Particip-AI: A Democratic Surveying Framework for Anticipating Future AI Use Cases, Harms and Benefits

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General purpose AI, such as ChatGPT, seems to have lowered the barriers for the public to use AI and harness its power. However, the governance and development of AI still remain in the hands of a few, and the pace of development is accelerating without proper assessment of risks. As a first step towards democratic governance and risk assessment of AI, we introduce Particip-AI, a framework to gather current and future AI use cases and their harms and benefits from non-expert public. Our framework allows us to study more nuanced and detailed public opinions on AI through collecting use cases, surfacing diverse harms through risk assessment under alternate scenarios (i.e., developing and not developing a use case), and illuminating tensions over AI development through making a concluding choice on its development. To showcase the promise of our framework towards guiding democratic AI, we gather responses from 295 demographically diverse participants. We find that participants' responses emphasize applications for personal life and society, contrasting with most current AI development's business focus. This shows the value of surfacing diverse harms that are complementary to expert assessments. Furthermore, we found that perceived impact of *not* developing use cases predicted participants' judgements of whether AI use cases should be developed, and highlighted lay users' concerns of techno-solutionism. We conclude with a discussion on how frameworks like Particip-AI can further guide democratic AI governance and regulation.

Additional Key Words and Phrases: Do, Not, Us, This, Code, Put, the, Correct, Terms, for, Your, Paper

1 INTRODUCTION

With the arrival of general-purpose models such as ChatGPT and platforms like GPT Store,[1] building or using AI applications has become increasingly accessible for everyday people [28, 102], leading to numerous beneficial *use cases* of AI [67, 77, 103] along with potential risks [61, 84, 85]. At first glance, the emergence of new use cases appears to reduce the barriers to AI participation and promote its "democratization." However, the restricted access to AI models reinforces standards established by major tech companies, resulting in an AI landscape that is alarmingly closed and centralized [24, 105]. Companies possessing frontier models entrench their monopoly power of AI through user policies [74], safety statements [47, 75], and opaque design decisions [105] that prioritize profit [19, 70]. They also exert

[1] https://openai.com/blog/introducing-the-gpt-store

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influence on AI governance externally through lobbying efforts [8, 92] and academic research funding [66, 73], often circumventing public participation in decision-shaping processes. Meanwhile, the assessment of AI risks mostly solely relies on opinions from AI experts, despite being called broadly by policy-makers, business leaders, and tech experts [16, 95, 104], missing views from the world at large [38, 55].

To truly democratize AI, their usage and development decisions should be defined with broad public input [20, 25, 46]. To accomplish this, a framework for the non-expert public to share opinions and express critical assessments on AI is needed. Such a framework must be centered around concrete use cases [4, 98], since only discussing high-level regulation of general purpose models leads to rules that are too vague to operationalize [82]. Moreover, the framework should allow the public to consider the alternate reality associated with an AI use case, considering both its development and non-development, a contrastive perspective often missing in AI risk assessment.

Towards this goal, we introduce Particip-AI, a framework to gather detailed and nuanced public opinion on AI based on use cases and their impact, inspired by participatory design practices [21], threat modeling from computer security [54], and ethical dilemmas from philosophy [23]. Our framework proposes a four-step process that asks participants to brainstorm use cases, imagine and rate their harms and benefits under two alternate scenarios of developing and not developing, and finally, make a choice to express their opinion on the development of the use cases. Showcasing the feasibility of our framework, we conduct an online survey with 295 demographically diverse, US-based participants and analyzed their responses to answer the following research questions.

RQ1. What current and future use cases of AI are in the public's imagination? This research question aims to unravel the direction of AI development overlooked by businesses and governments to help guide its equitable progress through public's ideation of use cases. Our results offer a wide array of use cases to improve personal, everyday life, showing diverse interests to enhance life through AI. Participant responses also emphasize the value of AI in making societal impact towards betterment of society as a whole.

RQ2. What are the harms and benefits of the use cases? As many use cases of AI that seemed beneficial and useful, however, can become harmful through misuse, unintended consequences, and failures. Therefore, anticipating its impact with the public can help illuminate governance and regulatory gap. Our work finds that participants surface set of harms complementary to taxonomies created by experts, for example, raising issues of distrust in institutions and highlighting the need for regulation to protect mental health.

RQ3. What are the harms and benefits of *not* developing certain applications of AI? Not developing AI use cases can also have harms and benefits. By imagining when the AI use case is not developed, we encourage participants to think beyond technological determinism [56] and consider alternate solutions. Our findings uncover a set of benefits and harms associated with not developing a use case and highlight a tension in AI's impact on human potential.

RQ4. What creates tension between developing and not developing the applications? We aim to study the decision process of non-expert lay people to understand tensions and dilemmas of conflicting values to guide a wider discussion beyond this work. We find in our participants' responses, a key tension over human potential and AI's role in either diminishing or amplifying it. Furthermore, we find that level of benefits and harms of *not* developing a use case is significantly more correlated with decision of development, compared to level of benefits and harms of developing.

To summarize our contributions, in this work, we (1) propose a framework, developed with insights from various field of AI, computer security, and philosophy, towards a more inclusive AI development and governance. We (2) showcase Particip-AI's usability through a survey with lay-users, who surfaces possible use cases, along with their harms and

benefits.[2] We (3) synthesize and code participants' input, finding use cases that emphasize equitable progress through enhancing everyday life and solving societal issues, harm types complementary to the expert-generated, various impacts of not developing a use case, and tensions over value of human work. Finally, we (4) conclude with a discussion on direction of AI development to reflect diverse goals and needs, risks of AI and ways to address regulatory gaps, and tensions over development and techno-solutionism. We hope our work will provide a set of initial guidance and a blueprint for including diverse voices, especially that of lay publics, into the future of AI.

2 RELATED WORK

Building upon prior works in risk assessment, participation, and policy-making, our research addresses the challenge of incorporating public inputs in governing and developing AI, with an emphasis on large-scale generative AI models.

Risk Assessment of AI Applications. Generative AI models like ChatGPT and DALL-E [31, 61], have been widely adopted across diverse application fields [11, 41, 53, 76, 80, 87, 97, 107]. AI applications' far-reaching impact and increasing accessibility among lay users [102] urges broad, deliberate, and multifaceted assessments of their nuanced and unexpected risks [58]. While many works have developed assessment frameworks of AI risks, most have focused on expert inputs only [16, 95, 104], neglecting the valuable perspectives of end users impacted by AI-related harms.

In works that incorporate user inputs for AI risk assessments, there is a noted limitation in accommodating a wide range of diverse and potentially conflicting human values [104]. For instance, Buçinca et al. [27] identify harms across five distinct AI deployment scenarios by leveraging the collaboration between language models and a small group of crowd workers. Additionally, Gabriel et al. [45] integrate constrained human rights guidelines and value-sensitive design into technology development. To address the challenge of surfacing diverse perspectives and values, our framework adopts a large-scale, *democratic* approach to anticipate risks associated with current and future AI. By soliciting lay users' inputs to assess the potential harms and benefits of both *developing* and *not developing* AI applications based on individual choices, our work grounds the exploration of AI risks in a consequentialist ethical framework [54].

Participation in AI. While the rapidly growing deployment of AI systems across many sectors has called for meaningful participation and involvement [34, 35, 78, 81, 96], exploration of such approaches has lagged behind [17, 18, 20, 39], especially in large-scale AI models [20]. For example, previous efforts span "data labor" for model optimization like annotation and feedback [13, 68], public consultation such as citizen juries [15, 99], public participation for AI policy insights [72, 83], community collectives [71, 81], and representative evaluation [18].

Unlike prior work that has enabled human inputs at granular, instance-level (e.g., human annotation or feedback [13, 30, 75]) or only at broad, principles-level (e.g., community constitutional AI [12, 14]), our work targets the middle-ground by facilitating public assessment of potential real-world AI applications across domains, aligning with recent legislation advocating more application-based approaches [4]. Building on participatory design traditions [48, 94], we created an inclusive virtual framework for demographically diverse public participants to creatively ideate and critically evaluate AI use cases. By focusing on future applications rather than just current capabilities, our work provides a wider possibility space for the public to surface concerns early while exploring beneficial uses. Our work, thus, aims to lay scalable foundations for empowering public participation and influence over equitable, accountable AI systems.

AI Policy-making and Governance. One of the most impactful potential applications of PARTICIP-AI is to provide comprehensive, representative perspectives from lay end-users to establish better guidelines in future AI design and

[2]We will release our data upon acceptance for researchers to further analyze.

regulation. AI governance encompasses a wide array of policies, frameworks, and practices implemented by government bodies [3, 7, 9, 33, 43, 72] and industry players [1] to ensure the responsible use of AI technologies. In addition to these efforts, jurisdictions globally have taken proactive regulatory approaches for governing AI systems (e.g., The EU AI Act [4], Canada's AI and Data Act [5], China's generative AI rule [10]). As the landscape of AI governance evolves, the development of best practices for establishing AI policies emerges through a dynamic interplay of collaboration and conflict among stakeholders. In this process, the inclusion of views and representative voices from laypeople becomes crucial, offering complementary perspectives to top-down governmental and organizational oversight.

Question Numbers				Content
Technology Description				
⚙	Tech-X			Imagine an AI technology (let's call it "Tech-X") is developed by tech companies that can follow any instructions to generate new content such as images, human-like language, computer code, etc. To name a few of its capabilities, it can interact with people in a conversational way, write stories, create illustrations and paintings, and answer questions about almost anything.
⚙⚙	Tech-X 10			Now consider a date five to ten years into the future. Imagine a more sophisticated version of Tech-X (let's call it "Tech-X 10"), which can follow any instruction you give it, has expert-level knowledge or even better, can solve problems creatively, can connect to the internet and other devices, and can process and read massive amounts of data or text within seconds.
Sec 1: Use Cases				
⚙	Q1	⚙⚙	Q4	Do you think a technology like this should exist?
⚙	Q2	⚙⚙	Q5	How confident are you in the above answer?
⚙	Q3*	⚙⚙	Q6*	Please write some tasks that {⚙, ⚙⚙} could assist or automate in the text box below.
💼	Q7*			Complete the following sentence by choosing one task from your brainstormed answers that you believe Tech-X or Tech-X 10 will change the most drastically. The task that I think Tech-X / Tech-X 10 would most dramatically change would be in…
Sec 2: Harms and Benefits of Developing				
👍	Q8*	👎	Q11* & Q14*	How will Tech-X / Tech-X 10 automating or assisting the task you identified {👍, 👎} impact individuals?
👍	Q9*	👎	Q12* & Q15*	Which groups of people do you think would {👍, 👎} the most from the above {👍, 👎} impacts?
👍	Q10	👎	Q13 & Q16	How {👍, 👎} would it be if Tech-X / Tech-X 10 was used for the following task and had the above {👍, 👎} impacts?
Sec 3: Harms and Benefits of *Not* Developing				
👎	Q17*	👍	Q20*	Now imagine that Tech-X / Tech-X 10 was never used to automate or assist with {💼}. How will banning or not developing this particular application {👍, 👎} impact individuals?
👎	Q18*	👍	Q21*	Which groups of people do you think would {👍, 👎} the most from the above by banning or not developing this particular application?
👎	Q19	👍	Q22	How {👍, 👎} would it be if Tech-X / Tech-X 10 was banned or never developed to perform the following task and had the above {👍, 👎} impacts?
Sec 4: Use Case Opinion				
✎	Q23			After thinking about the benefits and harms of the application and the harms of it not being developed, do you think that this application of the technology should or should not be developed?
	Q24			How confident are you in the above answer?
	Q25			How likely do you think are people to agree that an application of Tech-X / Tech-X 10 that automates or assists with {💼} {✎}?

