AI Ethics: Software Practitioners’ and Lawmakers’ Points of View

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Abstract

Despite their commonly accepted usefulness, Artificial Intelligence (AI) technologies are concerned with ethical unreliability. Various guidelines, principles, and regulatory frameworks are designed to ensure that AI technologies bring ethical well-being. However, the implications of AI ethics principles and guidelines are still being debated. To further explore the significance of AI ethics principles and relevant challenges, we conducted an empirical survey of 99 AI practitioners and lawmakers from twenty countries across five continents. Study findings confirm that \textit{transparency}, \textit{accountability}, and \textit{privacy} are the most critical AI ethics principles. On the other hand, \textit{lack of ethical knowledge}, \textit{no legal frameworks}, and \textit{lacking monitoring bodies} are found the most common AI ethics challenges. The impact analysis of the challenges across AI ethics principles reveals that \textit{conflict in practice} is a highly severe challenge. Our findings stimulate further
research, epically empowering existing capability maturity models to support the quality assessment of ethics-aware AI systems.

1 Introduction

Artificial Intelligence (AI) becomes necessary across a vast array of industries including health, manufacturing, agriculture, and banking [1]. AI technologies have the potential to substantially transform society and offer various societal benefits, which are expected to happen from high-level productivity and efficiency. In line with this, the ethical guidelines presented by the European commission expert group on AI highlights that (AI HLEG) [2]:

“AI is not an end in itself, but rather a promising means to increase human flourishing, thereby enhancing individual and societal well-being and the common good, as well as bringing progress and innovation.”

However, the promising benefits of AI technologies have been considered with worries that the complex and opaque systems might bring more social harm than good [1]. People start thinking beyond the operational capabilities of AI technologies and investigate the ethical aspects of developing strong and potentially life consequential technologies. US government and private companies do not consider the virtual implications of decision-making systems in health, criminal justice, employment, and creditworthiness without ensuring that these systems are not coded intentionally or unintentionally with structural biases [1].

Concomitant with advances in AI systems, we witness the ethical failure of those systems. For example, a high rate of unsuccessful job applications that was decided by the Amazon recruitment system was later found biased against women applicants and triggered interest in AI ethics [3]. The need for developing policies and principles that address the ethical aspects of AI systems is timely and critical. The ethical harm in AI systems might jeopardize human control and these potential threats set a stage for AI ethics discussion. AI systems are not only concerned with technical efforts, but also need to consider the social, political, legal, and intellectual aspects. However, AI’s current state of ethics is broadly unknown to the public, practitioners, policy, and lawmakers [4].

Extensively, the ethically aligned AI system should meet the following three components through the entire life cycle [2]: 1) the proposed AI system should comply with all the applicable laws and regulations, 2) adhere to
ethical principles and values, and 3) should be technically and socially robust. To the best of our knowledge, no empirical study is conducted that cover and explore the above three core components based on the data collected from industrial practitioners and lawmakers. For instance, Vakkuri et al. [4] conducted a survey study to determine industrial perceptions based only on four AI ethics principles, Lu et al.[5] conducted interviews with researchers and practitioners to understand the AI ethics principles implications and the motivation for rooting these principles in the design practices. Similarly, Leikas et al. [6] mainly focused on AI ethics guidelines.

In this study, insights are provided by encapsulating the views and opinions of practitioners and lawmakers regarding the AI ethics principles and challenges by collecting survey data from 99 respondents across 20 different countries.

2 Background

Generally, the AI ethics is classified under the umbrella of applied ethics, which mainly consider the ethical issues that happen because of developing, deploying, and using the AI systems. It focuses on linking how an AI system could raise worries related to human autonomy, freedom in a democratic society, and quality of life. Ethical reflection across AI technologies could serve in achieving multiple societal purposes [2]. For instance, it can stimulate focusing on innovations that aim to foster ethical values and bring collective well-being. Ethically aligned or trustworthy AI technologies can flourish sustainable well-being in society by bringing prosperity, wealth maximization, and value creation [2].

