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Engineers and AI: A Comparative Analysis of Attitudes, Emotions, and Policies Related to AI Use in the Workforce

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Abstract

As conversations around artificial intelligence (AI) in the workforce expand globally, it is increasingly important to understand engineers' attitudes and emotions toward the rise of AI in engineering practice. While there are growing calls for increased AI workforce development in the United States, many engineering systems in the US currently lack clear policy or guidance around AI use, whereas the European Union (EU) and the United Kingdom (UK) are actively shaping AI governance through comprehensive frameworks that balance technological advancement with ethical considerations and public safety, such as the EU AI Act. This study seeks to understand current US practicing engineers' emotions and attitudes toward AI while exploring the thematic areas covered in AI policy in the EU and UK, with the goal of informing future guidance, training, and policy development for AI in US engineering contexts.

The research was conducted in two phases. In Phase 1, exploratory qualitative interviews with 23 practicing engineers across various disciplines in the US were analyzed using the control-value theory which suggests that emotions arise when individuals appraise an activity or outcome as personally important (value) and feel either in control or out of control of it, with lack of control often leading to negative emotions like fear [1], [2] to uncover engineers' emotions and attitudes around AI use. Phase 2 consisted of a document analysis using qualitative coding techniques [3], [4] of AI policies in engineering education and practice in the US, EU, and UK, identifying the thematic areas in which AI policies are addressing governance, training, and practical applications.

Findings from Phase 1 reveal that early-career engineers in the US navigate mixed signals from organizational and environmental contexts, negotiate conflicting values around AI, and experience mixed emotions shaped by the absence of formal guidance. Participants reported both curiosity and optimism about AI's benefits, such as efficiency and data analysis, while simultaneously expressing concerns about overreliance, security risks, ethical implications, and environmental impacts. As a result, they adopt a selective and cautious approach to AI use, often worrying that others may misuse these tools or over depend on them. Phase 2 presents a comparative analysis of AI policy in the EU and UK, highlighting major policy categories including regulatory approach and institutional design, risk management and safety, accountability, governance and oversight, transparency, and fairness and fundamental human rights. Together, these findings underscore the interplay between individual attitudes, emotions, and behaviors and broader institutional and regulatory frameworks, providing insight into how AI adoption and responsible use can be supported in engineering education and professional practice.

This work has implications for US engineering education and practice by highlighting the need for clear guidance, structured training, and informed policy development to support AI integration, while identifying the thematic areas where such clarity is most needed. Understanding engineers' attitudes and emotions toward AI, alongside international policy

frameworks, can help policymakers, educators, and engineering leaders foster positive perceptions of AI, promote workforce readiness, and build public trust in AI-driven engineering systems. It is our hope that these findings will spark discussion around the development of US guidance and policy that promotes safe, ethical, and effective use of AI in engineering practice and education.

Introduction

Artificial intelligence (AI) is rapidly reshaping engineering practice, yet engineers' preparedness to engage with these tools responsibly remains inconsistent. In the United States (US), national calls to expand an AI-ready workforce emphasize technical skill development and innovation capacity, but comparatively little attention has been paid to how practicing engineers perceive, emotionally respond to, and navigate AI use in the absence of clear organizational or professional guidance. Emotions can strongly influence whether engineers adopt, avoid, or misuse these AI tools [1]. Many early-career engineers are already engaging with AI in the workplace with little to no formal education or training to guide appropriate and ethical use.

Recent federal efforts, such as *America's AI Action Plan* [5], call for continuously evaluating AI's impact on the labor market and rapidly retraining workers to thrive in an AI-driven economy. However, these high-level initiatives offer limited concrete guidance for engineers, engineering organizations, and education. This resulting "AI policy vacuum" in the US, particularly within engineering education and practice, likely contributes to confusion about when, how, and whether AI should be used responsibly [6].

In contrast, global approaches to AI governance differ markedly. The European Union (EU) has developed a comprehensive policy framework that explicitly address AI risk, accountability, workforce development, education, and sector-specific applications, including critical infrastructure, while the United Kingdom (UK) has a pro-innovative but principle-based approach. These policy regimes provide a useful contrast for examining how governance structures may shape engineers' confidence, trust, and sense of control when working with AI.

To better inform engineering education and prepare future engineers for work in the age of AI, it is critical to understand how recent engineering graduates and early-career professionals are experiencing AI and how they feel about its use in practice. This two-phase study first examines US practicing engineers' attitudes and emotions toward AI use and then compares these findings with the thematic priorities embedded in AI policy frameworks in the EU and UK. By connecting US early-career engineers lived experiences with international policy approaches, this work aims to inform future guidance, education, and policy development that supports safe, ethical, and effective AI integration in US engineering education and practice.

Literature Review

Attitudes and AI

Attitudes, whether positive or negative, toward new technologies such as AI play a critical role in shaping individuals' intentions and behaviors, including the adoption and use of AI [7]. Although research on attitudes toward AI in engineering practice and education remains a relatively new and emerging area of scholarship, existing studies are beginning to provide initial insights into how such attitudes are formed and what factors influence them. In engineering contexts, students', practitioners', and educators' attitudes toward AI vary widely, ranging from positive perceptions of AI's potential to provide useful feedback and enhance efficiency, to more critical or negative attitudes characterized by skepticism and ethical concerns [8], [9] . These concerns include issues related to information security, hallucinations, skill atrophy, reduced academic integrity, job displacement, diminished human-to-human interaction, and potential impacts on learning autonomy, critical thinking, and agency [9], [10], [11]. Given that critical thinking and design competence are central to engineering practice and education, fostering informed, reflective, and critical attitudes toward AI is essential.

Emotions and AI

Similar to attitudes toward new technologies, emotions represent a more affective dimension of individuals' responses that is deeply interconnected with beliefs and perceptions and plays a significant role in shaping behaviors. Emotions are commonly understood as complex intrapersonal phenomena involving interconnected physiological, neurological, and cognitive changes within individuals' minds and bodies [12]. Scholars have argued that emotions in engineering education remain highly understudied, despite being deeply intertwined with individuals' experiences in engineering learning and practice, and have called for more intentional and theoretically grounded approaches to studying emotions in this context [12]. Emotions therefore play an important yet often underexamined role in shaping how engineers and engineering students engage with AI. Emotional responses such as curiosity, excitement, joy, and a sense of ease, as well as anxiety, frustration, and fear, can influence trust in AI systems, willingness to experiment with AI tools, and perceptions of AI's reliability and appropriateness for engineering tasks. In engineering education, positive emotions may support exploration and learning by lowering barriers to experimentation, whereas negative emotions, such as anxiety related to errors, loss of control, or ethical implications, may hinder adoption or contribute to overreliance, avoidance, or dishonest reporting of use of AI tools. As engineering practice increasingly involves human-AI collaboration, understanding and addressing emotional dimensions alongside cognitive and technical factors is essential for fostering responsible, reflective, and effective use of AI in both educational and professional engineering contexts.