Table 1. Survey questions in Particip-AI. Questions are summarized due to space constraint. Open-text questions are denoted with an asterisk (*). Within curly brackets are variations such as benefit (👍) or harm (👎) or input from previous questions, such as task (💼).

3 METHODS: DESIGNING PARTICIP-AI AND COLLECTING LAY USERS' INPUTS

In this section, we first introduce the design practice of Particip-AI, including the motivation and the scope of the Particip-AI framework (§3.1.1), the question choices for the survey instrument (§3.1.2), and participants recruitment details (§3.1.3). We also describe the data analysis methodology for collecting lay users' input from the survey (§3.2).

3.1 PARTICIP-AI: A Democratic Surveying Framework to Engage Lay End-users' Opinions in Anticipating Benefits and Harms of Near-future or Far-future AI

3.1.1 Motivation and Overview. The primary goal of PARTICIP-AI is to effectively elicit the opinions of lay end-users on the potential harms and benefits across many near-future and far-future AI applications. Our initiative seeks to complement expert perspectives in AI development by incorporating diverse, bottom-up views from the broader end-user community. We thus adopt *online crowdsourcing platforms* for broadly surveying populations with diverse backgrounds. To create a survey instrument that addresses pertinent, pivotal questions in AI, we harness the interdisciplinary expertise of our research team, spanning fields like computer security, public policy, natural language processing (NLP), and AI ethics. Our diverse cross-disciplinary expertise guides the *iterative* process of designing the survey questions.

To explore how lay users perceive the influences and consequences of *future* AI applications, we prompt users to *imagine* potential use cases of AI and consider speculative harms and benefits of both *developing* and *not developing* such technologies. This fictional inquiry approach [37], is deeply rooted in various fields, including design fictions [21] and threat modeling in computer security [40]. In particular, the alternative scenarios (i.e., *to develop* or *not to develop* a use case) involve choosing between two outcomes, reminiscent of hypothetical dilemmas in moral philosophy [23].

The option of *developing* an AI use case considers two distinct types of harms: (1) those arising from the *failure or low performance* of AI, and (2) those resulting from the *malicious misuse* of AI. Finally, acknowledging the distinct real-world impacts of *short-term, near-future*, and *long-term, far-future* AI technologies, PARTICIP-AI guides users to analyze and differentiate the distinct potential harms and benefits presented by AI with varying levels of capabilities. We include a detailed description of survey questions with their corresponding target research questions in Appendix A.

3.1.2 Question Design. The list of survey questions is shown in Table 1.

Use Cases of AI (RQ1): First, participants are asked to imagine the use cases of two variants of AI, *Tech-X* and *Tech-X 10*. Tech-X, while fictional, describes a technology similar to current generative AI, i.e., following an instruction to generate language and image output. Tech-X 10, on the other hand, describes a technology five to ten years into the future with a focus on its expert-level knowledge and creative problem-solving. For each variant, participants are asked three questions: whether the technology like the one described should exist or not (Q1, Q4; binary), their confidence in that opinion (Q2, Q5; 5-point Likert), and ideas on how the technology could be used (Q3, Q6; free-text). Finally, participants are asked to choose one brainstormed use case that would be changed *most drastically* through AI (Q7). *All subsequent questions ask specifically about the use case chosen in this step.*

Harms and Benefits of Developing (RQ2): Here, participants are asked to anticipate the use case's benefits and the two types of harms (i.e., malicious misuse, failure cases). Regarding the benefits and each type of harm, participants describe their impact (Q8, Q11, Q14; free-text), the group of people that might be impacted the most (Q9, Q12, Q15; free-text), and the scale of the impact (Q10, Q13, Q16; 8-point Likert[3]).

Harms and Benefits of NOT Developing (RQ3): Next, assuming a hypothetical scenario where the technology is not allowed to be used for the use case, participants are tasked to describe the impact of potential harms and benefits (Q17, Q20; free-text), most impacted groups (Q18, Q21; free-text), and the scale of impact (Q19, Q22; 8-point Likert[4]).

[3] Anchored scale to control for individual user interpretations. See Appendix A for details.
[4] See footnote 3.

Use Case Opinions (RQ4): Finally, to understand how participants perceive the permissibility of developing the use case, participants are asked to select whether the application should be developed (Q23; binary), the confidence in that answer (Q24; 5-point Likert), and how likely it would be that others would agree to that opinion (Q25; 8-point Likert[5]).

3.1.3 Participant Recruitment. We recruited 300 participants on Prolific to conduct the PARTICIP-AI survey.[6] To obtain diverse opinions representative of different social and demographic populations, we performed targeted recruiting across five different ethnic groups provided by the platform (i.e., Asian, Black, Mixed, Other, and White),[7] and across two age groups (i.e., 18 to 48, 49 to 100) that divides the US adult population in approximately half.[8] The recruitment resulted in 10 different groups with 30 participants each. These groups were balanced in male and female sex categories.[9] 295 participants responded to the survey. The survey took median 25.2 minutes. Participants were compensated at the rate of $9.67/hr. Our study was approved by an institutional review board.

Below, we describe a subset of participants' demographics; see §A.2 for a full description. Participants were White (29.8%), Black (21.7%), Asian (20.0%), Other (10.8%), and mixed (11.9%). They were aged 25-34 (20.3%), 35-44 (16.6%), 45-54 (28.8%), and 55-64 (19.9%). Participants largely identified as men (47.8%) and women (47.1%) and educational backgrounds ranging from bachelor's degree (40.3%), graduate degree (18.6%), and a high school diploma (10.8%).

3.2 Collecting Lay Users' Inputs: Data Analysis Methodology

We performed a mixture of *quantitative* (for questions whose answers in nominal or ordinal scales) and *qualitative* analyses (for questions with free-text answers) to extract insights from the collected survey data.

3.2.1 Quantitative Analysis. Quantitative analysis is conducted on data in nominal or ordinal scales, including opinions on whether a use case should be developed (Q1, Q4, Q23; binary), the scale of impact (Q10, Q13, Q16, Q19, Q22; Likert) and participants' rating of their confidence and anticipated agreement (Q24, Q25; Likert). We aggregate the percentage of responses for opinions, take the mean by theme for the harms and benefits scales, and conduct an exploratory factor analysis for the effects of harms and benefits on opinions of use case development.

3.2.2 Qualitative Analysis. We apply qualitative analysis to questions with free-form answers, using a coding practice [86] augmented with GPT-4[10] to aid in applying the human-generated codebook on the large-scale survey dataset. These questions include AI use cases (Q3, Q6, Q7), impact of benefits (Q8, Q20), impact of harms (Q11, Q14, Q17), and most impacted groups (Q9, Q12, Q15, Q18, Q21). See Appendix F for the codes and their definition.

Open Coding with Human Annotators. With three authors from our research team, we developed codebooks by performing open coding on approximately 25% of the data (80 samples). For questions on tasks and impact of harms and benefits (Q7, Q8, Q11, Q14, Q17, Q20), three authors developed codebooks independently, and then merged them into a shared codebook upon discussion with unanimous agreement. Next, the three authors apply the merged codebooks to all questions of each user sample. Individual low-level codes are grouped into a high-level *theme* during data analysis. In addition, we pre-process brainstormed tasks (Q3, Q6) using GPT-4 to standardize their expressions (see Appendix B.1

[5] See footnote 3.
[6] https://www.prolific.com/
[7] It's a noted limitation that the Prolific platform simplifies ethnic groups into this five categorization. Future work should consider broader ethnic groups beyond the platform restriction.
[8] US Census Data, Accessed on 11/29/2023.
[9] Due to the limitation of the Prolific platform, we are limited to consider automatic stratification over binary sex for balancing number of samples. See details in Prolific balanced sample description as well as §5 for further discussion.
[10] `gpt-4-1106-preview`

for further details). Finally, given the brevity and directness of answers, questions pertaining to groups impacted (Q9, Q12, Q15, Q18, Q21) were coded by a single author. For detailed description of the coding process, see Appendix B.2.

Closed Coding with GPT-4 Augmentation. Manually coding responses is prohibitive when the sample size is large; frontier language models such as GPT-3 and GPT-4 have shown promise in automatic qualitative coding [62, 106]. Thus, we applied GPT-4 to perform closed coding of the remaining 75% of the samples using the codebooks developed by our research team during the open coding process. We use the first two samples from the held-out data that we manually coded as few-shot examples to prompt GPT-4, and we evaluate the human and GPT-4 annotation agreement using the remaining 78 samples. In line with previous research [106], GPT-4 has moderate (0.41-0.60) to substantial (0.61-0.80) agreement [65] with the human annotators.[11] See Appendix B.3 for detailed prompts, settings, and additional metrics.

4 RESULTS: HOW DO LAY USERS PERCEIVE THE FUTURE OF AI?

We apply the PARTICIP-AI surveying framework with 295 participants via Prolific, and discuss the results in this section. Before jumping into the specific use cases, 86.1% and 85.4% of participants responded that the Tech-X and Tech-X 10 technologies "Should exist" (Q1, Q4), respectively, showing an overall positive attitude towards future AI technology. Analysis on questions such as anticipated groups affected by use case (Q9, Q12, Q15, Q18, Q20) can be found in Appendix D.2 and E.2.1.

Code / THEME	Quote	% responses Q3 1032×	Q6 992×	Q7 295×
DOMAIN		**55.0%**	**63.2%**	**67.8%**
Artistic expression	*"Make abstract art with my dog's picture"* (P13, Q3)	13.4%	3.4%	5.4%
Medical	*"Automating medical research"* (P54, Q6)	4.9%	10.5%	13.9%
Education	*"Teaching me how to code in different languages"* (P104, Q7)	11.1%	9.7%	10.5%
Research	*"Revolutionize scientific research"* (P203, Q6)	3.0%	8.5%	10.5%
Translation	*"Translations while traveling"* (P292, Q3)	8.0%	1.3%	4.1%
SUPPORT TYPE		**39.0%**	**39.3%**	**40.7%**
Efficient data analysis	*"Assist in personalized medicine by analyzing genetic data, medical histories, and current research..."* (P242, Q6)	8.9%	17.4%	19.0%
Professional consulting service	*"Mental health diagnosis and intervention...since...professionals often gets overwhelmed with their work."* (P203, Q7)	2.1%	6.3%	7.8%
Writing assistance	*"Adapting resumes to different job postings"* (P146, Q3)	11.5%	3.6%	2.7%
PERSONAL LIFE		**45.7%**	**39.2%**	**29.5%**
Everyday task automation	*"Summarizing important email content into a list"* (P293, Q3)	25.4%	22.1%	14.2%
Everyday life assistance	*"Assisting me with planning meal ideas that meet my family's dietary needs...[to] take much weight off my mental plate."* (P249, Q7)	17.8%	15.6%	13.9%
GOAL OF THE USE CASE		**26.5%**	**25.9%**	**33.6%**
Personal life productivity	*"Assisting with managing time spent on activities"* (P100, Q3)	8.8%	6.0%	10.2%
Creativity	*"Creating unique entertainment options that cater to individuals and evolve with them over time"* (P265, Q6)	12.4%	4.6%	6.4%
SOCIETY		**0.3%**	**8.7%**	**9.5%**
Societal issues	*"Predictive models that improve health and environment challenges."* (P28, Q7)	0.3%	8.7%	9.5%
WORK		**5.2%**	**6.8%**	**10.8%**
Human labor replacement	*"Replacing humans in customer interaction jobs"* (P282, Q6)	0.8%	4.8%	8.1%
Workplace productivity	*"Generate job reports that would take human hours"* (P86, Q6)	4.5%	2.5%	4.1%
OTHER		**0.8%**	**2.2%**	**4.4%**
New code	*"Find a way for the AI to destroy its own AI self"* (P25, Q6)	0.8%	2.0%	3.7%

Table 2. Tasks (Q3, Q6, Q7): percentage of occurrence for THEME and top few most frequent codes with representative quotes.

