wasn't them that did this, it was a supplier that did this, that they weren't up to code. But I still believe that it should have been my company, that should have taken some responsibility into saying, we're trying to – we will make this better or do something [so] that it never would have happened in the first place. […] Sometimes companies do exploit people or, or use those tactics of, of having subsidiary or something else take the blame.

Overall, these examples indicate how moral awareness operates as an important part of ethical climate as colleagues set an example for early-career engineers to recognize ethical issues in their daily work. Across interviews, moral awareness appeared through stakeholder reviews, safety meetings, and regulatory discussions. At the same time, our interviews also included examples of contractors and suppliers demonstrating a lack moral awareness through neglect of safety measures and unclear accountability. This ethical dimension helps explain how ethical

climate influences whether engineers and organizations actively recognize the ethical dilemmas occurring in their daily practices.

Collective moral sensitivity – Norms of empathetic concern

In Arnaud's framework, empathetic concern is the second subcomponent of moral sensitivity [2]. She defines empathetic concern as "evaluating the consequences of […] actions in terms of how they affect others and who would be affected by them" (p. 348). In her quantitative measure of ethical work climate, Arnaud used words such as "sympathize [with someone]" and "feel pity [for someone]" to identify empathetic concern.

As one example of empathetic concern, Santiago described a coworker noticing and standing up for him when he was unfairly removed from his office assignment:

> Um, he would, he would see when something was going wrong with me. So it was, I had an office in that company, and they kicked me out when they needed to bring in someone else. Then he basically saw like, 'Oh, you've been working here for a year. You're an engineer. […] They're not treating you right by kicking you out and putting you in a room with someone else.' So yeah, he basically, yeah, he did that, he stood up for other people.

Of all the codes we investigated from both Arnaud and Victor and Cullen, empathetic concern was coded the least frequently, only appearing in two interviews (out of 29). It was the least coded of the 11 dimensions of ethical climate that we investigated from Arnaud and Victor and Cullen. It's also interesting to note that in both instances where we did code for empathetic concern, the subject of the concern was the interviewee (meaning, they were reporting on a situation where a colleague was showing empathy for them). We wonder whether, in workplaces where empathy is already relatively rare, these early-career engineers were most attuned to empathy when they were on the receiving end.

Collective moral judgment – Focus on others

Arnaud's definition of focus on others, a subcomponent of collective moral judgment, includes valuing the outcomes for two distinct "others": society and other employees of the organization [2]. Frequently, interviewees would touch on both when they summarized the ethical climate of their organization. For example, Benson said, "We talk about lots of different facets of ethical behavior, especially safety, very large, safety culture. And when I say that, I mean, like workplace safety, but also […] since we operate large plants with, with hazardous conditions, safety of our workers, and our communities."

As Benson exemplifies, safety-related concerns were frequently featured in codes of focus on others. Another common theme was an ethical climate that prioritized supporting and valuing coworkers, such as when Bosco described his workplace as:

> They emphasize caring for our customers, and they do kind of pride themselves on like a very family-like company. So just treating each other like family and not really 'some

> people being higher than others,' you know. Of course there's a hierarchy, but, but just treating everyone as, you know, as human beings and, and respectfully, no matter where they are on this hierarchy.

Interviewees also frequently stressed the importance of responding to specific stakeholders' needs, including investors, interns at the company, or end users. (We note here that in Arnaud's framework, the only groups identified are the company/workplace and society, with stakeholders such as customers and investors all falling under this latter category.) For example, Shawn talked about the need to mitigate potential risks or harms to the user of the product he was working on:

> [For employees here,] the first question they ask themselves, okay, if […] this problem happened, how does it affect the patient? If there's-what's the risk to the patient? How can we minimize it? Or how can we show that the risk is minimal? […] Because that's, that's who we serve. […] For someone who exemplifies moral character, […] there's one person I'm thinking of where that's the that's the first thing they always ask.

The other collective moral judgment subcomponent, focus on self, was included in the discussion of Victor and Cullen's instrumentalism dimension above.