Recent work highlights the impact of these emotional dynamics. In a study examining students' engagement with generative AI, students reported experiencing ethical discomfort, with ambiguity in institutional policies and concerns about the fairness of AI-detection tools identified as key triggers of negative emotional responses toward AI use [13].

AI Policy in the US

While attitudes and emotions shape how individuals engage with AI at personal and interpersonal levels, these responses are also shaped by the US policy environment, including federal and state actions, agency guidance, and evolving expectations for responsible AI use. Institutional and policy contexts play a critical role in framing how AI is understood, taught, governed, and used within engineering education and practice. AI-related policies influence not only what forms of AI use are permitted or restricted but also how individuals interpret the ethical, professional, and academic implications of engaging with AI technologies. Ambiguity or inconsistency in policy guidance can contribute to uncertainty, ethical discomfort, and anxiety, whereas clear, context-sensitive policies may support more confident, responsible, and transparent use of AI [13].

At the national level, the US currently implements *America's AI Action Plan*, a strategic framework designed to maintain and expand national leadership in AI. The plan is organized around three main pillars: (1) *Accelerating AI innovation*, by reducing regulatory barriers, promoting research and open-source models, and encouraging workforce skill development, often through a trial-and-error "try-first" approach; (2) *Building American AI infrastructure*, including streamlining permitting for data centers, semiconductor facilities, and energy systems, while enhancing computing and cybersecurity capacity, though the plan gives limited attention to sustainability or socio-environmental impacts; and (3) *Leading in international AI diplomacy and security*, by shaping global standards and countering strategic competitors [5]. Overall, the plan emphasizes deregulation to accelerate adoption, expanded access to computing and datasets, and fostering conditions for innovation, while seeking alignment among federal policy, industry, and national security objectives.

Within the US engineering industry, policies in organizations vary widely. Some government engineering agencies report strict "No AI" policies, where AI use is simply prohibited on company devices. In contrast, many engineering firms have adopted internal AI governance policies to ensure regulatory compliance, safety, and quality control in AI-assisted design, predictive maintenance, autonomous systems, or generative design. These policies often reflect a combination of federal guidance, client requirements, and sector-specific standards. Other private-sector organizations may offer minimal AI training or internal terms of use, typically limited to securing proprietary data, without detailed guidance on appropriate or ethical use.

In the context of engineering education, professional and accreditation standards increasingly emphasize responsible AI use. ABET is encouraging accredited programs to teach AI ethics, human-AI collaboration, and risk management as part of the curriculum. ABET criteria now highlight the need for students to understand professional and ethical responsibilities, which include navigating AI technologies in engineering practice [14]. Universities and engineering programs are beginning to implement AI use guidelines for students and faculty, covering acceptable use of generative AI for assignments, academic integrity, plagiarism detection, data privacy, and transparency in AI-assisted projects. For example, one institution's AI policy for students emphasizes developing AI literacy, avoiding plagiarism, recognizing potential biases, and acknowledging that AI can misinform. Instructors are encouraged to establish their own AI policies aligned with course and department specific syllabus guidelines, ensuring students understand expectations and boundaries for AI use [11].

While some guidance exists for AI use in the US, engineering practice, and engineering education, much of it remains vague or contradictory. National initiatives promote broader AI adoption, yet industry and education often lag in formal policy development and training. Meanwhile, media coverage and public discourse amplify concerns regarding AI ethics, fairness, and accountability. Understanding AI policy in these contexts and its impact on attitudes and emotions toward AI adoption is essential for advancing ethical and responsible AI use in engineering and education in the US. To achieve national goals and prepare engineers for professional practice, it is critical to examine how attitudes, emotions, and regulatory or institutional structures interact, shaping individual behaviors, adoption patterns, and engagement with AI.

Responsible AI Use in the US

Across the United States, expectations for responsible AI use are evolving from broad principles to operational governance, especially in high impact contexts where AI can affect rights, safety, or access to services. Federal guidance has increasingly emphasized that organizations should be able to explain why an AI system is being used, document and test it appropriately, monitor it over time, and assign clear accountability for its outcomes, rather than treating AI as a purely technical add on [15]. In practice, many organizations are aligning to risk management approaches that stress lifecycle thinking and trustworthiness characteristics (for example, validity, reliability, robustness, transparency, and accountability), with the NIST AI Risk Management Framework and its generative AI profile serving as common reference points even when adoption is formally voluntary [16]. Expectations are also being reinforced through government implementation mechanisms such as agency AI use case inventories and acquisition guidance that push teams to identify higher risk uses, apply safeguards, and be transparent about how AI is used [17]. At the same time, the policy signal has remained dynamic as executive actions shift priorities, including recent moves that revoke or reorient earlier federal AI directives while still calling for a national approach to AI leadership and governance [18].

AI Policy in the EU and UK

While policy in the US emphasizes accelerating AI innovation, infrastructure development, and global competitiveness, with a relatively light-touch regulatory framework, the landscape of AI policy in other regions often takes a more precautionary and rights-focused approach. In particular, the European Union (EU) has developed a regulatory framework that prioritizes safety, transparency, and accountability, with more oversight of AI systems, including in educational and engineering contexts. The UK falls between the US and EU by emphasizing pro-innovation while also explicating sector-specific governance. Comparing these approaches provides insight into how different policy models shape organizational practices, professional ethics, and individuals' attitudes and emotions toward AI adoption, highlighting the broader interplay between regulation, trust, and responsible use in engineering and education.

This section of the literature review compares AI policy between the EU and the UK, identifies their differences, and examines their implications for the engineering workplace and engineering education.

The European Union AI Act is the first comprehensive framework for the regulation of AI and is based on the risk level, imposing regulatory requirements and guidelines according to the degree of threats to security and human rights. The levels of risk are classified as unacceptable (prohibited), high (regulated), limited (light regulation), and minimal (unregulated). A risk-based approach helps to avoid regulating the uses of AI that pose little risk and ensures some flexibility. Additionally, the EU AI Act provides an online compliance checker tool that can assist organizations in determining whether the EU AI Act applies to their AI systems and in identifying the obligations they need to fulfil.

Under the EU AI Act, workplace-relevant AI systems, such as those deployed in critical infrastructure (e.g., transportation), vocational training, employment and worker management systems, public and private services, migration and asylum, are classified as high risk. The applications of AI in these categories can lead to endangerment of human lives, consequences for education and career paths (such as evaluating learning outcomes and grading), decision-making that impacts work-related decisions, discrimination, and human rights infringement.