[11] Inter-rater agreement scores based on Cohen's κ [32] on validation set for each question: (Q7; κ=.59, Q8; κ=.51, Q11; κ=.66, Q14; κ=.67, Q17; κ=.62, Q20; κ=.58, Q9; κ=.77, Q12; κ=.85, Q15; κ=.87, Q18; κ=.85, Q21; κ=.82)

4.1 RQ1. What current and future use cases of AI are in the public's imagination?

First, participants brainstormed use cases regarding current (near-future) generative AI, i.e., Tech-X (Q3), and future-oriented (far-future) AI, i.e., Tech-X 10 (Q6) (**RQ1**). Participants also selected a task that would be most drastically changed by AI (Q7). We grouped the codes into the high-level *themes* to assist analyzing the results (see Table 2): DOMAIN, SUPPORT TYPE, realms of impact (i.e., WORK, PERSONAL LIFE, and SOCIETY), and GOAL OF THE USE CASE. While we present the high-level themes to highlight broader and general trends, more granular results can be found in Appendix C.

4.1.1 Current and Future AI Use Cases. Participants brainstormed a similar number of use cases across themes for both current (Q3, Tech-X; avg. of 3.5) and future (Q6, Tech-X 10; avg. of 3.4 tasks) technology. Across both questions, participants most commonly mentioned the DOMAIN of use cases (55.0%; Q3, 63.2%; Q6) compared to SUPPORT TYPE, GOAL, or realms of impact. However, use cases differed in their distributions within the theme: those for future technology emphasized domains such as `medical` (10.5%), `education` (9.7%), and `research` (3.0%) whereas those for the current version discussed `artistic expression` (13.4%), `education` (11.1%), and `translation` (8.0%). PERSONAL LIFE applications occured more frequently for Tech-X (45.7%) compared to Tech-X 10 (39.2%). In contrast, tasks surrounding impact to SOCIETY grew most drastically from Tech-X (0.3%) to Tech-X 10 (8.7%), suggesting people's interest in future AI applications to address societal issues. The distribution of the themes and codes are shown in further detail in Table 2.

4.1.2 Participant Selected Use Cases. Among tasks described as most revolutionized by AI, DOMAIN of applications was the most common theme (67.8%), covering `medical` (13.9%), `education` (10.5%), and `research` (10.5%) domains. The second most prevalent theme was SUPPORT TYPE (40.7%) containing top use cases related to `efficient data analysis` (19.0%) and `professional consulting service` (7.8 %). As in previous questions, PERSONAL LIFE (29.5%) related tasks were discussed more frequently compared to WORK (10.8%) and SOCIETY (9.5%) (details in Appendix C.1). Notably, participants selected more use cases that impact *the society* compared to previous questions (details in Appendix C.2).

4.2 RQ2. What are the harms and benefits of the use cases?

To answer **RQ2**, participants anticipated harms and benefits of their use case (qualitative; Q8, Q11, Q14), groups that could be harmed or benefited the most (qualitative; Q9, Q12, Q15), and the scale of impact (quantitative; Q10, Q13, Q16).

4.2.1 Harms of Developing. The harms of developing the selected use cases were grouped into ten high-level themes (see Table 3; left). We analyzed harms due to misuses (Q11) and poor performance (Q14) separately. For harms due to *misuses or unintended consequences*, participants most often mentioned SOCIAL AND PSYCHOLOGICAL EFFECT (35.3%) followed by ECONOMIC IMPACT (32.5%). Within SOCIAL AND PSYCHOLOGICAL EFFECT, the most common concerns were `manipulation of people` (12.9%) (e.g., "*control and manipulate information for human exploitation*" by P114), `misinformation` (12.5%), and `mental harm` (12.2%). For harms caused by the technology failing to do the task properly, participants most commonly discussed ECONOMIC IMPACT (33.6%), such as `financial disturbance` (20.7%) at the personal and business level and `economic disturbance` (9.8%) at the societal level. The second most discussed harm due to failure cases was PHYSICAL EFFECT (29.8%), such as `physical harm` (23.7%) and `negative impact to health and well being` (8.5%).

While the two types of harms showed different distributions of themes, the scale of harm is similar. Among all themes, REDUCING PROGRESS (7.50±0.84; Q13, 6.57±1.45; Q16) and PHYSICAL (6.70±1.40; Q13, 6.28±1.59; Q16) had the biggest scale of impact (see Table 3). While the two types of harm showed different distributions of themes, their scale of impact is similar. Among all themes, REDUCING PROGRESS (7.50±0.84; Q13, 6.57±1.45; Q16) and PHYSICAL (6.70±1.40;

Code	Quote & Scale of Impact (Q13 / Q16)	% responses Q11 295×	% responses Q14 295×
SOCIAL & PSYCHOLOGICAL EFFECT	**5.82±1.94 / 5.29±2.05**	**35.3%**	**26.4%**
Manipulate people	*"People would lose control potentially over important data, ideas..."* (P113, Q11)	12.9%	1.0%
Misinformation	*"It could give false information and confuse people as to where they don't know which source of information to trust"* (P126, Q11)	12.5%	10.8%
Mental harm	*"Loss of confidence and motivation: Repeated misunderstandings and failed interactions could lead to frustration and a reluctance to engage in...learning."* (P280, Q14)	12.2%	9.5%
Social isolation	*"It would harm...relationships...maybe [leading] to ostracism or loss of trust."* (P200, Q14)	2.4%	4.4%
ECONOMIC IMPACT	**5.39±1.70 / 4.63±1.75**	**32.5%**	**33.6%**
Financial disturbance	*"People would lose jobs and incomes"* (P93, Q11)	16.3%	20.7%
Economic disturbance	*"Shortage in suppliers or a raise in costs"* (P126, Q11)	12.9%	9.8%
Waste resources or time	*"Potentially leading to misguided decisions [and] wasted resources..."* (P250, Q14)	1.0%	9.5%
SAFETY & SECURITY RISK	**6.32±1.57 / 6.10±1.60**	**21.7%**	**7.8%**
Data security & privacy risk	*"It could be...compromising users' private data"* (P235, Q14)	10.5%	3.1%
Extinction	*"human race eliminated by machines"* (P220, Q11)	5.8%	2.0%
Aid criminal	*"It will lead to theft"* (P275, Q14)	4.1%	2.7%
PHYSICAL EFFECT	**6.70±1.40 / 6.28±1.59**	**16.9%**	**29.8%**
Physical harm	*"It could lead to serious injury or death."* (P215, Q14)	12.9%	23.7%
Negative health & well-being	*"People would become more unhealthy"* (P175, Q11)	3.4%	8.5%
QUALITY & RELIABILITY ISSUES OF AI	**5.16±1.76 / 5.43±2.12**	**15.9%**	**24.1%**
Incorrect AI output	*"Providing incorrect or incomplete medical diagnostics"* (P221, Q14)	9.8%	13.6%
Distrust AI	*"People would lose trust in technology"* (P72, Q11)	5.1%	5.8%
IMPEDING HUMAN DEVELOPMENT & LEARNING	**4.41±1.80 / 4.42±2.10**	**12.9%**	**12.5%**
Overreliance	*"[People] will not learn to do anything on their own"* (P274, Q14)	9.5%	6.8%
Impede learning	*"Diminished capacity for original ideas, maybe even critical thinking"* (P221, Q11)	3.7%	3.7%
Hinder career	*"The reputation of the developers would be ruined"* (P125, Q14)	1.0%	4.1%
REDUCING QUALITY & RELIABILITY OF SOCIETY	**5.70±2.01 / 5.48±2.09**	**12.2%**	**9.2%**
Distrust institution	*"The negative impact would be...decreased trust in the medical professionals..."* (P62, Q14)	5.8%	5.4%
Legal issues	*"Increased lawsuits."* (P95, Q14)	3.1%	4.1%
GENERAL HARM	**5.95±2.25 / 5.97±1.94**	**6.8%**	**11.5%**
General harm	*"More people would be hurt"* (P105, Q11)	4.7%	10.2%
Range	*"Could cause anything from minor issues to loss of life"* (P271, Q14)	2.0%	1.7%
REDUCING PROGRESS	**7.50±0.84 / 6.57±1.45**	**2.0%**	**4.7%**
Environmental harm	*"It could negatively impact fighting climate change"* (P23, Q14)	1.4%	1.7%
Hinder science	*"Delay scientific advancement and progress"* (P276, Q14)	0.7%	3.1%
OTHER	**3.30±3.22 / 4.28±2.83**	**4.4%**	**7.1%**
N/A	*"Many things"* (P216, Q11)	2.4%	2.7%
No harm	*"I can't think of any [harms]"* (P242, Q11)	1.7%	3.7%

Table 3. Harms of developing (Q11, Q14): percentage of occurrence for THEME with scale of impact (Q13, Q16) and corresponding top few most frequent codes with representative quotes.

Q13, 6.28±1.59; Q16) had the biggest scale of impact (see Table 3). While ECONOMIC IMPACT was a frequent theme overall, its perceived impact was lower (5.39±1.70; Q13, 4.63±1.75; Q16), especially for harms due to bad performance.

4.2.2 Benefits of Developing. The benefits of selected use cases are grouped into eight themes (see Table 4; right). The most prominent theme was REINVESTING HUMAN CAPITAL (52.5%), within which, `personal life efficiency` (35.6%) to "*save time effort and energy*" (P19) in personal life was mentioned the most followed by `personal growth` (16.9%), and `reducing mundane work` (13.2%). The second most frequent theme was ECONOMIC GAIN (43.7%), covering the benefit of `general efficiency` (31.5%) and `financial gain` (17.6%).

While REINVESTING HUMAN CAPITAL was the most frequently observed benefit, its scale of impact (5.13±1.86) was lower compared to IMPROVING QUALITY OF SOCIAL LIFE (6.76±1.17) and IMPROVING QUALITY OF PERSONAL LIFE (6.50±1.50). This suggests that while AI offers efficiency in reinvesting human capital, the more influential positive impact comes from improving the quality of life.