It is vital to understand the development, deployment, and use of AI technologies to ensure that everyone can build a better future and live a thriving life in the AI-based world. However, the increasing popularity of AI systems has raised concerns such as reliability and impartiality of decision-making scenarios [2]. We need to make sure that decision-making support of AI technologies must have an accountable process to ensure that their actions are ethically aligned with human values that should not be compromised [2].

In this regard, different organizations and technology giants developed committees to draft the AI ethics guidelines. Google and SAP presented the guidelines and policies to develop ethically aligned AI systems [7]. Similarly, the Association of Computing Machinery (ACM), Access Now, and Amnesty
International jointly proposed the principles and guidelines to develop an ethically mature AI system [7]. In Europe, the independent high-level expert group on artificial intelligence (AI HLEG) developed the guidelines for promoting trustworthy AI [2]. The Ethically Aligned Design (EAD) guidelines are presented by IEEE, consisting of a set of principles and recommendations that focus on the technical and ethical values of AI systems [8]. In addition, the joint ISO/IEC international standard committee proposed the ISO/IEC JTC 1/SC 42 standard which covers the entire AI ecosystem, including trustworthiness, computational approach, governance, standardization, and social concerns [9].

However, various researchers claim that the extant AI ethics guidelines and principles are not effectively adopted in industrial settings. McNamara et al. [10] conducted an empirical study to understand the influence of the ACM code of ethics in the software engineering decision-making process. Surprisingly, the study findings reveal that no evidence has been found that the ACM code of ethics regulate decision-making activities. Vakkuri et al. [11] conducted multiple interviews to know the status of ethical practices in the domain of the AI industry. The study findings uncover the fact that various guidelines are available; however, their deployment in industrial domains are far from being mature. The gap between AI ethics research and practice remains an ongoing challenge. To bridge this gap, we conducted an empirical study to know the significance of AI ethics principles, challenges, and their impact by encapsulating the views of AI practitioners and lawmakers.

3 Setting the Stage

Previously, we conducted a systematic literature review (SLR) to provide an in-depth overview of AI ethics challenges and principles [12]. This study aims to empirically validate the SLR findings based on the insights provided by the AI practitioners and lawmakers. AI practitioners have higher ethical responsibilities compared to others. Practitioners often make the design decisions of complex autonomous systems with less ethical knowledge. The magnitude of risks in AI systems makes practitioners responsible for understanding ethical attributes. To achieve reliable outcomes, it is essential to know the practitioners understanding of AI ethics principles and challenges. Law resolves everyday conflicts and sustains order in social life. People consider law an information source as it impacts social norms and values [13].
The aim of considering this type of population (lawmakers) is to understand the application of the law to AI ethics. The data collected from legislation personnel will uncover the question, of whether standing AI ethics principles are sufficient, or is there a need for innovative standards [13]?

The primary goal of this study is to understand the significance of the AI ethics principles, challenges, and the severity of the challenges across the principles. We used industrial collaboration contacts to search the AI practitioners and send a formal invitation to participate in this study. Moreover, various law forums across the world were contacted and requested to participate in this survey. The targeted populations were approached using social media networks including LinkedIn, WeChat, ResearchGate, Facebook, and personal email addresses. The survey instrument consists of four core sections: 1) demographics 2) AI ethics principles 3) challenges 4) challenges impact on principles. The survey questionnaire also includes open-ended questions to know the novel principles and challenges that were not identified during the SLR [12]. The Likert scale is used to evaluate the significance of each principle and challenge and assess the severity level of the challenging factors. The survey instrument is structured both in English and Chinese. The software industry in China is flourishing like never before, where AI is taking the front seat and is home to some of the leading technology giants in the world, such as Huawei, Alibaba, Baidu, Tencent, and Xiaomi. However, it would be challenging to collect the data from the Chinese industry because of the language barriers. Mandarin is the national and official language in China, unlike India, where English is commonly used for official purposes. Therefore, the Chinese version of the survey instrument is developed to cover the major portion of the targeted population. Both English and Chinese versions of the survey instrument are available online for replication [14].