Therefore, the core regulatory concepts in the EU AI framework, such as transparency (documents stating the characteristics, capabilities, limitations, and associated risk of AI use), human oversight, data governance, and risk management, require that providers and deployers of high-risk AI systems meet obligations that cut across these concepts [19]. While the EU AI policy's strength lies in setting a global benchmark for AI regulation, the risk classification may be subjective and difficult to enforce consistently, and the effects of non-compliance might undermine AI innovation in Europe [20], [21].

AI growth has been prioritized since the UK's exit from the European Union [22]. The UK approach to AI regulation is laid out in the "A pro-innovation approach to AI regulation" policy paper (2023) and the follow-up "A pro-innovation approach to AI regulation: government response to consultation" (2024). The UK government's AI policy deploys a pro-innovation strategy and principle-based regulatory approach that is based on sector regulation as opposed to cross-cutting AI regulation. The absence of cross-cutting AI regulation leads to uncertainty that can disrupt business and consumer confidence in AI and stifle innovation [23].

AI governance in the UK is handled by different regulators within their respective jurisdiction, such as the Financial Conduct Authority (FCA), the Information Commissioner's Office (ICO), and the Medicines and Healthcare Products Regulatory Agency (MHRA) [23]. With various regulators being responsible for overseeing AI applications and having significant influence, the non-statutory guidelines of the UK AI principles, e.g., transparency, fairness, accountability and governance, contestability and redress, and the absence of comprehensive legislation compared to the EU AI Act, could lead to a lack of oversight across industries.

In all, the EU AI policy framework provides a legally binding and uniform level of protection, while the UK AI regulatory framework focuses on flexibility by leveraging regulators who understand the risks in their sectors. Taking all this together, limited attention has been paid to integrating these three separate bodies: AI governance, workplace emotional experience, and engineering education, thereby indicating a research gap for further studies. This intersection provides the basis for this study, as the emotional experiences in AI-mediated workplace environments might inform the preparation of future engineers and help current engineers feel secure, motivated, and have a sense of belonging.

Connecting Engineering Education and Practice

Distinct AI policies generate varied implications for the engineering workplace and can lead to diverse employee experiences, especially when AI systems are deployed. A recent bibliometric and systematic review [24] found that AI can improve efficiency and engagement, while potentially increasing job stress and insecurity. Thus, in the context of EU and UK regulatory approaches to ensuring transparency, disclosure, accountability, and workers' protection, it is crucial that engineers be informed about the use of AI systems in the workplace to protect their rights and well-being.

Although the EU and UK AI frameworks are not directly targeted at engineering education, the impact of AI deployment shapes workplaces where engineering students are expected to work after their graduation. In a study on navigating the AI ethics frontier: a cross-national comparison of AI policy documents for developing responsible AI workforce, the authors extended their research on how the differences and similarities in AI policies can be used to integrate AI ethics into curriculum and teach these to future engineers, in order to prepare them for the challenges of AI application [25]. This work highlighted that engineering ethics education must make explicit the ethical issues associated with AI (e.g., bias mitigation, transparency, privacy, accountability, and risk management), and the need for students to develop policy literacy, which can be accomplished through familiarization with the technological policy process, policy simulation exercises and interaction with stakeholders to address practical issues with AI governance. Also, it was recommended that AI ethics education should incorporate interdisciplinary projects integrating computer science, law, philosophy, and social science to groom Engineers for ethical AI leadership and to understand the societal, legal, and ethical issues associated with AI systems [25].

Conceptual Framework

Control-Value Theory

The Control-Value Theory (CVT) proposes that emotions arise when individuals evaluate an activity or its outcomes in terms of personal significance (value) and their perceived ability to influence it (control) [1], [2], [26]. A widely used framework in educational psychology, CVT explains how students' achievement emotions, such as enjoyment, pride, anxiety, or frustration, are shaped by these two core appraisals. Control appraisals refer to the extent to which learners believe they can influence outcomes or succeed at a task. High perceived control generally fosters positive emotions, whereas low control can produce anxiety, hopelessness, or other negative feelings. Value appraisals reflect how important or meaningful a task or outcome is to the individual. Highly valued tasks can amplify positive emotions like pride and hope when control is high but may also intensify negative emotions such as anxiety or shame when control is low [1], [2]. CVT further highlights that these emotions are not merely responses, they actively shape motivation, self-regulated learning, and performance, creating feedback loops in which emotions influence engagement and learning outcomes [26]. The theory distinguishes between activity-related emotions, experienced during the learning process, and outcome-related emotions, experienced in response to success or failure.

In the context of this study, the CVT provides a useful lens for understanding how early-career engineers' emotional responses to AI tools are shaped by their perceptions of control and value. By linking these appraisals to activity-related emotions (i.e., the emotions that surface in response to using AI within their current context of engineering organizations in the US under US policies), CVT helps explain how emotional experiences influence learning behavior, engagement, and adoption of AI in engineering education.

Research Questions

1. What are early-career engineers' attitudes and emotions around AI use in the engineering workplace in the US?
2. What are the thematic areas addressed in AI policies in engineering education and practice in the US, EU, and UK?

Methods

Phase 1 - Qualitative Analysis - Emotions around AI and AI Policy in Engineering Industry in the US

This study is part of a broader longitudinal narrative inquiry exploring the professional development of early-career engineers in the US [27]. This research examines the attitudes and emotions that early-career engineers feel and experience in regard to using AI in engineering work. A qualitative design [3], [4] was employed to capture participants' experiences in depth and within their sociocultural contexts, allowing insight into the perspectives and practices of both mentees and their mentors .

Data Collection

Data collection involved interviews with early-career engineers about their experiences and emotions around AI in engineering and engineering education. Following IRB approval, semi-structured interviews and reflective journaling exercises were conducted. Early-career participants were recruited through the research team's professional networks and were within 0–5 years post-graduation with a bachelor's degree in engineering. Participants represented diverse disciplines and identities, with demographic information self-disclosed during interviews; participant information can be found in table 1. All interviews were conducted by the first author, an early-career engineer, who disclosed her positionality to foster trust. Participants were all asked questions like *"What kinds of conversations or discussions about AI take place at your workplace?"* and *"What attitudes or feelings do you have toward AI in your engineering work?"* Follow-up prompts were guided by a semi-structured protocol, allowing the interviewer to explore topics in greater depth based on participants' responses resulting in many nuanced discussions amongst participants. Data collection and analysis occurred simultaneously, and the researchers concluded that data collection was complete once data saturation was met.