Code	Quote & Scale of Impact (Q10)	% responses Q8 295×
REINVEST HUMAN CAPITAL	**5.13±1.86**	**52.5%**
Personal life efficiency	*"Save time, effort, and energy...[and] allow a layperson to accomplish this task."* (P19)	35.6%
Personal growth	*"Since it's data driven, individual performances will be vigorously assessed and suggest ways by which an individual can improve."* (P47)	16.9%
Reduce mundane work	*"I would be able to focus on relationships and team building versus menial manager tasks that AI could complete for me."* (P157)	13.2%
ECONOMIC GAIN	**5.38±1.75**	**43.7%**
General efficiency	*"Companies will not need to have as many employees...because they'll be able to automate much of the workload...which will increase company profits."* (P209)	31.5%
Financial gain	*"It will save cost of different diagnostic tests."* (P211)	17.6%
RESOURCE ACCESSIBILITY	**5.58±1.62**	**35.9%**
Information accessibility	*"People need quick and reliable answers because not a lot of people have time for themselves...[and] can't deeply engage in topics they encounter in daily life."* (P53)	18.0%
Resource accessibility	*"It would give people more equity and assistance."* (P99)	15.6%
IMPROVE SOCIETAL ISSUES	**6.96±1.25**	**31.9%**
Improve medical care	*"Health care would be cheaper (hopefully) and more accessible to everyone"* (P109)	13.2%
Scientific research innovation	*"Research would be able to be done at a faster pace."* (P159)	11.2%
REDUCE ERROR	**6.11±1.57**	**16.9%**
Less human error	*"It could remove certain human biases"* (P171)	10.8%
Information quality	*"It could quickly detect lies said by politicians."* (P229)	9.8%
IMPROVE QUALITY OF PERSONAL LIFE	**6.50±1.50**	**15.3%**
Improve well-being & health	*"My family would have a healthier diet & they would live better lives."* (P238)	10.2%
Improve mental health	*"It would reduce the cases of mental illness in lonely people."* (P96)	5.4%
IMPROVE QUALITY OF SOCIAL LIFE	**6.76±1.17**	**8.1%**
Better communication	*"People would be able to communicate in different languages in real-time."* (P176)	5.4%
Social interaction	*"It would help me navigate through various social situations and problems, thus improving my social life."* (P200)	2.0%
OTHER	**5.25±2.17**	**5.4%**
New code	*"Help others with problems"* (P232)	2.7%

Table 4. Benefits of developing (Q8): Percentage of occurrence for THEME with scale of impact (Q10) and corresponding top few most frequent codes with representative quotes.

4.3 RQ3. What are the harms and benefits of *not* developing certain applications of AI?

To answer **RQ3**, participants brainstormed harms and benefits of not developing (qualitative; Q17, Q20), groups that could be harmed or benefited the most (qualitative; Q18, Q21), and the scale of impact (quantitative; Q19, Q22).

4.3.1 Harms of Not Developing. Responses on harms of not developing the use case are grouped into nine high level themes (see Table 5). The most common themes were LIMITING HUMAN POTENTIAL (32.9%) and LOSE INFORMATION AND ACCESSIBILITY TO RESOURCES (26.1%). By not developing the application, it's anticipated that there will be more `wasted resources or time` (13.2%) or `inefficiency` (12.2%), e.g., "*where people's lives are being wasted on unfulfilling labor for low pay*" (P110). Another major concern involves `losing assistance` for the task (11.5%) and `losing accessibility to solution and service` (9.8%). Unlike the answers on the harms of developing (Section 4.2.1), 23.4% of answers were categorized as OTHER, within which many answers mentioned there being `no harm` (16.6%), indicating that harms of not developing often does not exist or is harder to imagine compared to harms of developing (e.g., "*if it never gets develop [sic] we won't know what we are missing out on*").

Regarding the scale of impact (Q19; see Table 5), PHYSICAL EFFECT had the highest perceived impact of harm (5.14±2.62), similar to the scale of impact indicated in harms of developing. Participants also anticipate a high impact of LESS PROGRESS IN SOLVING SOCIETAL ISSUES (4.78±2.19), which, considering previous results, conveys solving societal issues an important beneficial area of AI.

Code	Quote & Scale of Impact (Q19)	% responses Q17 295×
LIMITING HUMAN POTENTIAL	**3.56±2.12**	**32.9%**
Waste resources or time	*"I waste so much time on these types of activities. Time that could be spent on productive things..."* (P39)	13.2%
Inefficiency	*"Government and public agencies will continue to operate in a wasteful and ineffective manner."* (P76)	12.2%
Impede personal growth	*"People would not be able to reach their potentials."* (P106)	11.9%
LOSE INFORMATION & ACCESSIBILITY TO RESOURCES	**4.14±2.04**	**26.1%**
Lose assistance	*"Immigrants would not recieve [sic] translation support easily."* (P122)	11.5%
Lose solution or service	*"Homeless need easier more accessible help..."* (P206)	9.8%
OTHER	**2.73±2.59**	**23.4%**
No harm	*"It wouldnt [sic] necessarily be harmful"* (P216)	16.6%
New code	*"It may be an emergency"* (P1)	4.1%
LESS INNOVATION	**4.64±2.08**	**15.9%**
Delay in innovation	*"It could slow down progress against climate change"* (P23)	9.5%
Less innovation	*"New technology would not be used to help man kind."* (P87)	8.5%
SOCIAL & PSYCHOLOGICAL EFFECT	**4.07±2.40**	**15.6.5%**
Stress & overworked	*"It would increase the workload and time spent on tedious tasks."* (P181)	10.8%
Mental harm	*"It would deprive people of an opportunity to address their loneliness"* (P96)	4.7%
LESS PROGRESS IN SOLVING SOCIETAL ISSUES	**4.78±2.19**	**13.9.5%**
Hinder medical care	*"Many individuals will continue suffering from ailments that...worsen in time."* (P117)	8.5%
Misinformation	*"Some people...find bad answers on the internet that make things worse"* (P246)	3.7%
ECONOMIC & BUSINESS IMPACT	**3.70±2.27**	**11.5.5%**
Financial disturbance	*"Individuals might lack access to highly personalized and good retirement strategies"* (P292)	4.7%
Economic disturbance	*"Increases cost and reduce employment"* (P16)	4.1%
LIMITED TO HUMAN CAPABILITIES	**4.39±1.64**	**9.5%**
Human error	*"Humans are biased...and often unable to combine various fields of thought."* (P88)	6.8%
Hinder creative work	*"It could hinder some people's ability to create."* (P120)	2.7%
PHYSICAL EFFECT	**5.14±2.62**	**8.5%**
Physical harm	*"it could've saved a lot of lives"* (P152)	5.8%
Health issues	*"My health will suffer."* (P30)	3.7%

Table 5. Harms of *not* developing (Q17): percentage of occurrence for THEME with scale of impact (Q19) and corresponding top few most frequent codes with representative quotes.

4.3.2 Benefits of Not Developing. Benefits of not developing the use cases had seven high level themes (see Table 6). The most reported benefit of not developing AI was HUMAN GROWTH AND POTENTIAL (43.4%), such as `less dependence on tech` (26.4%), `learning skills and knowledge` (20.7%), and `increased human interaction and dependence` on one another (13.2%). The second most common benefit was ECONOMIC IMPACT AND ECONOMIC SECURITY, such as `job security` (17.6%) and `financial benefits` (6.8%). Regarding the scale of benefit (Q22, see Table 6), BENEFICIAL SIDE EFFECTS OF NOT USING AI (e.g., `better health` and `environmental impact`) had the highest impact (4.75±2.71). HUMAN GROWTH AND POTENTIAL also had a high impact (3.95±2.71), showing an tension in delaying technological progress for the sake of not LIMITING HUMAN POTENTIAL.

4.4 RQ4. What creates tension between developing and not developing the applications?

We analyzed participants' opinions on whether the application should be developed or not to see the source of tension (**RQ4**). We also analyzed the confidence of their answer and how much they perceive others will agree with them. Most participants answered that the use case "should" (83%) rather than "should not" (17%) be developed.

4.4.1 Factors in Tensions over Development. To examine how considering harms and benefits impacted opinions on whether a use case should be developed, we ran a linear mixed effects model (see Table 7). Participants' answers were

Code	Quote & Scale of Impact (Q22)	% responses Q20 295×
HUMAN GROWTH & POTENTIAL	**3.95±2.08**	**43.4%**
Less dependent on technology	*"People would think critically and rely on the thoughts of other human beings who have a more nuanced understanding of real life situations then AI ever could."* (P113)	26.4%
Learning skills & knowledge	*"It would make it so more people would strive to learn the local language"* (P122)	20.7%
Human interaction dependence	*"I might have to communicate that I need help and hopefully would bring us together."* (P249)	13.2%
ECONOMIC IMPACT / SECURITY	**3.54±2.23**	**22.4%**
Job security	*"It will not take over peoples' jobs."* (P251)	17.6%
Financial benefit	*"The insurance companies and doctors...make more money off of multiple visits"* (P272)	6.8%
OTHER	**3.05±2.79**	**18.6%**
No benefit	*"I don't see any benefits"* (P272)	10.8%
New code	*"The company could put in more effort"* (P148)	4.4%
LESS BAD AI USAGE	**3.66±2.41**	**15.6%**
Less improper or unethical use	*"It would not allow for the potential harmful uses of the ai assistance"* (P235)	9.5%
More privacy	*"It would protect information of all and keep breaches at a minimum"* (P293)	4.4%
INCREASE TRANSPARENCY, CONTROL, & RELIABILITY	**3.34±2.06**	**12.5%**
More attentive	*"It could foster more personal involvement...in one's investment choices"* (P31)	7.1%
Human control	*"It allows for more deliberate, controlled, and transparent progress...fostering public trust and the responsible development of technology."* (P204)	4.1%
NO CHANGES	**3.26±2.33**	**7.8%**
Maintain status quo	*"There would really be no change in society, it would remain the same"* (P216)	5.8%
Other non-AI solutions	*"Advances in medicine woud still occur with use of other technologies and methods"* (P45)	2.0%
BENEFICIAL SIDE EFFECTS OF NOT USING AI	**4.75±2.71**	**2.7%**
Better health	*"People...[would]...seek qualified medical assistance, which could save their life."* (P43)	2.0%
Environmental	*"AI requires a lot of energy so not developing it will be good for the environment"* (P209)	0.7%

Table 6. Benefits of *not* developing (Q20): percentage of occurrence for THEME with scale of impact (Q22) and corresponding top few most frequent codes with representative quotes.

	Development Opinion (Q23)		Confidence (Q24)		Agreement (Q25)	
	Coefficient (SE)	p-value	Coefficient (SE)	p-value	Coefficient (SE)	p-value
Benefits of Developing (Q10)	0.16 (0.07)	$< .05$	0.17 (0.06)	$< .01$	0.20 (0.06)	$< .01$
Harms of Developing (Q13)	−0.08 (0.07)	0.30	−0.12 (0.06)	$< .05$	−0.10 (0.07)	0.19
Harms of Developing (Q15)	−0.12 (0.07)	0.08	−0.18 (0.07)	$< .01$	−0.08 (0.07)	0.22
Harms of Not Developing (Q19)	**0.27** (0.07)	$< .001$	**0.41** (0.06)	$< .001$	**0.29** (0.06)	$< .001$
Benefits of Not Developing (Q22)	**−0.20** (0.06)	$< .001$	**−0.23** (0.05)	$< .001$	**−0.22** (0.06)	$< .001$

Table 7. Effects of each benefit and harms scale to the development opinion -1, 1, confidence -4, 4, and agreement -8, 8. All scales were normalized and negative values denote opinion that the application should not be developed. Standard error is in parenthesis.

converted numerically for opinion,[12] confidence,[13] and perceived agreement.[14] *harms of not developing* consistently showed the most significant effect on opinions, confidence, and agreement that the application *should* be developed. Similarly, *benefits of not developing* showed the most significant effect on the opinion that the application *should not* be developed. These results highlight that considering *not developing* scenarios provides deeper insights into people's opinions about AI development than *developing* scenarios alone. Finally, despite the harms and benefits of not developing are use case specific, they reflect participants' general attitudes toward AI. Specifically, among people who believe their selected use cases should not be developed, 54.9% and 52.9% of them also think Tech-X (Q1) and Tech-X 10 (Q4) "Should not exist," respectively, higher than the proportion of answers over all the participants (13.9%; Q1, 14.6%; Q4).