The piloting of the questionnaire is performed by inviting three external qualitative software engineering research experts. The expert’s suggestions were mainly related to the overall design, and understandability of the survey questions. The suggested changes were incorporated, and the survey instrument was online deployed using Google forms (English version) and Tencent questionnaire (Chinese version). The data were collected from September 2021 to April 2022 and we received 107 responses. The manual review revealed that eight responses were incomplete and we only considered 99 responses for the final data analysis.
4 Survey Results

Frequency analysis is performed to organize the descriptive data and it is more suitable for analyzing a group of variables both for numeric and ordinal data. We noticed that 99 respondents from 20 countries across 5 continents with 9 roles and 10 different backgrounds participated in the survey study (see Figure 1(a-c)). The organizational size (number of employees) of survey participants mostly ranges from 50 to 249, which is 28% of the total responses (see Figure 1(d)). Of all the responses, majority (48%) have 3-5 years of experience working with AI focused projects as practitioners or lawmakers (see Figure 1(e)).

Participants were asked to explain their opinions about the perceived importance of AI systems in their organization. The majority of the participants positively agreed. For instance, 77% mentioned that their respective organizations consider ethical aspects in AI processes or develop policies for AI projects, 12% answered negatively, and 10% were not sure about it (see Figure 1(f)). We mapped the respondents’ roles across nine different categories using thematic mapping (see Figure 1(b)). The final results show that the most of the respondents (29%) are classified across the law practitioner category. Similarly, the domains of the participants’ organizations are conceptually framed in 10 core categories and the results revealed that most (19%) of the organizations are working on smart systems (see Figure 1(c)).

The survey responses are classified as average agree, neutral and average disagree (see Figure 2(a-b)). We observed that average ≥ 60% of the respondents positively confirmed the AI ethics principles and challenges identified in the SLR study [12]. For instance, one survey participant mentioned that:

– “The listed AI ethics principles are comprehensive and extensive to cover various aspects of ethics in AI.”

Moreover, we selected the most frequently reported seven challenging factors and six principles discussed in our SLR study [12]. The aim is to investigate the severity impact of the seven challenges (i.e., lack of ethical knowledge, vague principles, highly general principles, conflict in practice, interpret principles differently, lack of technical understanding, and extra constraints) across the six AI ethics principles (i.e. transparency, privacy, accountability, fairness, autonomy, and explainability). The survey participants were asked to rate the severity impact using the Likert scale: short-term (insignificant, minor, moderate) and long-term (major, and catastrophic) (see Figure 2(c)). The results reveal that most challenges have long-term impacts on the princi
ples (major, and catastrophic). For example, interpret principles differently challenge is likely to have a long-term impact (i.e., 50% major, and 27% catastrophic) on the transparency principle.

Further, the non-parametric statistical analysis is performed to understand the significant differences between both types of populations (AI practitioners and lawmakers). Because of the allowed word limits, the statistical discussion and dataset are provided online [14].

5 Data Interpretation

The results illustrate that the majority of the survey participants positively agreed to consider the identified list of AI ethics principles (see Figure 2(a)). We noticed that 77.8% of survey respondents thought transparency as the most significant AI ethics principle. This is an interesting observation as transparency is equally confirmed as one of the core seven essential requirements by AI HLEG [2] for realizing the ‘trustworthy AI’. Transparency provides detailed explanations of logical AI models and decision-making structures understandable to the system stakeholders. Moreover, it deals with the public perceptions and understanding of how AI systems work. Broadly, it is a societal and normative ideal of “openness”.