Table 1. Early Career Practicing Engineers Interviewed in the US

Early- Career Engineers Participant Information					
Participant Pseudonym	Race	Gender	Industry Position	Sector	Time in Industry
Alice	White	Woman	Environmental Engineer	Private	3 years
Brittany	Black	Woman	Civil Engineer	Private	3 years
Caddy	White	Woman	Civil Engineer	Private	4 years
Cheryal	Black	Woman	Biomedical Engineer	Private	3 years
China	Black	Woman	Civil Engineer	Private	2 years
Clara	Black	Woman	Software Engineer	Private	2 years
Coffee	White	Woman	Biomedical Engineer	Private	2.5 years
Elle	White	Woman	Civil Engineer	Private	3 years

Early- Career Engineers Participant Information					
Grace	South Asian	Woman	Civil Engineer	Public	2.5 years
Kasey	White	Woman	Aerospace Engineer	Private	0.25 years
Kaylee	White	Woman	Aerospace Engineer	Private	0.25 years
Kelsey	White	Woman	Civil Engineer	Private	3 years
Kim	Asian/ White	Woman	Aerospace Engineer	Private	4 years
Sandy	Black	Woman	Civil Engineer	Private	2.5 years
Steve	White/ Latino	Man	Software Engineer	Government	1 year
Strawberry	Black	Woman	Biomedical Engineer	Private	3 years
Susan	Black/ Latina	Woman	Biomedical Engineer	Private	0.75 years
Sunflower	White	Woman	Civil Engineer	Private	2 years
Mary	Black	Woman	Biomedical Engineer	Private	1.3 years
Mango	Black	Woman	Algorithms Engineer	Private	4 years
Persimmon	Not disclosed	Woman	Biomedical Engineer	Private	5 years
Valerie	White/ Latina	Woman	Civil Engineer	Private	1.5 years
Xavier	Black	Man	Software Engineer	Private	1.75 years

Data Analysis

The interview transcripts were analyzed using thematic analysis [3], [28]. This process involved multiple readings of the transcripts to ensure accuracy, build familiarity with the data, and identify preliminary patterns, while analytic memos [29] were written to capture emerging insights, reflections, and interpretations throughout the analysis. The data was coded using a CVT as a lens to help categorize the data. Following initial and focused coding, excerpts were systematically organized and compared using a cutting-and-sorting approach [30] to construct categories within the CVT framework, and develop themes addressing the first research question.

Phase 2 - Document Analysis of UK and EU AI Policy

The second phase employed a qualitative document analysis to examine how policy texts from the EU and the UK shape the governance and regulation of AI. Document analysis is a systematic procedure for evaluating print or electronic documents [31] and helps identify and induce meaning from policy texts. Document analysis uses content and thematic analysis to identify categories and themes related to the research question [31]. This approach can be used along with other qualitative research methods as a means of triangulation [32]. In this study, document analysis is combined with thematic analysis of interviews to understand both personal experiences and policy contexts related to AI to more holistically develop insights and implications for engineering education and practice. For this analysis, the document corpus consists of the EU AI Act [33] and the UK pro-innovation approach to AI regulation [34]. These documents serve as the official sources that set out the AI governance approach in the EU and UK, respectively. The process began with iterative readings of the policy texts to gain familiarity with the documents. Next, inductive coding was used to note salient concepts to serve as emergent categories. Once the categories were determined, the documents were read again, and content analysis was used to understand how each document related to the categories. The content between the documents was then compared to understand similarities and differences between the EU and UK. This process was led by one researcher. The documents and categories were then shared with a second researcher for peer debriefing to support the trustworthiness and reliability of the analysis [35]. From this process, the final categorized themes were: regulatory approach and institutional design; risk and safety management; accountability, governance, and oversight; transparency and explainability; fairness and fundamental human rights; contestability, redress, and liability; and innovation. These categories are defined in the findings section and compared between the EU and UK.

Positionality

We recognize that in qualitative research, meaning is co-constructed through interactions between researchers and participants, and interpretations are shaped by researchers' identities, experiences, and social locations [36]. To support transparency, we engaged in reflexive practice by explicitly acknowledging our positionalities and considering how these perspectives influence data collection, analysis, and interpretation. Here we share our positionality statements for transparency in author order.

I, Elizabeth Volpe, identify as a White woman and am a Postdoc in civil engineering. My worldview has been shaped by my experiences as an early-career engineer in both the civil engineering industry and academia in the US. I approach emerging technologies with curiosity and openness, motivated by a genuine interest in their potential to improve lives. At the same time, I feel a strong sense of responsibility to ensure that the engineering profession remains ethical, safe, and grounded in human values. For me, engineering is not only a technical practice but a human one, where the consequences of decisions extend beyond systems and algorithms to real people. I believe that the most meaningful engineering decisions are made when logic is balanced with emotion, and when empathy is treated as a strength rather than a limitation. Keeping humans at the center of engineering decisions is central to how I understand my role as an engineer.

I, Denise R Simmons, identify as an African American woman and am a civil engineer by training, as well as a workforce development scholar and thought leader. My professional lens has been shaped by experience in both the engineering industry and academia in the US, particularly through sustained engagement with engineering professional formation and career transitions. Over the past 15 years, I have mentored engineers from their undergraduate education through early and mid-career professional practice. I recognize that my professional experiences and research orientation may shape what I attend to in the data and how I interpret participants' experiences, and I remain reflexive about these influences throughout the research process.

I, Madeline Polmear, am a lecturer (assistant professor) in engineering education in the UK. Before the UK, I lived and worked in Belgium and the US. Having professional experience in the UK, EU, and US shaped my interest in comparative research and my understanding of policy in each of these contexts. My research specialization in engineering ethics education and emotion in engineering education influenced my approach to this work and particularly the lens through which I interpreted the data and developed the implications.

I, Damilola Ojo, am a PhD student in the UK with a background in Electrical Engineering. Through my education and work experience in system design, control, and end-user support, especially in M365 administration and IT network support, I gained firsthand insights into how technical glitches disrupt workflow in organizations and a systematic approach to their resolution. My interest in this research is shaped by my technical experiences in workplace environments having lived and worked in different cultural backgrounds, especially Nigeria and Republic of Korea, as well as my current research on emotions in engineering education, which has enabled me to recognize the emotional aspects of engineering work and learning and how the integration or adoption of AI systems could impact them.

Findings

Phase 1 - Emotions around AI and AI Policy in Engineering Industry in the US

In response to the first research question, *'What are early-career engineers' attitudes and emotions around AI use in the engineering workplace in the US?'* We present the following themes to describe the attitudes and emotions around AI use in the engineering workplace in the US as described by the early-career engineers in this study. Viewed through control-value theory, early-career engineers' emotional responses to AI reflect tensions between its perceived importance for efficiency and innovation and limited feelings of control due to organizational, ethical, and safety constraints, resulting in cautious engagement characterized by curiosity, uncertainty, and ethical and safety concerns.