4.4.2 Case Analysis. Ordering domains and themes by the number of use cases participants said should not be developed, applications that impact WORK (28.1%) ranked first, followed by SOCIETY (21.4%) and GOAL (18.2%); see Appendix E.2 for

[12] −1=("Should not be developed"), 1=("Should be developed")
[13] −4=("Should not be developed", "Extremely confident"), 4 ("Should be developed", "Extremely confident")
[14] −8=("Should not be developed", "Highly likely"), 8=("Should be developed", "Highly likely")

PID	Task Description (Q7)	Harms of Not Dev. (Q17)	Benefits of Not Dev. (Q20)	Conf. (Q24)	Agr. (Q25)
P189	*"public transportation that helps the disabled."*	*"wouldn't have a way to make things easier disabled people"*	*"human workers would keep their jobs"*	−4	−3
P32	*"driving cars for visually challenged and/or physically challenged people."*	*"Visually/physically challenged people will miss out on being more independent in the day-to-day activities."*	*"there would be no risk of malfunction during driving task."*	3	4
P175	*"buying groceries because then it could...change peoples' diets to be healthier"*	*"people would have to spend a day each week to buy groceries"*	*"people would be forced to go outside and interact in society to buy groceries"*	−2	−2
P10	*"helping me watch my diet and groceries on-hand... It would save me a LOT of time having to shop for groceries twice a week myself."*	*"It wouldn't be harmful. People would just go about making...grocery decisions like they do now. There is no negative impact...other than the simple lack of progress."*	*"People MIGHT start taking the initiative to be more knowledgeable and involved with their own diet and health goals instead of relying on an automated tool."*	3	5

Table 8. Case analysis of tasks for which participants indicated should not be developed (negative confidence and perceived agreement scores) compared to similar tasks that indicated otherwise. As their effects were most significant, harms and benefits of not developing are shown for comparison.

further analysis. Examples of similar tasks that participants said should and should not be developed are shown in Table 8. P189 and P32 both discuss reduced accessibility. P32 states that those negatively affected by not developing "*will miss out on being more independent*" (P32); however P189 reflects more on "*human workers*" keeping their jobs compared to P32. Meanwhile, P175 ("Should not be developed") and P10 ("Should be developed") discuss similar lack of assistance in addressing mundane tasks, but P10 noticed less reliance whereas P175 noticed not developing would force those affected to "*interact in society*". It is observable that in the examples that the participants thought the application should not be developed focused more on alternate solutions having additional benefits not addressable by technology whereas the others focused on the absence of possible harms from technology.

5 DISCUSSION & CONCLUSION

To address the need for participation from lay users in anticipating the harms and benefits of AI use cases, we introduced PARTICIP-AI, a framework to collect diverse AI use cases and to examine the impact (i.e., benefits and harms) of both developing and not developing them. We applied our framework and collected AI use cases from nearly 300 demographically diverse participants. We now discuss the implications of our findings on future work and public policy.

Benefits of AI: AI for Augmenting Life and Social Good. Our framework allowed lay users to evaluate and envision use cases of current and future versions of the AI technology. The brainstorming exercises in our framework uncovered a new array of AI usage highlighting personal life applications to augment everyday life, and societal applications to enrich the lives of everyone. At a personal level, participants expressed interest in automating everyday tasks, as well as to help with their personal growth, mental and physical health, and better allocation of resources (§4.2.2), echoing the need for AI design to allow greater stakeholder capabilities and liberties [22].

Participants showed strong interest in using AI to solve significant societal problems from advances in medicine to addressing inequality, global warming, and world hunger. These use cases, present a stark contrast to the current directions of AI development geared towards work and business productivity [61]. Future studies should explore methods to satisfy these public needs like digital commons [100], moving beyond profitability and work productivity.

Harms Envisioned by Lay Users. Our framework also enabled participants to reason through harms and benefits of AI use cases, where a unique set of harms emerged. This shows that lay users can anticipate the impacts of AI in their daily

lives, complementary to technical experts' assessment [95, 104]. While the themes had some overlap with Solaiman et al. [95], additional or more detailed harms were uncovered such as distrust in AI and technology, distrust in institutions, and stalled progress (§4.2.1). Experts also discussed harms that were not as common in participant responses such as environmental costs, and data labor, highlighting the complementary value of the approaches. We project that AI literacy could further empower non-expert public to surface and discuss more diverse and relevant harms [57].

Psychological harms such as manipulation, misinformation, and mental harm were among the most common concerns (§4.2.1), however, have been largely overlooked in current regulatory and academic discussions on AI. Some emerging works have examined the psychological impact of AI and automation (e.g., depression [63, 101], influence on autonomy [49, 51], over-reliance [59]); but the negative impacts of AI remains largely under-explored [42]. Concerningly, these intangible yet impactful harms would not be effectively remedied through law and policy like EU AI Act [79] or US liability case law [29]. Therefore, further studies to understand how AI affects mental health is paramount to establishing frameworks that can reveal harms to hold different actors accountable.

Considerations for AI Development: Techno-solutionism and Tensions of (Not) Developing. As seen with many examples [50], AI applied without careful consideration can exacerbate the already existing inequality by creating a hierarchy of the technology owner and the recipient, especially through its opaqueness [60]. In addition to the harms of AI such as disparate performance on majority vs. minority groups [26, 89, 90], risk of dual-use [52], and imposition of norms [88], the foregone benefits of non-technical solutions such as job creation, human involvement, and community building should be further studied and considered when discussing risks and harms of AI, as illustrated by our framework.

By presenting two alternate scenarios (to develop or not to develop) and collecting harms and benefits of each scenario, we analyzed the users' reasoning behind their choice of what use cases should or should not be developed. Our qualitative analyses showed that participants often emphasized the benefits of non-technical solutions, such as increased social interaction and job security when they opted for not developing the use case (§4.4.2), and positive impacts to indirect stakeholders. This highlights the need for discussions of often overlooked non-technical solutions and their benefits to various stakeholders, beyond the default persona of technology (i.e., a culturally prototypical user, often straight white tech-savvy men) [93], particularly those vulnerable and marginalized. Anticipation of consequences [38] in the process of deciding to build (or not build), thus, could be a promising direction towards an inclusive progress.

Participants' responses on harms and benefits of not developing the AI system also highlighted tensions around human growth and potential. Not developing a use case could reduce the efficiency of allocating human resources, but the absence of AI applications could fortify human worth and independence, spurring investment in human knowledge and skills. This dilemma underscores the tension between human's value in creation activities and its perceived competition with that of the machines. This resonates with creator groups' call for protective regulations for their work [2, 6] and researchers' warning against greater inequality from AI-induced productivity [24, 29, 56, 69]. Given these concerns, researchers, developers, and companies should consider immediate and long term impact of AI in labor to maintain the value of human work. In developing AI, a focus on implementing participatory approaches to ensure positive and mitigate negative impacts on affected communities [22, 36, 44]. Additionally, regulatory measures and economic policies must aim to ensure human value and equality in the distribution of AI-generated benefit [56].

Limitations. While we targeted demographically diverse participants [55], our demographics are skewed to people who reside in the United States and are English speakers. Additionally, demographics are skewed those who are technologically more comfortable due to the choice of our platform (Prolific) and choice of instrument (online survey). The platform provided pre-screening criteria rely on the automatic classification of participants by the platform.

Furthermore, while we manually checked that the quality of data acceptable for our study, decentralized nature of crowdsourcing-based studies, it is difficult to guarantee that data came from reliable and expected sources. The survey wording, formatting and ordering could have affected the participant answers [64].

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Racial Identity	***(N) (%)***	**Age**	***N (%)***	**Gender Identity**	***N (%)***	**Education**	***N (%)***
White or Caucasian	88 (29.8)	18-24	26 (8.8)	Woman	141 (47.8)	Bachelor's degree	119 (40.3)
Black or African American	64 (21.7)	25-34	60 (20.3)	Man	139 (47.1)	Graduate degree*	55 (18.6)
Asian	59 (20.0)	35-44	49 (16.6)	Prefer not to disclose	4 (1.4)	Some college *	48 (16.3)
Other	32 (10.8)	45-54	85 (28.8)	Genderqueer*	4 (1.4)	Associates degree*	36 (12.2)
Prefer not to say	10 (3.4)	55-64	56 (19.0)	Additional identity*	4 (1.36)	High school diploma*	32 (10.8)
Pacific Islander*	2 (0.7)	65+	19 (6.4)	Multiple Identities	2 (0.7)	Prefer not to say	3 (1.0)
Native American*	5 (1.7)			Agender	1 (0.3)	Some high school*	2 (0.71)
Mixed	35 (11.9)						

Table 9. Racial, age, gender identities and education level of participants. Asterisk (*) denotes labels shortened due to space. Additionally, "Other" racial identities included Hispanic/Latinx (*N*=26), and "Additional identity" included Non-binary (*N*=4). See Appendix A.2 for more detail.

A SURVEY

A.1 Scale Anchors

We anchored the scales we used for harms, benefits, and perceived likelihood of agreement. For example, we used the following scale to anchor the benefits: "Slightly beneficial (comparable to a free meal)", "Somewhat beneficial" (comparable to improving public transportation), "Very beneficial (comparable to saving a life)", and "Extremely beneficial (comparable to stopping a war or curing a disease)". For the scale of harms, we used anchors such as comparable to jaywalking, theft, arson, and terrorism in order of increasing degree of harm, and for agreement we used no alignment, slight preferences, equally split, majority winner but an ongoing debate, and a clear winner without further debate, as our anchors in increasing agreement.

Race - Other	*N*	Transgender	*N*	Sexuality	*N*	Political Leaning	*N*
Hispanic/Latinx	25	No	281	Straight (heterosexual)	216	Liberal	96
multi, Asian, caucasian	1	Yes	8	Bisexual	39	Moderate	74
Arabic Middle Eastern	1	Prefer not to disclose	6	Gay	11	Strongly liberal	66
Brown	1			Lesbian	7	Conservative	40
Middle Eastern	1			Pansexual	6	Strongly conservative	11
Black and white	1			Prefer not to disclose	6	Prefer not to say	8
West Indian	1			Asexual	3		
Indigenous American	1			Other	2		
Mexican American	1			More than one applicable	5		
Caribbean	1						
multi	1						
Sephardic jew	1						
asian, white and middle eastern	1						
Hebrew	1						
Cajun	1						

Table 10. Additional demographic identities

A.2 Participant Demographics

The main demographics of participants are included in Table 9. Additional demographics collected are shown in Table 10 and 11.