Collective moral motivation

Arnaud defines moral motivation as, "the degree to which ethical values dominate other potential values (e.g., power values or economic values) in a particular situation" [2, p. 348]. In many of the instances where this code was used in our data, ethical values were in conflict with economic values, manifested in instances where the employees feared losing their job if they took an ethical stance that ran counter to the company's interests, or where a team was facing budgetary or timeline constraints. For example, Shawn described what sometimes happened in his workplace when an important product was in a time-critical production phase:

> I work for, like, on the [PRODUCT NAME] line, which has very, very high demand at the moment. So […] sometimes it's difficult for management and everyone to balance, like, stopping the line, for safety reasons to, "Oh, shoot, we have to get product out the door, to make sure that we don't short the market for whatever, like whoever needs this." So it is, there are some times where […] the rules are bent a little bit. But for the most part, *they're, I don't think they're broken, they're more just bent*. (emphasis added)

In applying this code, we often saw how company structures, such as team roles and management structures, influenced an individual early-career engineer's perspective of their workplace's moral motivation. For example, Bagheera, a manufacturing engineer, described times when his group had to decide whether to accept hardware that is defective, and how there is a "scrap budget" which sets a maximum target for how much they can scrap each year due to defects. He explained that there were different players in these conversations (quality engineers, manufacturing engineers, and their managers, among others) who each had a role to play as they made decisions in a situation that he described as "a check and balance." Bagheera spoke positively of this dynamic and how it helped them back decisions about which parts to accept and which to scrap: "It's not stressful, it's kind of just almost a method of […] ensuring we're

making the correct decision as a team. So I guess it's more of a, an exercise than, than a moral debate." Bagheera believes that his company's internal structures (e.g. the different roles that make up their team) allow them to navigate the tension that sometimes arises when ethical and economic values are in conflict.

Collective moral character

From Arnaud's definition and measure, an ethical climate of *moral character* is based on people's confidence to act, take charge, take responsibility, or be in control when faced with an ethical situation [2]. Participants often identified examples of moral character within their organization, ranging from colleagues they worked with side by side to higher-ups and supervisors. For example, Charlie identified a coworker he viewed as a moral exemplar due to his ethical reliability and confidence. He described the individual as "very responsible" and "uncompromising… in his morals," explaining that when the coworker was confident in his technical knowledge, he would "draw the line in the sand and not cross it." This confidence in ethical boundaries – paired with technical competence – was repeatedly emphasized as a defining feature of moral character.

As another example of collective moral character, Braxton highlighted his manager's ethical transparency with customers, nothing that he would not "let something unfinished go out", and if it did, he would clearly explain that it was "a partial solution" rather than "trying to sneak anything by or get them to pay for something that they're not actually receiving." Braxton characterized this behavior as "an excellent example … of a professional, ethical person."

Across interviews, moral character was consistently associated with participants perceiving their colleagues to demonstrate ethical confidence, fairness, transparency, and a demonstrated willingness to act in ways that protect others. Rather than abstract moral principles, participants grounded moral character in everyday workplace practices, such as refusing shortcuts, advocating for safety, supporting coworkers, and maintaining integrity in interactions with customers, clients, and the public.

Discussion and Conclusion

In this work, we applied two frameworks of workplace ethical climate [1], [2], which are most frequently employed in quantitative studies, to analyze of qualitative interview data of early-career engineers. Our data supported both frameworks, demonstrating their effectiveness for qualitative analysis. In the section below, we describe the implications of our study for other researchers who might be interested in using qualitative approaches to studying ethical climate. We also highlight what our findings contribute to broader research into how engineering professionals, particularly those who are early in their careers, understand and experience ethics in their workplaces.

In our work, we found that participants' description of the ethical climate of their workplace was richest in their answers to the interview question, "Describe an experience you've had with professional ethics since you graduated with your bachelor's degree," rather than their responses to, "How would you describe the ethical climate at your workplace?" In the latter case,

participants responded very generally when asked directly about the ethical climate of their workplace. In comparison, when asked about ethical dilemmas they faced in professional settings, they answered with rich examples and real-life situations they face on a day-to-day basis. Ethical climate emerged indirectly through stories, not researcher-provided labels.