In the context of US engineering workplaces, the early-career engineers in this study did not have strong opinions about AI on its own. Instead, how they feel about AI was largely shaped by their workplace rules, professional norms, and the risks tied to their work. All engineers in this study expressed mixed feelings about AI, reporting neither uniformly positive nor negative emotions, but rather a combination of attitudes toward its use in engineering practice. Commonly engineers felt unsure, cautious, or conflicted, around the use of AI in engineering practice resulting in them choosing to use AI in limited and careful ways. In Figure 1, we depict how the US-based early-career engineers in this study experience and use AI in the workplace. We then outline in detail each of the four themes, describing the thematic findings of engineers' emotions, attitudes, values, and AI use, with a focus on how US engineers currently experience AI in their workplaces.

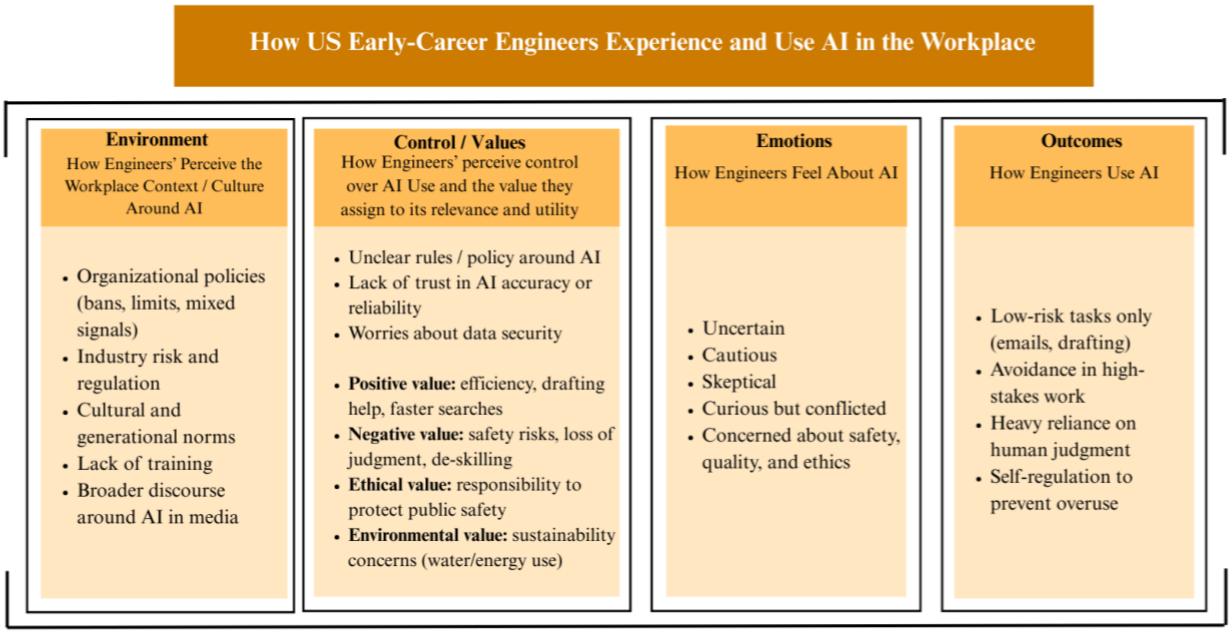

Figure 1. How US Early-Career Engineers Experience and Use AI in the Workplace

Theme 1: Early-Career Engineers Receive Mixed-Signals from Organizational and Environmental Contexts on AI Use

Early-career engineers' perceptions of AI were strongly shaped by organizational policies, industry norms, and broader cultural signals. Many workplaces either restricted or prohibited AI use entirely or sent mixed messages about when and how it was appropriate. These restrictions were often tied to industry-specific risks and US regulatory requirements, particularly in government, biomedical, and safety-critical sectors. Cultural and generational norms also influenced attitudes, with older engineers often expressing skepticism or resistance toward AI. Compounding these factors, most participants reported limited or no formal training in AI, leaving them uncertain about appropriate or responsible use.

One participant, Sunflower, shared that although she knew many engineers using AI, her company generally discouraged its use. She explained, "They discourage new people from using it because they don't want you to become a ChatGPT warrior." This comment highlights the mixed signals participants experienced: while national and industry-level initiatives encourage broader AI adoption, her organization sent a more cautious message, even as individuals continued to use AI tools informally. Similarly, Steve, a software engineer at a US government organization, shared

> Within the government, there isn't explicit training on how to use AI. They do tell you that you can't use it with classified information, and you wouldn't even be able to access that on unclassified systems. They teach you how to keep information safe in general, and you're expected to use those same practices. But in terms of AI, the government is very 'old-headed' and not very modern. There's a lot of pushback from older people…There's still an icky feeling towards it with the older generation.

Here Steve reflected that in this government context, engineers received minimal AI-specific training and had to rely on general data security practices, and navigate a cautious, tradition-oriented culture, where older colleagues often expressed skepticism or discomfort toward AI, creating mixed signals for adoption and use.

In addition to navigating mixed signals from their organizations and national AI policies regarding AI use, most participants reported having little to no formal AI training during their engineering education to draw from. Nearly all our participants reflected on a desire for more guidance and understanding of AI and its appropriate use in engineering contexts. For example, one participant, Alice, suggested that AI education should be mandatory for engineering students, but immediately recognized the current gaps in curricula, asking, "Do they even have AI classes?"

Theme 2: Early-Career Engineers are Negotiating Conflicting Values around AI: Balancing Benefits and Risks

Early-career engineers recognized both the potential benefits and risks of AI, but in the absence of formal guidance or training, control over AI use was often left to individual judgment. Unclear workplace rules and policies, combined with limited trust in AI's accuracy and concerns about data security, contributed to uncertainty. At the same time, engineers acknowledged AI's value in increasing efficiency and supporting low-risk tasks, while weighing these benefits against safety, ethical, and environmental considerations.

Many participants acknowledged the value of AI in improving quality and efficiency in engineering work yet also expressed personal concerns and feelings of unease or guilt regarding AI use. Xavier shared, *"*AI is very scary, but it also kind of stinks at a lot of things… you need humans for that." Xavier highlights that AI overreliance scares him since it doesn't perform as well as humans in all areas. Alice noted environmental implications, stating, "It takes a lot of water to power AI… that's a big thing for me," highlighting that environmental impact was a concern for some participants. The use of AI and the impact AI data centers had on the environment had some participants feeling guilty around AI use. Sandy, a civil engineer, emphasized professional responsibility, saying, "We have a responsibility as engineers to make sure we are keeping people safe." For Sandy, the value of safety in the built environment was paramount, and she expressed anxiety about how AI might affect engineering practice and public well-being if it at all sacrifices the safety of our designs.