B CODING PROCEDURES

B.1 Pre-processing Details

Prompt. The prompt, system and user input, for parsing Q6 were the following:

Political Leaning	*N*	Longest Residence	*N*	Employment	*N*	Occupation (Top 10)	*N*	Religion	*N*
Liberal	96	United States of America	288	Employed, 40+	132	Other: please specify	29	Christian	98
Moderate	74	Philippines	3	Employed, 1-39	66	Health Care and Social Assistance	26	Agnostic	49
Strongly liberal	66	Guyana	1	Not employed, looking for work	40	Professional, Scientific, and Technical Services	26	Catholic	43
Conservative	40	Nigeria	1	Retired	18	Prefer not to answer	24	Nothing in particular	41
Strongly conservative	11	China	1	Other: please specify	13	Retail Trade	24	Atheist	36
Prefer not to say	8	Cuba	1	Not employed, NOT looking for work	13	Arts, Entertainment, and Recreation	22	Something else	10
				Disabled, not able to work	10	Information	22	Buddhist	6
				Prefer not to disclose	3	Educational Services	21	Jewish	6
						Finance and Insurance	20	Muslim	6
						Construction	13		

Table 11. Additional demographics

```
"system": "You are a helpful research assistant. You are processing public survey data
for a project involving tasks that AI can be used for. Carefully read the question and
participant answer, and parse the answer into separate tasks. All outputs should be in a
json format."
"user": "The following is the participant answer to the question "What are some tasks that
you might have Tech-X 10 help with or automate? This is a brainstorming exercise! Feel free
to answer with whatever comes to your mind."\n\n participant answer: "{}"\n What are the
mentioned tasks? Separate each task and provide them in a json format."
```

For Q3, we used the same prompt with a different question, and the curly brackets ({}) denote where participant answers would be filled in. For both Q3 and Q6, two parsed examples were given as fewshot examples.

Settings. We used `gpt-4-1106-preview` with the following settings: `max_tokens=128, temperature=0.0, top_p=1.0, frequency_penalty=0.0, presence_penalty=0.0, seed=42`. Moreover, for those stopped due to length, we increased the max_tokens parameter to 256.

B.2 Open Coding

The authors then performed open-coding on the 80 samples by inductively and independently generating codebooks. Codes were defined with a brief name and a description. Each sample was labeled with one or more codes. The authors then convened to merge the individual codebooks into a shared codebook by identifying similar codes and creating new a code for it. For the remaining codes, the authors unanimously agreed to add or delete the code. The shared codebook was then reapplied to the 80 data samples by unanimous vote by the three study authors. Finally, the study authors reconvened to organize the codes around themes, which were decided based on a unanimous vote.

To improve the clarity of the codes' names and definitions, we applied GPT-4 on the 80 samples and reviewed areas of disagreement between the authors and GPT-4. Only in the case where disagreements arose due to unclear or vague

code definitions or names, the field was updated. This iteration, however, was only applicable for one of the questions (Q7).

This open coding process was utilized for data on use cases (Q7), harms and benefits of developing (Q8, Q11, Q14), harms and benefits of not developing (Q17, Q20). We applied codebook developed from open coding use cases for data on brainstormed answers (Q3, Q6). For data on impacted groups by AI, as the answers were short and direct, a single author open coded 80 instances per question to develop the codebook and validation sets to measure agreement with GPT-4.

B.3 Closed Coding Setting

Prompt. We used the following prompts to apply our codebook:

```
"system": "You are a research assistant helping open coding of survey data. Carefully read the definition of each code and apply one or more codes to the participant's answer. All outputs should be in a json format."
"user": "Following are the codes and their definition.\n{}\n\nThis specific survey question asked: Ẅhat is one task you think AI will change the most drastically?̈\n\nSelect *one to four* most relevant codes **from the codes defined above** for the following participant answer. Format output into a json.\nparticipant answer: "{}"
```

The above prompt was for coding Q7, where first curly bracket was filled with codes and definitions and the second filled with participant answers. For all questions requiring coding, we followed similar template with the questions changed to reflect the original question. For all questions, two fewshot examples were given.

Settings. We used `gpt-4-1106-preview` with the following settings: `max_tokens=128, temperature=0.0, top_p=1.0, frequency_penalty=0.0, presence_penalty=0.0, seed=42`.

	Tasks	Harms and Benefits					Groups				
Metric	Q7	Q8	Q11	Q14	Q17	Q20	Q9	Q12	Q15	Q18	Q21
Avg.	.59	.51	.67	.68	.64	.59	.78	.86.	.88	.86	.82
Scott's π	.59	.51	.66	.67	.62	.57	.77	.85.	.87	.85	.82
Cohen's κ	.59	.51	.66	.67	.62	.58	.77	.85.	.87	.85	.82

Table 12. Agreement metrics between human and GPT-4 showing all moderate to substantial agreement. We report average observed agreement, Scott's π [91], and Cohen's κ [32].

B.4 Closed Coding Evaluation

As shown in Table 12, GPT-4 shows moderate to substantial agreement over all questions.

C EXTENDED ANALYSIS OF USE CASES

C.1 AI Use Cases for Personal Life

Use cases for personal life were more common in participants' answers compared to ones impacting work and society, resulting in a wide array of application ideas to improve everyday life as shown in Table 13. One commonly observed type of application was information seeking such as `search`, `feedback`, and `simplification` in a more personalized and "*specific*" (P245) ways that current search engines cannot yet provide. Participants also emphasized tools for not

Personal life applications			
Search	Q3	P245	"*Finding specific recipes with specific ingredients*"
Feedback	Q3	P107	"*Providing ideas on how to improve in certain hobbies*"
		P46	"*Advising on how to discuss sexuality with family without angering them or turning the conversation into an argument*"
Simplification	Q3	P210	"*Helping people understand complex information related to healthcare, such as doctor's forms/letters, health insurance forms, taxes, etc.*"
Efficient data analysis	Q6	P75	"*Help with resource allocation that maximizes benefit for utilities and food*"
Writing assistance		P51	"*Writing a CV/resume that tailors the job description*"
Health	Q3	P14	"*Creating an exercise routine*"
	Q6	P87	"*Replace doctor visits for non-life-threatening ailments*"
Mental health	Q6	P143	"*Monitoring health data and providing personalized insights and recommendations for maintaining physical and mental health*"
Personal finance	Q6	P184	"*Assist with budgeting and finances for people who struggle with budgeting*"
Personal life productivity	Q3	P26	"*Provide a schedule to accomplish everything I want to get done today or this week*"
Accessibility marginalized*	Q6	P184	"*Make technology more accessible to those with limited understanding or disabilities*"

Table 13. Examples of personal life applications, items that were coded with everyday life assistance, everyday task automation, etc., along with their additional characteristic codes. Code condensed due to space marked with (∗).

only synthesizing large amount of public data such as research and information but also from personal data to provide "*personalized insights*" (P143). Other applications were in assistance or automation of everyday tasks such as email writing, cooking, shopping, and repairs. Additionally, participants showed interest in using AI for improving physical and mental health, for better resource and time management, and for providing accessibility to all these personal life tasks for those who have difficulties.

C.2 AI Use Cases for Society

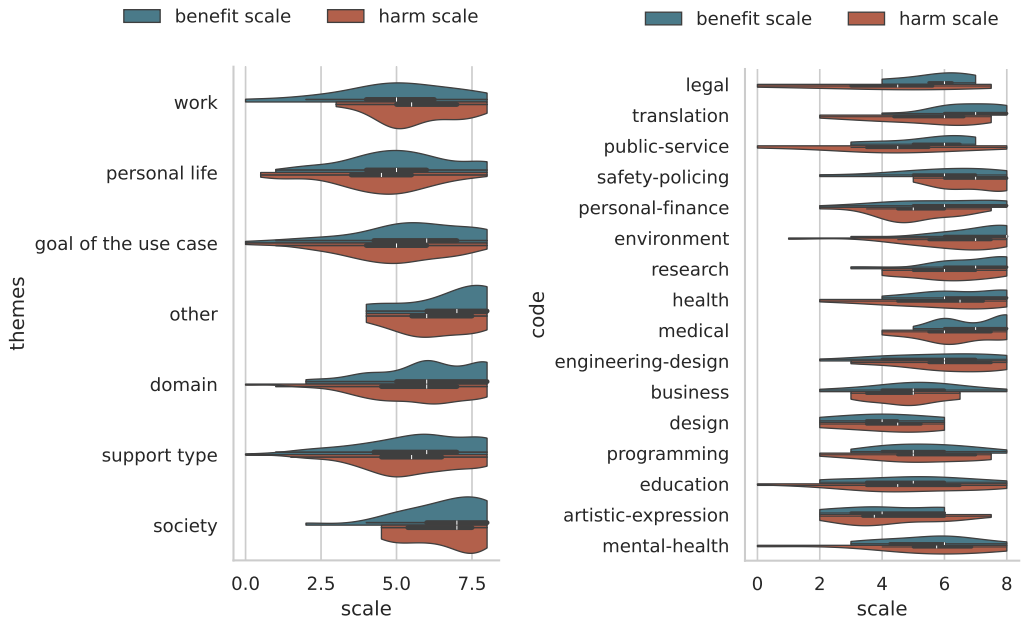
As participants brainstormed use cases for a futuristic version of technology (Q6) and selected an application with the most drastic change (Q7), discussion of societal applications increased. Some common AI support included finding new and creative solutions to societal issues such as "*Helping corporations get out of the boxed idea of the bottom line and become stewards to this planet...*" (Q7, P13) highlighting environmental challenges and "*solving or coming up with new way of finding a solution to poverty and homeless*" (Q7, 68) and "*Propose ways to make education more affordable for all*" (Q6, P67) focusing on inequality and resource allocation challenges. Applications targeting current issues were also mentioned including "*helping to eliminate false facts and rhetoric, often hateful, from social and mainstream media.*" (Q7, P161) and "*mediation between countries at war*" (Q6, P206).

D EXTENDED ANALYSIS OF HARMS AND BENEFITS OF DEVELOPING

D.1 Harms and Benefits of Use Cases

We plot the scales of impact for harms (Q13, Q16) and benefits (Q10) aggregated and averaged by themes and codes of corresponding use cases (Q7) in Figure 1. Noticeably, use cases that discuss WORK had a higher mean on the scale of harm (5.75±1.35) compared to benefit (4.94±2.08). PERSONAL LIFE use cases, on the other hand, had higher mean benefit (5.12±1.84) than harm (4.43±1.82). Disregarding the theme other, use cases that considers societal applications had the highest mean in both benefit (6.57±1.47) and harm (6.51±1.24).

Moreover, domains such as legal, translation, public service had the highest difference in their perception of benefit compared to their harms. While most domains had higher perceived benefit with AI applications compared to harms, domains such as safety policing, engineering design, and design had higher perceived harms compared to benefits. The domain of application that was perceived to be the most beneficial was in the use cases for the



(a) Benefits and harms scale averaged by task theme. (b) Benefits and harms scale averaged by task DOMAIN.

Fig. 1. Distribution of the harms and benefits scale by use case theme and domain sorted in order of decreasing absolute mean difference of benefit and harm. White mark indicates median, and black box within indicates quartile.

`environment` with mean of 7.00±1.41 on the scale of harm and safety policing was perceived to be the most harmful with a mean of 6.91±1.07 on the harms scale.

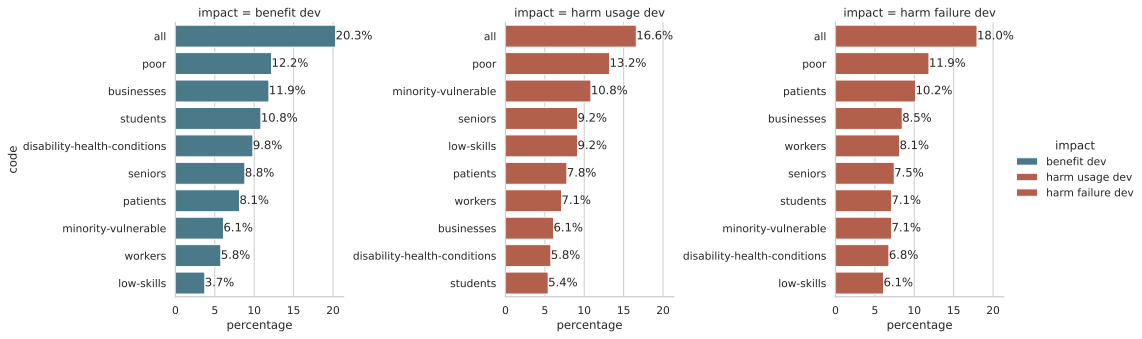


Fig. 2. Distribution of top few codes mentioned in groups impacted the most by the use case (Q9, Q12, Q15).

