Developing Use Cases to Support an Empathic Technology Ethics Standard

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***Abstract*— Artificial Intelligence (AI) is becoming endemic to everyday life and continues to promise significant positive impacts to global quality of life in many areas, but AI generally, and empathic technology, in particular, needs a better framework for ethical and human-centered design to reach its full potential and improve both specific contextual and general societal outcomes. Contributors to the use-case effort developed a structured approach focused on the needs of standard designers to exercise draft standard content, tools, and frameworks to ensure their effectiveness in application better. A diverse range of use cases were identified across a range of criteria. This catalog of use cases provides flexibility in identifying weaknesses and strengths and otherwise proving standard content as a design tool. While an essential tool in supporting rigor in the final ethical standard, use cases are only one option, and other approaches should be employed in parallel as part of the verification and validation approach to a draft standard.**

Keywords—ethics, standards, artificial intelligence, empathic technology

I. Introduction

A group of multinational volunteers from academia, industry, and government across many domains (legal, business, development, data science, social science) have come together to form the IEEE P7014 Working Group [1]. This group's focus is to standardize the ethical design associated with empathetic technologies and its tools, frameworks, and processes. For the purposes of P7014, empathic technologies are a category of AI that attempt either to measure or emulate affective state. The scope of ethical consideration of P7014 includes the design of, integration of, and application of empathic technology.

It is an incredibly complex task to create the related "shall" statements for an AI ethical standard framework to bound design activities and make the standard as a means to establish organizational controls and governance. First, P7014 membership recognized the importance of scoping the standard design as to minimize overlap with, and instead leverage, the many ongoing standards efforts around broader AI ethics, as well as other related standards and recommended practices (for example, those under development for data protection, nudging, biometrics, and AI governance). This decision bounds the standard's application to areas of ethical impact specific to empathic technology factors in design, integration, or application. Second, in order to maximize the applicability of the standard within a global legal, regulatory, and ethical environment, P7014 focuses on supporting ethical assurance independent of the legal or regulatory context and in association with a broader classical ethical framework [2], one which reflects the position of the standard user's organization. Therefore, P7014 does not seek to establish universal ethical answers to all empathic design considerations. Instead, it aims to develop appropriate tools, frameworks, and processes to create organizational assurance, documentation, monitoring, and so, to support ethically aligned design efforts for empathic technology. Third, the potential specific or societal harms associated with empathic technology application drive the need for a standard. Still, there is limited ability to field test nor hard engineering data about previous failures that support verification and validation of the standard content prior to publication. IEEE uses a rigorous review and revision process for fielded standards to ensure that they remain accurate and relevant. In addition, the P7014 working group is employing a variety of techniques, including use cases, to ensure that the standard delivers the intended results when deployed.

The rest of this paper is organized as follows: Section II presents a succinct literature review; Section III describes the philosophy used in creating the use cases and the design methodology; the catalog of use cases is discussed in Section IV; finally, conclusions are drawn in Section V.

II. Literature Review

Application of use cases to support verification and validation of draft engineering standards content is a common practice [3], and use cases are widely available [4]. TietoEVRY's response to AI regulation strongly urges the application of use cases to ensure effectiveness [5]. Of particular relevance to our approach are efforts to expand the range and notion of standard use cases for increased validation [6], and those related standards that involve human-machine interaction, like the "scenario-based design" techniques employed in human factors engineering [7]. As suggested by the definitions in [2] on pp. 269, our application of use cases supports both "verification" and "validation" activities of draft standard content, though not perfectly [8]. We are using feedback from the content producers to refine specific use cases to purpose and focus their effectiveness for verification; the P7014 working group may apply a variety of other approaches to improve validation.

III. Use Case Philosophy and Design Methodology

Use cases might play a variety of roles in support of an AI ethics standard. They are useful in both proving the draft standard content to improve rigor, but also as a component of the content to provide elucidation as to proper use for the published standard user. The P7014 working group reasoned that use cases designed primarily for verification and validation of the draft standard might, in turn, be illuminated and refined through an application. This approach provides both the best support to the development of the standard and the best fit for use cases as example content.