Another participant, Strawberry, a biomedical engineer, shared how she was negotiating these conflicting values around AI. When asked about her feelings toward AI in engineering, Strawberry shared,

> I see both benefits and concerns. I have a STEM background, but I care a lot about communication. Translating your thoughts into something understandable is a skill, and I worry that relying on AI could weaken that muscle. Privacy is another concern. We work in a confidential field, and we need to understand where information goes when we put it into AI systems. When it comes to skills, I think keeping up is important. Every new technology causes moral panic. We saw that with cameras and social media. The issue with social media was that there wasn't regulation early on. With AI, we should learn

> from those lessons and anticipate potential harms now. We won't see all the impacts immediately, but we can think ahead about how to prevent things from becoming harmful.

Here, Strawberry highlights the value she placed on skill development, maintenance, and effective communication, expressing concern that overreliance on AI could undermine these competencies. She also emphasizes privacy as a key value in the US medical industry, noting that AI may pose risks to this principle. Strawberry further observes that the absence of external controls can create anxiety or panic, and expresses a desire for proactive, harm-prevention-focused regulation rather than reactive approaches. She draws on historical examples, such as the rollout of the internet and other technologies that adopted a "try-first" approach and led to significant harm, suggesting that lessons from these cases could inform strategies to prevent potential negative consequences of AI. Strawberry further compared negotiating conflicting values around AI to her experiences with social media. She noted that, in some cases, social media can connect people and foster positive interactions, while in other cases, it can cause harm through exclusion, cyberbullying, or even more serious consequences, highlighting the complexity of weighing benefits against potential risks when determining appropriate use.

Together, these insights illustrate how early-career engineers in the US must constantly navigate the tension between leveraging AI's benefits and striving for the advancement of the nation, and managing its ethical, societal, safety, and environmental risks, often without clear guidance or formal training.

Theme 3: Early-Career Engineers have Mixed Emotions Around AI Arising from Conflicting Values and Lack of Guidance

Resulting from mixed signals in organizational and environmental contexts and the need to negotiate conflicting values around AI, the early-career engineers in this study expressed mixed emotions toward AI. Participants described a combination of interest, curiosity, caution, and skepticism. While some felt positive emotions about AI's potential benefits, such as interest in making routine tasks faster, more efficient, or analyzing large amounts of data quickly, many expressed uncertainty about its reliability, ethical implications, and appropriate use. These concerns often manifested as ambivalence, skepticism, or even guilt, influenced by considerations of safety, quality, professional judgment, and environmental impact.

Brittany, a civil engineer, described this duality: "I'm kind of anti-AI personally, but it would be interesting to see how that could get incorporated into our programs." Similarly, Kelsey, an environmental engineer, expressed interest in AI for reducing human effort and supporting environmental protection: "There's people that do storm condition assessments where they have to watch hours of videos looking for damage in pipes. And, they're hoping AI can help with that." While excited about AI's potential to improve efficiency and prevent environmental harm, Kelsey and others also voiced concerns about the environmental costs of AI, such as the resources consumed by data centers. Kaylee highlighted these concerns,

> From what I hear, it's taking up way too much water, like one search is *really, really, really* depleting our water sources. It's having really harmful emissions, especially in the

> towns where these big data centers are. And that's going to have really harmful effects on human health.

Similarly, Alice, an environmental engineer, described a tension between workplace encouragement and personal concerns:

> AI is talked about in a more positive sense [at my company]. In our work, they say to use it. I do know the environmental impact of it, it takes a lot of water to power AI. That’s something that, whenever I go to use AI, which I don’t that often, honestly, I think about how much water is being used. That’s a big thing for me. My company supports it and finds it to be a good tool. In some instances, I feel like it is. But overall, if you can do a standard Google search, or look in a manual to find a size, or even have someone help you draft an email or proofread it, I feel like that’s better than using AI. I think about the environmental impact of AI, and I guess keeping an understanding of what it does.

Alice’s reflection illustrates that, even in workplaces where AI is generally viewed positively and encouraged, early-career engineers may experience guilt and concern, particularly around environmental impacts. She also expressed a desire for more knowledge about AI’s capabilities and guidance on when it is most appropriate to use it versus other tools, reflecting the broader tension between curiosity and caution in the adoption of AI in engineering contexts.

The early-career engineers in this study expressed mixed and sometimes conflicting feelings about AI, which stemmed from conflicting values and a lack of formal guidance. Participants recognized AI’s potential to improve efficiency and support routine tasks, but they also worried about its ethical and environmental implications. Many reflected on tensions such as: ‘If I don’t use it, will I be left behind?’ and concerns that using it might harm the environment, make them look bad, or limit their ability to develop skills naturally. These ambivalent emotions highlight the challenges engineers face in navigating AI adoption without clear organizational or educational guidance.

Theme 4: US Early Career Engineers’ Practice Selective and Cautious Use of AI, but Worry Others May Not

Early-career engineers primarily used AI for low-risk tasks such as drafting emails or conducting searches, while avoiding high-stakes or safety-critical work. They emphasized human judgment, relied on team input when uncertainty was high, and engaged in self-regulation to prevent overreliance on AI. However, some early-career engineers in this study expressed concern that if the future engineers over relied on AI and did not have deep understanding of how to apply it ethically to their work, it may result in overuse and major errors in engineering practice.

Many early career engineers in this study reflected on attempting to limit their reliance and use of AI. China shared, “I’m trying also like not to rely on AI so much, and still relying on my team more so”. China reflected that in her work she sought out guidance more so from her coworkers and experts in her field than AI, indicating limited use of AI, Similarly, Sandy shared,

> I look at AI through the lens of responsible use. How do we use these tools while making sure the work we produce is high quality and that confidential client information stays protected? We also need to think about plagiarism, human judgment, and not using tools

> blindly. We may not have all the answers yet, but responsibility plays a big role, especially because engineers have a responsibility to keep people safe.

Sandy shared that she was cautious in her use of AI and emphasized viewing AI through the lens of responsible use, balancing efficiency with quality, data protection, ethical considerations, and professional responsibility to ensure safety and sound judgment.

While the participants in this study reflected the ways in which they took precautionary measures when engaging with AI, some expressed a fear that others may misuse or overly on AI as a tool and lack fundamental skills hindering the future of the engineering profession. Xavier, a computer engineer shared,

> Our team, we're early adopters. There's a lot of optimism. There have been a lot of policy shifts around AI at our company very recently. And things are still changing because new technologies are coming out. It's recommended by the company and by the organization […] Right now my workflow with AI is pretty good… I mainly use it for documentation and debugging.
>
> My personal concern is just like really somebody who relies on it too much. I've heard stories… actually, one story in particular where somebody made an app with AI and had something to do with sensitive information. I can't remember the exact type of app that they were making, but since it had access to the sensitive information. It needed security, and they wrote it all with AI. And then within 10 hours it got broken into by multiple people […] I don't think it's good for thinking in place of a human just because it's not really thinking. You know, it's just aggregating information from a bunch of different sources, trying to figure out what you want to hear.
>
> I appreciate AI as a tool, because I do like it...it's very good, and I think it will do a lot of good for human society, but I think [going to college before AI and learning the fundamentals] gave me a really good foundation. I already know how to do all this stuff without the tools. And I think that's a good policy, mandatory labels, for when AI is used… mandatory education on the foundations before using AI as a tool.