D.2 Groups Affected by Developing

Some most frequently mentioned groups that participants selected to be benefiting or harmed the most by the use case are shown in Figure 2. The distribution of the top two most frequent were similar across the three questions, codes `all`

(all people) (20.3%; Q9, 16.6%; Q11, 18.0%; Q15) and `poor` (12.2%; Q9; 13.2%; Q11, 11.9%; Q15), showing participants' interest in AI to improve accessibility and to help attain resources to improve the lives of everyone, especially those who do not have access due to lack of monetary means. However, the starting from the third most commonly affected groups, the distribution diverges. `Businesses` were the third most commonly occurring group that would benefit the most. `minority and vulnerable` (10.8%; Q12) were mentioned to be third most frequent as being harmed the most in cases of misuse, highlighting the understanding that AI applications might further drive inequality or would be misused to harm the vulnerable population. `patients` (10.2%; Q15) were also frequent in the groups to be harmed the most by failure cases, conveying the participants' interest in medical and health applications, however, failures being high risk.

E EXTENDED ANALYSIS OF HARMS AND BENEFITS OF *NOT* DEVELOPING

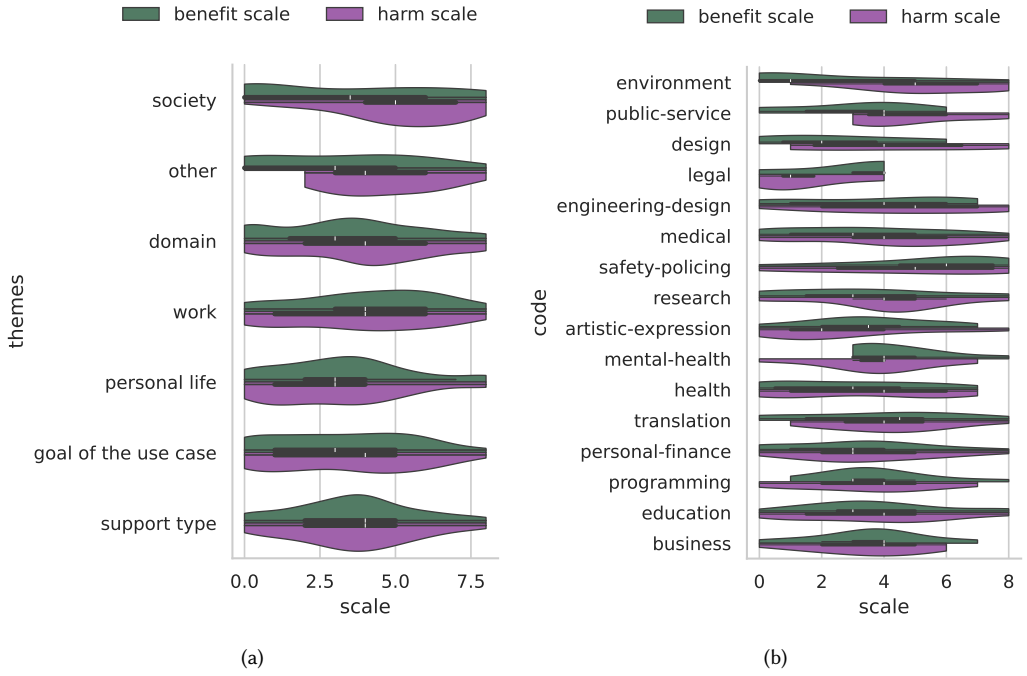


Fig. 3. not developing use case scale

E.1 Harms and Benefits of Not Developing Use Cases

Scale of harms (Q18) and benefits (Q21) of not developing aggregated by themes and codes of corresponding use cases (Q7) and sorted by descending order of mean absolute difference is shown in Figure 3. The use cases that impacted society had the highest mean difference between harms of not developing (5.14±2.12) and the benefits of not developing (3.32±3.15). Work and personal life applications both had higher benefit of not developing, however, with personal life (3.32±2.27; Q21, 3.05±2.25; Q18) having a lower difference than work (4.11±2.38; Q21, 3.64±2.54; Q18). These results are consistent with the analysis detailed in Section **??** of harms and benefits of developing in that work related applications are perceived to be more harmful to develop and beneficial to not develop, suggesting concerns of labor replacement.

Theme	Example Tasks (Q7): *Should not be Developed*	Distribution
WORK	*"To replace employees in white collar jobs"* (P50)	72% 28%
SOCIETY	*"Assessing the metrics of a social problem..."* (P76)	79% 21%
GOAL	*"public transportation that helps the disabled."* (P189)	82% 18%
DOMAIN	*"Give medical advice and health care prescriptions"* (P109)	82% 18%
PERSONAL LIFE	*"Create a meal plan and shopping list."* (P242)	86% 14%
SUPPORT TYPE	*"fact check political debates"* (P229)	87% 13%
OTHER	*N/A*	92% 8%

Should be developed Should not be developed

Table 14. Development opinions aggregated by use case (Q7) THEME.

Moreover, uses of AI that helps societal issues are seen as having both high benefit and harms but also seen as harmful to not develop, indicating a fundamental tension.

E.2 Use Cases: Should not Be Developed

Use case decision (Q23) aggregated by theme is shown in Table 14. As discussed in the main results, WORK had the highest percentage of responses that the application "Should not be developed", and interestingly PERSONAL LIFE application had the lowest percentage of the same answer compared to other realms of impact.

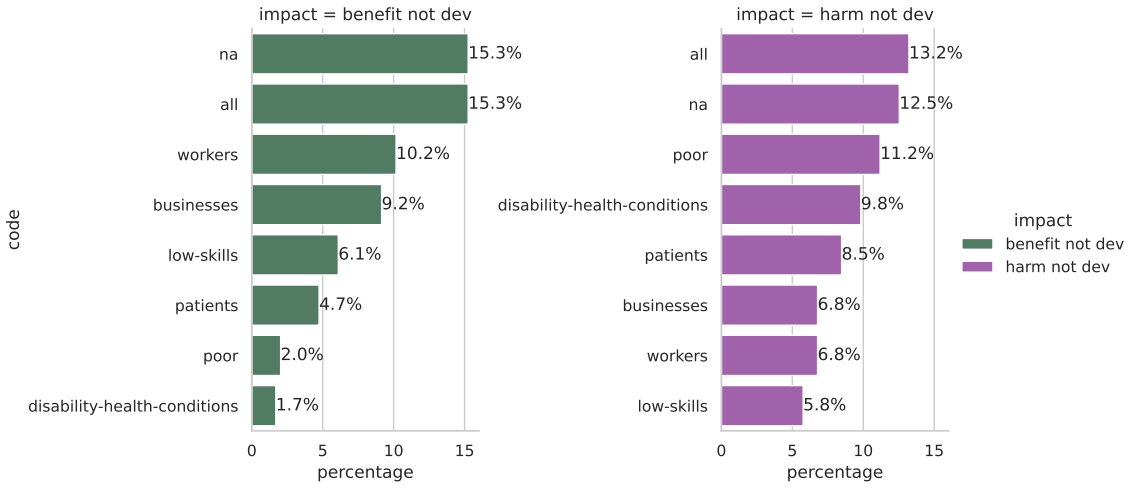


Fig. 4. Distribution of top few codes mentioned in groups impacted the most by *not* developing (Q18, Q21).

E.2.1 Groups Affected by Not Developing. Participants were less likely to write that any group would benefit or be harmed the most if the use cases were not developed (see Figure 4). However, participants mentioned `workers` and `businesses` benefiting when the use cases were not developed more frequently compared to mentioning those characterized with fewer resources (e.g., `poor`) in contrast to those harmed from not developing. This again highlights the tension over AI development, which could help alleviate inequality of resources and can become harmful to workers.

F CODES

Here we detail codes developed in §3 in order as they appear in main text.

Table 15. Codes and their definition for Q7 (tasks).

Code	Definition
education	Applications for educational purposes that is traditionally tought in schools or follows a curriculum
legal	Applications in legal domain
medical	Applications in the medical domain
health	Applications in health and well-being
mental-health	Applications in mental health both specialized and therapeutic everyday assistance
business	Applications in businesses such as profit enhancement tools for growth projection supply chain applications advertisement etc.
personal-finance	Applications in personal finances such as bill paying insurance taxes etc.
artistic-expression	Applications in the arts such as story creation image generation for paintings etc.
engineering-design	Applications for creating engineering designs for houses cars buildings etc.
programming	Applications for programming software applications
public-service	Applications for government work and public service
physical	Applications that offer physical assistance
translation	Applications for translation
companionship	Applications to function as a companion (e.g. babysitter bot to talk to when lonely tutor etc.)
interpersonal-communcation	Applications for assisting communication especially interpersonal (e.g. improve expression of self emotional / social connection etc.)
practical-skill-learning	Applications for practical skill learning such as repair cooking etc.
everyday-task-automation	Applications to automate mundane everyday tasks such as shopping meal-planning paying bill etc.
everyday-life-assistance	Applications to assist and optimize everyday life (e.g. organizing journal entries for self-discovery optimal scheduling)
feedback	Applications that can give suggestions and feedback for improvement
fact-checking	Applications to help with fact checking information
workplace-productivity	Applications to assist at workplace to increase productivity and hep with more mundane tasks but not fully automating the job
human-labor-replacement	Applications that replace human laborers such as robots robot servers which are more physical / menial but also experts such as legal medical financial business etc.
professional-consulting-service	Applications to give expert advice suggestions and services (e.g. medical or financial consulting)
beyond-human	Applications that leverages AI for beyond human capabilities
efficient-data-analysis	Applications that perform large scale data analysis or fast data analysis in a manner that is resource intensive for human alone - explicitly mentions data and analysis
search	Applications for search and sense making
writing-assistance	Applications for writing such as providing grammar edits or suggestions
image-generation	Applications for image generation from artistic images to practical ones such as concept art figures etc.
creativity	Application descriptions that specify a sense of creativity by using specific words that indicate creativity for example creative story telling creative advertisement etc.
simplification	Applications that simplify the task for example through summarization
embodiment	Applications that are embodied or require control in physical environment
research	Application that conducts open-ended research and performs knowledge discovery by asking and answering questions
design	Applications that aids design of objects and systems with a focus on creativity holistic approach user experience and aesthetics
math-problem-solving	The application is for solving math problems
mystery-crime-solving	The application is for solving mysteries and crimes
safety-policing	Applications for safety and policing purposes to reduce crimes
environment	Applications for environmental purposes such as reducing waste helping climate change etc
societal-issues	Applications for solving societal issues such as human trafficking cliamate change etc.

brainstorming	The answer mentions that the application's goal is to provide a new angle to solve problems using brainstorming
business-productivity	The answer mentions that the goal of the application is to help businesses to cut down on resources or create more output and profit
personal-life-productivity	The answer mentions that the goal of the application is to make them more productive in their life personally or to save a lot of time for themselves
societal-productivity	The answer mentions that the task will be more efficient and the application will help make the society more productive
accessibility-marginalized-disabled	The participant answer mentions that the goal of the application is to marginalized and disabled people will be able to get help
lower-barriers-resources	The participant answer mentions that the goal of the application is to lower barrier to resources
new-code	None of the above codes apply but the answer is still meaningful so a new code is needed
na	The participant answer does not make sense in the context

Table 16. Codes and their definition for Q11 & Q14 (harms of developing).