These narrative responses also revealed that ethical climate is most visible in a workplace when values are in conflict, not when norms are aligned. As interviewees described the decisions they or their coworkers faced when issues of safety, financial pressures, or schedule came into tension, the values of the workplaces became visible. In these moments, participants described how dilemmas are situated and negotiated and which values were ultimately prioritized. This suggests that ethical climate is shaped when norms are tested through everyday engineering decisions.

Our data showed that in these moments of conflict, ethical climate is enacted locally through day-to-day managerial responses. Early-career engineers frequently described how their managers or team leads set boundaries, stopped unsafe work, or escalated issues. For early-career engineers, management's responses to ethical situations were frequently cited as the source for establishing the ethical climate of the workplace.

Further, it seems that formal ethics training and ethics statements were not as impactful in shaping the perceptions that early-career engineers have about their workplaces. Participants were vague and general when asked about their training and statements of their organization, and their responses revealed little about how the ethical climate operated in practice. This finding, combined with our prior point about the ways that managers impact the ethical climate of a workplace, suggests that ethics trainings for managers may end up indirectly influencing the ethical behavior and perceptions of early-career engineers more than individual trainings do.

One of the objectives of this study was to demonstrate the utility (or lack thereof) of applying Victor and Cullen's and Arnaud's frameworks to qualitative data [1], [2]. We found the frameworks to be very effective in analyzing our interview data. Although participants rarely used the language of the frameworks themselves, nearly all workplace situations that were described in the interviews fit into at least one dimension of the ethical climate frameworks. There were also instances where both frameworks overlapped and blended together, for example Victor and Cullen's caring and instrumental with Arnaud's focus on others and moral motivation, respectively. At the same time, there were cases where one framework did not fully capture an ethical dimension, while the other framework did. The combination of the two allowed for minimal gaps during the coding process. These findings provide qualitative support for the validity of both frameworks while also illustrating how ethical climate dimensions may coexist in practice.

Finally, our findings highlight the value of a qualitative approach for studying ethical climate, making important contributions to the existing body of literature that uses Arnaud's and Victor and Cullen's frameworks. Our qualitative approach revealed insight into how ethical climate is experienced, interpreted, and enacted in engineering practice. We were able to see how participants were able to navigate through conflict, disagreements, and ethical reasoning in ways that would be difficult to capture through fixed survey questionaries. This study demonstrates

how a qualitative approach provides nuanced insights into the ethical processes that emerge in everyday engineering work, a finding confirmed by other work from this project [12], [13].

Limitations

There were four graduate students in our study, but they were not included in our research due to the focus being on professional engineering workplaces. We surmise that the ethical climate of graduate school is shaped primarily by research advisors and fellow students, which is different from the scope of our study. Future work could explore how ethical climate differs between academic and professional engineering contexts. Additionally, a longitudinal study could explore how engineers' perceptions of ethical climate develop over time, as early-career engineers grow into more experienced engineers and become familiar with workplace norms, expectations, and ethical decision-making practices. Lastly, quantitative data were collected utilizing surveys on the same participants. Future research could synthesize these results with the qualitative data to analyze whether participants' survey responses align with, differ from, or further complicate the themes identified in the interview data.

One challenge we faced when coding the transcripts was differentiating between the interviewees' individual traits related to ethics and the collective traits of their workplaces. There were instances when participants described ethical dilemmas they faced individually in their day-to-day work, which we decided to not include in our analysis because our focus was on the collective ethical climate of the workplace is. In the coding of our data, we differentiated collective approaches to ethics from individual views held by the interviewees by looking for mentions of other colleagues being involved, the ethical beliefs of coworkers, and descriptions of how others behaved. However, we at times found it challenging to separate the interviewees' individual beliefs from their experiences of the ethical climates of their workplaces. One way to address this in future studies could include altering the interview protocol to explicitly include questions that probe for group interactions and dilemmas faced by others in the company.

Acknowledgements

This material is based upon work supported by the National Science Foundation under Grant nos. 2024301 and 2130924. Any opinions, findings, and conclusions or recommendations expressed in these materials are those of the authors and do not necessarily reflect the views of the National Science Foundation. We also thank Lazlo Stepback and Brent Jesiek for their detailed feedback on our manuscript.

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