The second most significant principle to the survey participants was accountability (71.7%). It refers to the expectations or requirements that the organizations or individuals need to ensure throughout the lifecycle of an AI system. They should be accountable according to their roles and applicable regulatory frameworks for the system design, development, deployment, and operation by providing documentation on the decision-making process or conducting regular auditing with proper justification. Privacy is the third most frequently occurred principle, supported by 69.7% of the survey participants. It refers to preventing harm, a fundamental right specifically affected by the decision-making system. Privacy compels data governance throughout the system lifecycle, covering data quality, integrity, application domain, access protocols, and capability to process the data in a way that safeguards privacy. It must be ensured that the data collected and manipulated by the AI system shall not be used unlawfully or unfairly discriminate against human beings. For example, one of the respondents mentioned that

- “The privacy of hosted data used in AI applications and the risk of data breaches must be considered.”
Figure 1: Demographic details
In general, the survey findings of AI ethics principles are in line with the widely adopted accountability, responsibility, and transparency (ART) framework [15] and the findings of an industrial empirical study conducted by Ville et al. [2]. Both studies [2] [15] jointly considered transparency and accountability as the core AI ethics principles, which is consistent with the findings in this survey. However, we noticed that privacy has been ignored in both mentioned studies [2] [15], but is placed as the third most significant principle in this survey. The reason might be that, as more and more AI systems have been placed online, the significance of privacy and data protection is increasingly recognized. Presently, various countries embarked on legislation to ensure the protection of data and privacy.

Further, the results reveal that the majority of the survey respondents (>60%) confirmed the identified challenging factors [12] (see Figure 2(b)). Lack of ethical knowledge is considered as the most significant challenge by (81.8%) the survey participants. It exhibits that knowledge of ethical aspects across AI systems is largely ignored in industrial settings. There is a significant gap between research and practice in AI ethics. Various guidelines and policies devised by researchers and regulatory bodies discussed different ethical goals for AI systems. However, these goals have not been widely adopted in the industrial domain because of limited knowledge of scaling them in practice. The findings are in agreement with the industrial study conducted by Ville et al. [11], which summarises the overall findings by stating that ethical aspects of AI systems are not particularly considered, and it mainly happened because of a lack of knowledge, awareness, and personal commitment. We noticed that no legal frameworks (69.7%) is ranked as the second most common challenge for considering ethics in the AI domain. The proliferation of AI technologies in high-risk areas starts mounting the pressure of designing ethical and legal standards and frameworks to govern them. It highlights the nuances of the debate on AI law and lays the groundwork for a more inclusive AI governance framework. The framework shall focus on most pertinent ethical issues raised by the AI systems, the use of AI across industry and government organisations, and economic displacement (i.e. the ethical reply to the loss of jobs as a result of AI-based automation). The third most common challenging factor is lacking monitoring bodies, and it was highlighted by (68.7%) of the survey participants. Lacking monitoring bodies refers to the lack of regulatory oversight to assess ethics in AI systems. It raises the issue of public bodies’ empowerment to monitor, audit, and oversee the enforcement of ethical concerns in AI technologies by the do-
main (e.g., health, transport, education). One survey respondent mentioned that

“I believe it shall be mandatory for the industry to get standard approval from monitoring bodies to consider ethics in the development process of AI systems.”

Monitoring bodies extensively promote and observe the ethical values in society and evaluate technology development associated with ethical aspects of AI [2]. They would be tasked to advocate and define responsibilities and develop rules, regulations, and practices in a situation where the system takes a decision autonomously. The monitoring group should ensure “ethics by, in and for design” as mentioned in AI HLEG [2] guidelines.

Additionally, the survey participants elaborated on new challenging factors. For instance, one of the participants mentioned that

“Implicit biases in AI algorithms such as data discrimination and cognitive biases could impact system transparency.”

Similarly, the other respondent reported that

“Biases in the AI system’s design might bring distress to a group of people or individuals.”