Code	Definition
manipulate-people	Harm that misleads people to make choices that do not benefit them and is deceptive or fraudulent
misinformation	Harm that causes people to believe in false information or incorrect state of the world by intentionally providing misleading knowledge i.e. spreading misinformation
bias	Infringement of social justice by spreading prejudice and bias
mental-harm	Mentally harm or upsets people by hurtful outputs and spread of negative information
overreliance	People becoming dependent on technology and overtrusting and overrelying on them leading to diminished abilities to complete the task
physical-harm	Technology leads to physical harm such as injuries and deaths
war	Technology is used for wars or leads to wars and physical harm at a societal or global level
economic-disturbance	Technology causing wider economic harms and disturbances such as widespread job loss or depression
financial-disturbance	Technology causing more individual or smaller scale financial loss or property damage
human-labor-replacement	Technology causes job loss and replacement of human labor force causing unemployment
social-isolation	Technology causes weakened interpersonal connection especiallh with family and friends leading to isolation
range	Technology causes a range of harms from very small impact to serious and more wide-spread harms
aid-criminal	Technology is used to aid criminal activity
distrust-ai	Technology or complicated output leads to distrust or underuse of the AI application
distrust-institution	Technology leads to distrust of institutions such as the healthcare system
data-security-privacy-risk	Privacy is invaded or data is lost through the use of technology or data is used in a negative way to benefit other stakeholders rather than the user
plagirism	Technology plagirizes the existing work or copyrighted work
damaging-creativity	Technology damages creativity or leads to unoriginality
hinder-career	Technology causes career damage
incorrect-ai-output	AI output being unintentionally incorrect or erroneous leads to different harms to users such as misdiagnosis or incorrect advice
legal-issues	AI causing legal issues such as law suits due to illegal outputs
impede-learning	AI causes people to not learn or grow as much
social-division	AI causes social division and leads societal spread of hate or distrust
extinction	AI leads to extinction of some sort such as group of people human race other animals or culture
minority	AI leads to harming minority or underrepresente groups
waste-resources-or-time	Technology leads to wasting resources such as time in development and is useless
unqualified-accessibility	Technology makes certain tasks too easy so that non-qualified people or bad actors have better accessibility to these tasks
terrorism	Technology leads to aiding terrorists for example in making weapons or bombs
business-use	Technology is used by businesses to maximize profit
non-war-military-use	Technology is used by the military for non-war purposes
lower-quality	Technology lowers the quality by making mistakes or creating homogenious outputs which are worse than human work
information-access	Technology prevents access to information

general-harm	Risks security through lack of safety checks or the application is rendered unsafe and can harm or hurt users in unspecified ways
hinder-science	Hinders scientific breakthroughs
no-harm	No harms caused
miscommunication	The use of application leads to miscommunication
negative-health-wellbeing	Technology causes negative health outcome
hinder-medical-care	Technology causes hindrance to medical and healthcare advancement and application
environmental-harm	Causes environmental harm or allows continued environmental harm such as climate change
hacking-risk	AI could be hacked by bad actors to be used for malicious tasks
new-code	None of the above codes apply but the answer is still meaningful so a new code is needed
na	The participant answer does not make sense in the context

Table 17. Codes and their definition for Q8 (benefits of developing).

Code	Definition
scientific-research-innovation	Advances science research innovation and discovery
improve-medical-care	Improves medical care
specialized-resources-accessibility	Allows specialized resources such as medical mental legal or financial resources and services more available
information-accessibility	Allows information to be more accessible
resource-accessibility	Provides resources more accessible for everyday or life tasks
personal-life-efficiency	Allows people to be more productive with less time and effort to solve tasks faster and easier
reduce-mundane-work	Reduces mundane work in everyday life
improve-mental-health	AI application improves mental health
companionship	Provides companionship
social-interaction	Provides assistance in social interaction
better-communication	Allows people to communicate more effectively especially with less misunderstanding
more-production	Application allows more production of goods or services through automation or reducing overhead of human labor
personal-growth	Allows opportunities for personal growth or learning
enhancing-creativity	AI tool inspires more creativity
financial-gain	AI application leads to financial gain
safety	AI helps make the world safer by handling dangerous situations or improving policing
less-human-error	AI helps reduce human errors or bias
information-quality	AI assists in improving information quality by fact-checking or ensuring that the infromation is correct
improve-well-being-health	AI improves well-being fitness and health
improve-societal-issues	AI improves societal issue
save-life	The tecnology can save lives
general-efficiency	The technology offers general efficiency in speeding up the process or reducing needed resources
no-benefit	The answer says there is no benefit to the technology
new-code	None of the above codes apply but the answer is still meaningful so a new code is needed
na	The participant answer does not make sense in the context

Table 18. Codes and their definition for Q17 (harms of not developing).

Code	Definition
less-innovation	Not using AI will lead to less innovation leading to stagnation of society
delay-in-innovation	Not using AI will delay the rate of growth or breakthroughs however it might be possible for humans to get there without AI but just slower
misinformation	Lack of AI usage continues division or mislead people with incorrect information
waste-resources-or-time	Not using AI makes the task less efficient

business-loss	Businesses or companies losing profit
financial-disturbance	Financial loss at a smaller scale such as personal finance
unemployment	People losing jobs
physical-harm	Not using AI leads to physical harms such as death and injury
impede-personal-growth	People lose the opportunity to grow or achieve without the help of AI
human-error	Without AI human errors can be harmful
mental-harm	Not developing the application leads to worse mental health such as anxiety depression loneliness etc.
health-issues	Lack of AI assistance causes people to be unhealthy
stress-overworked	Causing people to be overworked or be stressed because of the lack of automation offered by AI
inefficiency	People will have to find another way that is not dependent on AI to solve the issue would cause some inconvenience but not disruptive
environmental-harm-continues	Global warming and other environmental issue continues
lose-transparency	Lack of AI assistance to understand complex systems leads to less transaprency
hinder-communication	Without the application there will continue to be misunderstandings and difficulties in communication
hinder-creative-work	Without the application products will become less creative limited to human creativity
lose-tech-race	Lack of development will lead to losing technical race between countries and cause political tension
hinder-medical-care	Not devloping the application will hinder patients from getting better medical care or treatment
lose-information-knowledge	Not developing the application will lead to loss of information and knowledge
lose-accessibility-solution-service	Not developing the application will lead to losing one of the solutions to a problem or service
lose-assistance	Not developing the application will result in less help and assistance for the task
economic-distrubance	Leads to economic distrubance such as cost increases at a larger scale
no-harm	There is no harm of not developing the application
new-code	None of the above codes apply but the answer is still meaningful so a new code is needed
na	The participant answer does not make sense in the context

Table 19. Codes and their definition for Q20 (benefits of not developing).

Code	Definition
less-dependent-on-tech	Make people less dependent on technology and self reliant in that they will have the skills to complete the tasks themselves
less-improper-unethical-use	Generally reduces misuse or ethical concerns of AI
relieve-plagarism	Relieves plagiarism issues
more-privacy	Preserves data privacy
job-security	Preserves employment and job security
learning-skills-knowledge	People would learn more without AI
human-interaction-dependence	People will interact more with real people and not AI increasing social interaction and interpersonal relations learning to depend on each other and invest in each other
environmental	The environmental harms will be reduced
creativity	Without AI people will be more creative and outputs will be more unique
less-misinformation	Using AI for generation or spreading of misinformation would be avoided and reduced
maintain-status-quo	Without the disruption of AI the current world will continue as is i.e. social order will not be disrupted and will continue to develop at the current pace
financial-benefit	Without AI people will continue to pay for services and their providers as before increasing their financial benefit
empathy	Without AI interactions and services will be more empathetic
higher-quality	Humans will create higher quality outputs with less ai errors
better-health	Results in better physical and mental health
human-control	Humans will be able to control from their understanding of the process for certain tasks
more-attentive	People will be more attentive to the task and lead to more understanding of the underlying problem
human-brilliance	The world will rely more on human brilliance leading to more investment and celerbration of human ingenuity
other-non-ai-solutions	Development will happen even if the application is banned through other non-ai solutions
no-benefit	Participant answer specifies that there is no benefit

new-code	None of the above codes apply but the answer is still meaningful so a new code is needed
na	The participant answer does not make sense in the context

Table 20. Codes and their definition for coding groups (Q9, Q12, Q15, Q18, Q21).

Code	Definition
researchers-scholars	People who are researchers (e.g. scientists) or scholars experts
low-skills	People with limited skills education knowledge or critical-thinking
adults	People who are adults but not elderly
youth	Young people
seniors	People who are old
lawyers	People who are lawyers
lawyer-clients	People who are clients of lawyers
rich	People who are rich or in a high socioeconomic status
poor	People who are not rich or engage in risky financial habits
middle-class	People who are in the middle class
tech-access	People who do have access to cutting-edge technology
no-tech-access	People who do not have access to cutting-edge technology
it-professionals	People who work in the IT industry such as software engineers
engineers	People who are engineers
internet-users	People who use the internet
anti-technology	People who are skeptical of technology
teachers	People who teach others
students	People who are students or engage in learning
coaches	People who are coaches
athletes	People who are athletes
english-speakers	People who only speak English for a language
nonenglish-speakers	People who do not speak English
citizens	People who are American citizens and have privileges only granted to these citizens such as voting
immigrants	People who are immigrants
developing-nations	People who live in developing nations
travelers	People who travel or are interested in other cultures
democrats	People who are Democrats or left-leaning
republicans	People who are Republicans
doctors-nurses	Healthcare professionals such as doctors and nurses
patients	People who are patients or are receiving healthcare
businesses	Businesses people who own businesses or high-level executives
consultants	People who are consultants
consumers-stakeholders	People who are consumers or stakeholders of a service or product
workers	People who work professionally
busy-people	People who are busy or have limited time due to other pressing commitments
disability-health-conditions	People who have physical and mental disbilities or preexisting or chronic health conditions
nd-people	People who are neurodivergent
mental-health	People who have mental health conditions
single	People who are not married or single
families	A family
religious-minority	People who belong to a minority religious gruop
christian	People who are Christian
racial-minority	People who are racial minorities and are not White
white	People who are White
do-drive	People who drive
don't-drive	People who do not drive or are passengers
men	People who are men
gender-minority	People who belong to a minority gender group

lgbtq	People who belong to the LGBTQ community
government-officials	Government institutions or people who work for such institutions
crime-victims	People who are negatively impacted by a crime including crime victims victims' families or people falsely accused of crimes
activists	People who advocate for any social cause
criminals	People who are criminals or engage in illegal activity
all	All people in the world
minority-vulnerable	People who belong to groups that are minoritized or generally vulnerable
na	There is no valid group
remote-location	People who live in remote areas
urban	People who live in urban environments
artists-creatives	People who are artists or engage in creative work
chefs	People who cook
high-power	People who have large amounts of influence or power
me	The response references the person writing the response

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