Here, Xavier describes a combination of optimism and caution. He notes receiving mixed signals, while his company's policies toward AI are generally positive and encouraging, they are also frequently changing. Xavier expresses generally positive emotions toward using AI but highlights concerns about overreliance, potential security risks, and the need for foundational training, and he emphasizes a desire for more responsible policies to guide AI use in the future.

Phase 2 - Document Analysis of UK and EU AI Policy - Categories / Thematic Findings

The findings across the comparative analysis are highlighted in table 2, along with implications for engineering workplace and engineering education. The categories are shown and defined in the first column.

Table 2. Comparative Document Analysis of EU AI Act and UK AI policy

CATEGORIES	EU AI ACT	UK AI POLICY	ENGINEERING WORKPLACE / EDUCATION IMPLICATIONS
Regulatory Approach and Institutional Design (This shows how AI governance is structured within the policy framework and the allocation of actors, regulators, or institutions, responsible for the coordination, deployment, and oversight of AI systems)	• Risk-based approach • Uniform and legally binding framework for the providers and deployers • Coordination of implementation through the European Artificial Intelligence Board and enforcement of compliance by the designated competent national authorities across member states • Non-compliance attracts a fine of 7% annual turnover or 35 million euros	• Principle-based and pro-innovation framework • Non-statutory • Implementation carried out by regulators within their respective domains	• The need for regulatory and compliance training • Professional judgement is crucial to interpret the AI governance context in the absence of a single AI law
Risk Management and Safety (This addresses risk identification in the provision and deployment of AI, and measures to mitigate its associated harm to users and organizations)	• Risks classification into high (regulated), limited (light regulation), minimal (unregulated), and unacceptable (banned) • A regular procedure to address the high-risk AI systems throughout their lifespan, and with the obligated responsibilities on the deployers • Mitigation of high-risk AI systems through the provision of the quality and applicability of data employed, technical documentation, testing, monitoring, and assessment of residual risk acceptability	• No formal risk classification, but awareness of AI risk into societal harms, misuse risks, and autonomous risks • Centralized risk assessment to support sector-led regulators to identify, measure, and monitor present and future AI risk	• Incorporation of risk and safety considerations into engineering design and problem-solving • The need for training in risk, safety and regulatory literacy pertinent to AI-enabled engineering practice
Accountability, Governance & Oversight (This involves the actors that are responsible for how AI systems are to be deployed,	• Accountability is defined within the value chains of AI through binding obligations for providers and deployers • Designated national authorities engage in formal supervisory oversight	• Interpretation of AI principles, response to risk, monitoring of AI use, guidance issuance, and measures to prevent risks and human oversight are regulators' duties • Organizations deploying AI are to manage their own risks in	• Engineers are to make technical decisions in compliance with existing frameworks • Fostering engineering education with professional responsibility and governance awareness

supervised, and the mechanisms for compliance or enforcement)	• Compulsory post-market monitoring	line with regulators' expectations.	
Transparency and Explainability (Defined as providing clear guidance to understand the use of AI systems, along with disclosure of AI use)	• Technical documentation and record keeping for high-risk AI systems • The right for individuals to obtain clear and meaningful AI-driven decisions that impact them	• Disclosure on when and how algorithmic tools are used • Clarification of AI results, effects, and limitations	• Necessity for engineers to provide clear instructions and guidance in the design and deployment of AI systems
Fairness and Fundamental Human Rights (This is put in place as a protection against human bias and discrimination that arises from the outcome of the use of AI)	• High-risk AI systems are identified via their potential violations, such as bias and discrimination against humans • Prohibition of certain AI practices that alter behavior	• Emphasis on the avoidance of harmful or discriminatory outcomes via context-specific regulations • Principle-led, with reliance on existing human rights law	• Inclusion of human rights-informed knowledge along with technical skills in engineering education and the workplace
Contestability, Redress, and Liability (This is to challenge the outcome of AI decisions that impact users or organizations, and the pathway to seek remedies and determine who to be held legally accountable for AI-related damages across the AI value chain)	• Providers and deployers are held liable for harms and non-compliance • Protection for whistleblowers for violation reports • Legal support for raising complaints and compensation against damages	• No concession on liability allocation across providers and deployers • Dependence on existing routes to contestability and redress	• Engineers are to develop AI systems which can be reviewed, questioned and audited • The need for Engineers to maintain AI system decisions that are traceable and can support the investigation process in a legal case • Engineering education should train engineers to understand the liability issue regarding the use of AI technology, either as a provider or deployer
Innovation (The provision of structures that give room for AI systems deployment to foster innovation)	• Binding, risk-based regulations that provide legal certainty to foster innovation • Enabled through AI sandboxes to facilitate testing and development under strict oversight • Lower conformity assessment fees for Small and Medium Enterprises, and start-ups	• Adaptive principles to prevent premature legislation to give priority to innovations • Flexible and non-statutory sandboxes • Public support funding	• The need for Engineers to innovate in regulatory guidelines that are flexible or restricted

The analysis outlined in Table 2 indicates that the EU AI Act and UK AI policy diverge in their approaches. The EU AI Act is based on the principle of binding regulation, characterized by risk classifications and the obligations imposed on deployers and providers across the AI value chain, while also facilitating innovations through controlled mechanisms such as AI sandboxes. In contrast, the UK AI policy is non-statutory, allowing flexibility through the regulator's discretion. This supports openness and innovation, although it is not framed by legal certainty and is non-uniform. These policies have implications for the providers and deployers of AI systems, and consequently, for the engineering design and implementation processes that underpin these technologies. Therefore, this underscores the need for professional and regulatory competencies among engineers, and a responsive set of technical standards that must reflect and support them.

Discussion

This study highlights that early-career engineers in the US are navigating a complex and often contradictory AI landscape, characterized by mixed signals from organizations, national policies, and professional norms, combined with limited formal training. Our findings suggest that if US engineers are to use AI responsibly, develop positive emotions, and build confidence in its applications, there is a need for clearer, more explicit policies at multiple levels (e.g., organizational, sectoral, and national). The comparative analysis of AI policy in the EU and UK provides a useful reference, demonstrating structured approaches that emphasize regulation, accountability, safety, transparency, and fairness, which may guide policy development in US engineering contexts.