Next, use cases must be designed in order to support validation of tools, frameworks, and processes intended to provide ethical assurance for empathic technology. Providing validation means that the selection of use cases must be sufficiently broad to cover, as best possible, the full scope of consideration supported by the standard. The P7014 working group developed several criteria to evaluate potential use cases based directly on the scope and objectives of the standard:

- Any engineered ethical concern in a use case should be tightly bound to empathic technology or result specifically from empathic technology's introduction into a scenario (e.g.., not based on broader AI technology or data privacy concerns, for example).
- As empathic technology is rapidly emerging, examples should not be bound to currently available technology but should include near-term realistic scenarios. Speculative/futuristic implementations or capabilities are not helpful. This supports the development of a practical, realistic standard and will remain relevant in the near-term, which is sufficient under the IEEE review and update policies.
- Be sufficiently specific to test the draft standard content, but vague enough that ethical-assurance answers are not "baked-in" to the scenario.
- Include a range of use cases sufficient to provide coverage across all dimensions of consideration, including (a) application sectors, (b) technological realizations, (c) ethical consideration, (d) development, integration, and deployment/use contexts, (e) stakeholders, to include disadvantaged users and indirect/second-order/societal impact, (f) commercial versus government development/use.

IV. Use-Case Organization And Catalog

As one of the primary objectives for applying use cases to an AI ethics standard is to support validation efforts, a catalog and organization scheme becomes essential. The number of conceived and fully developed use cases may become significant. Storing and indexing the use cases supports both discoverability for the standards developers and the ability to assess comprehensive coverage by the use case design team.

The P7014 working group uses established a set of basic organizing dimensions for its use-case catalog:

- Sector / Industry,
- Stakeholder,
- Ethical Aspect,
- Data Type.

These key dimensions allow working group members to easily find use cases of interest in order to assess the robustness of draft P7014 tools and frameworks.

Table 1 shows the range of sectors under initial consideration and some of the broad categories of use cases in the current P7014 catalog.

TABLE I. Currently Identified Use Cases by Sector

Sector / Industry	Use Case
Customer Service	Intelligent Customer Care Systems
Education	Personalized Lifelong Learning
Enforcement / Policing	Crime Preventions / Solving / Convictions
Entertainment	Virtual Companions
Entertainment	Toys/Games on the Internet (Adult and Children)
Healthcare	Health Detection and Tracking
Finance	Loan Scoring, and SecurityClizia Scoring / Smart Cities
Government	Clizia Scoring / Smart Cities
Marketing	Recommended Products/Services
Transportation	Car Safety / Self Driving Cars
Transportation	Improve In-Car experience

The P7014 working group has also indexed use cases within its catalog by stakeholder (subdivided as "maker," "third party," "disadvantaged user," and "other"), ethical aspect ("fairness," "accountability," "transparency," "privacy-individual," "privacy-group"), and data type ("face coding," "eye movement," "gestures," "biometrics," "voice," "text").

V. Conclusion

The P7014 working group has begun to apply its use case catalog to initially drafted tools, frameworks, and procedures for empathic technology ethical assurance. Initial findings suggest that most users conceive use cases based on the sector or industry and identify gaps based on that domain. For example, those working on developing an "ethical transparency toolkit" have requested an additional variety of use cases in the areas of healthcare and finance, more emphasis on negative examples, particularly in the area of marketing/sentiment analysis, and the addition of national discourse/political influence and defense/aerospace as sectors for consideration.

We must note that the P7014 working group continues to discuss whether military development/application will be within scope of the final standard; however, those engaged in the development of ethical transparency tools note that inclusion of these use cases is helpful regardless to support seam issues and, at a minimum, provide contrast. Others, in the review of this paper, have noted the need to emphasize the global diversity of stakeholders, particularly as global contexts may have an impact

on social science analysis of the ethical impact and there are known to be racial, ethnical, and linguistic influences on affective state expression in various data types. It was also noted that another source of "unknown-unknown" influence on ethical assurance has multi-modal effects across emergent dimensions, such as the impact of adversarial attack capability in conjunction with other considerations.

While use cases provide a powerful means to support verification and validation for developing an AI ethical standard, they are not a comprehensive tool [8]. Their development is subject to the biases and limited knowledge base of the standards development working group. It is informed by only the "known-knowns" and "known-unknowns" of current AI implementations and technology under development. Other approaches to supporting verification and validation include external/stakeholder focus groups and consultation, promoting diversity of viewpoints and formal logical analysis of the standard and its tools. For example, in [9], authors apply a module/object-oriented approach; other approaches, including ontological structuring, may be productive.

It is clear from the development of use cases that serious care must be taken in interpreting emotion across culture and gender. The approach being used by businesses today is trial and error and training and learning from past experiences. The key to the future is to create standards and best practices that improve the ethical issues ahead of us. There are two primary market forces driving emotion analysis today: the need and desire to humanize digital communications, and the need to evolve and improve customer experiences. Legacy methods used to train AI/ML systems use statistical model computer programming and need to be retooled to adapt emotional data.

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