Moreover, a survey respondent explicitly considered the lack of tools for ethical transparency and AI biases as significant challenges to AI ethics. We noticed that AI biases is reported as the most common additional challenge. It will be interesting to further explore (i) the type of biases that might be embedded with the AI algorithms, (ii) the causes of these biases, and (iii) corresponding countermeasures to minimize the negative impact on AI ethics.

Finally, the severity impact of the seven challenging factors is measured with respect to the six AI ethics principles (see Figure 2 (c)). For the transparency principle, we noticed that the challenging factor interpret principles differently has significant long-term impacts, and 77% (i.e., 50% major, and 27% catastrophic) of the survey participants agreed to it. The interpretation of ethical concepts can change for a group of people and individuals. For instance, the practitioners might perceive transparency differently (more focused on technical aspects) than law and policymakers, who have broad social concerns. Furthermore, lack of ethical knowledge has a short-term impact on the transparency principle, and it is evident from the survey findings supported by 52% (7% insignificant, 25% minor, and 20% moderate) responses. Lack of knowledge could be instantly covered by attaining knowledge, understanding, and awareness of transparency concepts.

Conflict in practice is deemed the most significant challenge to the pri-
vacancy principle. Hence, 74% (i.e., 53% major, and 21% catastrophic) survey respondents considered it a long-term severe challenge. Various groups, organizations, and individuals might have opinion conflicts associated with privacy in AI ethics. It is critical to interpret and understand privacy conflicts in practice. We noticed that (82%) of survey participants considered the challenging factor extra constraints as the most severe (long-term) challenge for both accountability and fairness principles. Situational constraints, including organizational politics, lack of information, and management interruption, could possibly interfere with the accountability and fairness measures. It could negatively impact the employee’s motivation and interest to explicitly consider ethical aspects across the AI activities. Interestingly, (82%) of the survey respondents considered conflict in practice as the most common (long-term) challenge for autonomy and explainability principles.

Overall, we could interpret that conflict in practice is the most severe challenge, and its average occurrence is >77% for all the principles. It gives a general understanding to propose specific solutions that focus on tackling the opinion conflict regarding the real-world implication of AI ethics principles. The results further reveal lack of ethical knowledge has an average (38%) short-term impact across selected AI ethics principles. The lack of knowledge gap could be covered by conducting training sessions, workshops, certification, and encouraging social awareness of AI ethics. Knowledge increases the possibility of AI ethics success and acceptance in the best practice of the domain.
Figure 2: AI Ethics Principles and Challenges
6 Lessons Learned

The study findings result in the following lessons learned:

1. **Emerging Roles**: Besides practitioners, the role of policy and lawmakers is also important in defining the ethical solutions for AI-based systems. Based on our knowledge, this study is the first effort made to encapsulate the views and opinions of both types of populations.

2. **Confirmatory Findings**: This study empirically confirms the AI ethics principles and challenging factors discussed in our published SLR study [12].

3. **Adherence to AI principles**: The most common principles (e.g., transparency, privacy, accountability) and challenges (e.g., lack of ethical knowledge, no legal frameworks, lacking monitoring bodies) must be carefully realized in AI ethics.

4. **Risk-aware AI ethics principle design**: The challenging factors have mainly long-term severity impacts across the AI ethics principles. It opens a new research call to propose solutions for minimizing or mitigating the impacts of the challenging factors.

The given catalogue (see Figure 2) of principles and challenging factors could be used as a guideline for defining ethics in the AI domain. Moreover, the catalogue is a starting point for further research on AI ethics. It is essential to mention that the identified principles and challenging factors only reflect the perceptions of 99 practitioners and lawmakers in 20 countries. More deep and comprehensive empirical investigation with wider groups of practitioners would be useful to generalize the study findings globally. This, together with proposing a robust solution for integrating ethical aspects in AI design and process flow, will be part of our future work.

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