The emotional responses reported by participants, curiosity tempered by concern, guilt, or skepticism, highlight the interplay between values, perceived control, and guidance, echoing frameworks like Control-Value Theory [2] that link emotions to engagement and learning. Participants often expressed “AI guilt” [37] over the environmental impacts of AI or concern that their peers may misuse AI, reflecting ethical tensions in the absence of clear guidance. These findings point to the need for policies that not only outline acceptable use but also support professional judgment, ethical reasoning, and environmental responsibility. Recent literature on AI guilt among students suggests that feelings of guilt often stem from concerns about perceived laziness, threats to authenticity, fear of judgment from instructors or peers, and challenges to identity and self-efficacy. This work highlights the critical role of clear ethical guidelines and structured educational support in helping students navigate the complexities of AI use in educational contexts. By clarifying appropriate use and reinforcing learning-centered goals, such guidance may reduce feelings of guilt while supporting confidence, integrity, and positive learning outcomes [38].

This work poses several critical questions for the engineering community to consider: how can AI policy balance flexibility and innovation with risk management? Should AI policies be legally binding, or serve as general frameworks to guide behavior? How might sector-specific or professional engineering organization policies complement broader national strategies? Considering the variation in US approaches versus the EU and UK, there is an opportunity to explore hybrid models that provide clear guardrails while supporting experimentation and learning.

For engineering education, these findings suggest the need to integrate AI literacy, ethics, and hands-on training into curricula to prepare engineers for responsible AI use in professional practice. These findings align with recent literature emphasizing the importance of integrating ethical awareness of AI into engineering education [39]. Other research indicates that students often experience mixed feelings about AI: while many are excited about its possibilities, most express significant concerns about the ethical and societal implications of AI deployment [40]. Findings from other studies note that discussions of ethical issues related to AI and other emerging technologies are frequently absent from engineering curricula, highlighting a clear need for programs to incorporate comprehensive instruction in ethics, public responsibility, and avenues for reporting concerns, ensuring that future engineers are equipped to address the novel dilemmas posed by AI [40]. Early exposure to structured guidance, along with discussion of ethical dilemmas and real-world trade-offs, may help reduce anxiety, foster positive attitudes, and support informed decision-making.

Limitations and Future Work

This work is exploratory by nature and has several limitations. First, participants reflected on their experiences over extended periods, which may introduce recall bias. Additionally, the study relied on self-reported emotions and AI use, which are inherently subject to personal interpretation and bias. The primary aim was not to explore the nuanced relationship between specific emotions and particular policies or engineering disciplines, but rather to provide a broad overview of common feelings and perceptions among early-career engineers navigating a landscape of varying AI policies. Emotion and policy are rarely examined together in engineering education and practice, and this work does not attempt to provide a comprehensive framework for integrating the two. Emotions are deeply sociocultural and context-dependent, shaping not only how individuals feel but also how they interpret guidance and act within institutional and professional settings. Because emotions are not experienced in isolation, the limited attention to contextual variation may constrain how these ideas are applied. Future research could investigate emotions and reactions to AI policies in greater depth, potentially examining how these experiences differ across engineering disciplines, organizational contexts, and national or cultural settings. Comparative studies across sectors or international contexts could provide insight into how institutional and policy environments shape engineers' emotional responses and AI-related decision-making, offering more targeted guidance for training, policy design, and responsible AI adoption in engineering practice.

Additionally, this paper does not empirically examine emotional responses or internal conflicts that may arise when individuals seek guidance on responsible technology or AI use. While policy is discussed as a mechanism for explicitly guiding behavior, particularly in engineering education and professional practice, specific policies, such as emerging acceptable-use guidelines from professional organizations, are not analyzed in depth. Future work should continue to examine how policies shape emotional responses, adoption behaviors, and perceptions of professional responsibility across engineering disciplines, organizations, and international contexts.

Finally, although the concepts of cognitive and affective responsibility are introduced in relation to AI, their implications are not fully developed. Cognitive responsibility raises questions of judgment, accountability, and reliance on AI systems, while affective responsibility highlights how emotions shape trust, uncertainty, and engagement. This paper acknowledges their interconnectedness but does not resolve how policy might address both dimensions simultaneously. Rather than offering definitive conclusions, this work aims to open dialogue and spark new ways of thinking about the intertwined roles of emotion and policy in shaping responsible engineering and AI use.

Implications

This work has implications for both engineering education and engineering practice, particularly as AI becomes increasingly embedded in professional decision-making. By foregrounding the relationship between policy, emotion, and responsibility, this paper aims to spark discussion around the role of AI policy in shaping ethical and responsible engineering behavior. Just as engineering codes of ethics guide professional conduct, AI-related policies have the potential to serve as shared reference points that support judgment, accountability, and trust.

For engineering education, these findings suggest the need to more intentionally align curricular approaches to AI use with the realities of engineering practice. Without clear and context-aware guidance, students and educators may struggle to navigate acceptable and responsible AI use, leading to uncertainty or inconsistent norms. Integrating policy discussions into engineering education can help prepare students to engage critically with AI tools while recognizing both cognitive and affective dimensions of responsibility. Another implication for engineering education is the opportunity to relate these findings to the way that ethics are taught. Engineering ethics education most commonly relies on codes or rules and case studies to introduce ethical issues and professional norms to engineering students [41]. However, this approach has limitations since cases are often presented as black and white issues with a clear solution or large-scale disasters that are difficult for students to relate to. The findings in this data show that emerging technologies, such as AI-based tools, present ethical considerations and conflicting values in engineers' day-to-day work with no clear solution. Furthermore, this study demonstrates the emotional side of engineers' decision-making that goes beyond the rationalist approach that is common in engineering ethics education [42]. Given the role of emotion in early-career engineers' use of AI and conflicting values regarding its role in the workplace, it is instructive to consider how engineering students can be effectively prepared to navigate these situations. The intentional integration of emotion in ethics case studies [42] and pedagogy that emphasizes conflicting values [43] can broaden engineering ethics education to include relevant challenges that early-career engineers face.

For engineering practice, the implications point toward the value of developing explicit, adaptable AI policies that acknowledge not only technical risk but also human experience. Policies that recognize how engineers think and feel when using AI may better support ethical decision-making and professional integrity. Overall, this work highlights the importance of aligning AI policy across education and practice to foster a shared understanding of responsible engineering in an evolving technological landscape.

Conclusions

This study highlights how engineers' attitudes and emotions toward AI are closely shaped by the presence, or absence, of clear policy and guidance. By pairing US engineers lived experiences with a comparative analysis of EU and UK AI policies, this work underscores the importance of aligning engineering education, professional practice, and governance to support responsible AI use. Together, these findings point to the need for clearer guidance and dialogue in engineering industry and education to ensure AI integration in engineering remains ethical, transparent, and responsible.

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