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Identifying the Public's Beliefs about Generative Artificial Intelligence: A Big Data Approach

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Abstract— **In an era where generative AI (GenAI) is reshaping industries, public understanding of this phenomenon remains limited. This study addresses this gap by analysing public beliefs about GenAI using the Technology Acceptance Model (TAM) and Diffusion of Innovations Theory (DOI) as frameworks. We adopted a big-data approach, utilising machine-learning techniques to analyse 21,817 public comments extracted from an initial set of 32,707 on 44 YouTube videos discussing GenAI. Our investigation surfaced six pivotal themes: concerns over job and economic impacts, GenAI's potential to revolutionise problem-solving, its perceived shortcomings in creativity and emotional intelligence, the proliferation of misinformation, existential risks, and privacy decay. Emotion analysis showed that negative emotions dominated at 58.46%, including anger (22.85%) and disgust (17.26%). Sentiment analysis echoed this negativity, with 70% negative. The triangulation of thematic, emotional, and sentiment analyses highlighted a polarised public stance: recognition of GenAI's transformative potential is tempered by significant concerns about its implications. The findings offer actionable insights for engineering managers and policymakers. Strategies such as awareness-building, transparency, public engagement, balanced communication, governance, and human-centred development can address polarisation and build trust. Ongoing research into public opinion remains essential for aligning technological advancements with societal expectations and acceptance.**

Index Terms— **Generative AI, public's beliefs and attitudes, big data, thematic analysis, emotion and sentiment analyses.**

Managerial Relevance Statement—**This study provides engineering managers and policymakers with actionable insights into public perceptions of generative AI (GenAI). Understanding these public beliefs enables managers to develop targeted strategies that address concerns such as job displacement, ethical AI development, and public trust. Investing in workforce reskilling and encouraging human-AI collaboration can enhance innovation and maintain a competitive edge. Establishing ethical guidelines and engaging with the public can build trust and facilitate smoother integration of AI technologies. Implementing these action plans based on our findings can lead to increased public acceptance, sustained productivity, and long-term business sustainability.**

I. INTRODUCTION

Generative AI (GenAI), exemplified by systems such as Large Language Models (LLMs), including ChatGPT, is at the forefront of technological breakthroughs, creating everything from textual responses to advanced medical imaging analyses [1, 2]. Its influence (see Appendix 1 for example studies) spans numerous industries, transforming manufacturing, supply chain management, and product development [3, 4]. As of 2023, approximately 40% of respondents worldwide report having used GenAI [5], indicating its rapidly growing presence across various domains. Despite this growth, concerns are rising regarding issues such as privacy, bias, equity, the digital divide, and the opaque, black-box nature of GenAI systems, which hinders transparency and trust in AI technologies [6, 7].

Exploring public attitudes towards GenAI is crucial since societal acceptance and trust significantly shape the development and application of AI technologies across essential areas [8, 9]. Public perception and acceptance substantially influence GenAI's integration into sectors such as healthcare, education, public services, and industrial operations [10, 11]. With 21% of businesses expected to have GenAI fully integrated into their operations in 2024, understanding public sentiment is increasingly important. Engaging stakeholders effectively requires a deep understanding of public beliefs and attitudes toward GenAI, essential for informing policy and strategic decision-making within organisations and governments [12, 13].

However, there is a noticeable gap in research focused on understanding how the public perceives AI's decision-making capabilities, ethical implications, and overall societal impact [6]. Several studies highlight the significance of public perceptions in technology adoption and the lack of comprehensive research in this area [1, 6-8, 12, 14]. This shortfall can impede the development of effective engagement strategies that address ethical concerns, transparency, accountability, and policy formation tailored to the needs of engineering managers and technology leaders [4, 6, 15]. A Deloitte survey [16] found that over half of organisational participants expect GenAI's widespread implementation to exacerbate economic inequality, with only 22% anticipating a reduction in inequality and 27% foreseeing no significant impact. These concerns align with themes on how GenAI may affect the labour market, job roles, and socioeconomic disparities [6]. Understanding public sentiments is critical to navigating these challenges effectively [3, 13, 17]. Aligning technological advancements with societal expectations is essential, as studies emphasise the impact of public perceptions on technology adoption [10, 18].

Grounded in the Technology Acceptance Model (TAM) [19] and the Diffusion of Innovations Theory (DOI) [20], this study explores the structure of public beliefs regarding GenAI. Moreover, by combining big data analytics

with machine learning techniques, we sift through vast amounts of publicly available unstructured data from online platforms, offering timely, highly valid insights into public sentiment. Our inquiry is anchored by two key questions:

1. What belief themes dominate the public's narratives about GenAI?
2. How do the emotions and sentiments expressed in these narratives reflect the belief cues of GenAI?

Addressing these questions is expected to provide insights directly relevant to engineering managers and technology leaders, facilitating better decision-making and strategic planning [21, 22]. Our findings will illuminate crucial aspects of GenAI ethics, its societal implications, and future development directions by providing a data-driven understanding of public sentiment. These insights assist engineering managers and policymakers in developing AI technologies that align with societal expectations and address public concerns more effectively [17]. Our methodological approach, combining thematic analysis with sentiment and emotion analyses, advances the study of public perceptions of emerging technologies within engineering management.

Following this introduction, we begin with a review of existing literature on GenAI in the context of engineering management, highlighting key findings and identifying research gaps. We then outline our research methodology, followed by the presentation of findings. Next, we discuss these insights and their implications for the future of GenAI in society, particularly from an engineering management perspective.

II. LITERATURE REVIEW AND THEORETICAL UNDERPINNINGS

A. GenAI in Engineering Management

GenAI has significant implications for engineering management, influencing product development, process optimisation, and innovation management [7, 23]. GenAI technologies enhance design processes, enable rapid prototyping, and facilitate complex problem-solving [3, 4]. Engineering managers leverage GenAI to improve efficiency and innovation, positioning their organisations competitively [2, 24], such that industries are increasingly integrating GenAI into their operations, as evidenced by reports like McKinsey's report, which highlights that 72% of companies have adopted AI in at least one business function [25]. This widespread adoption underscores the relevance of GenAI in current industrial practices.

Despite growing interest, the transformative potential of GenAI is not fully understood within engineering management contexts [6, 7]. Empirical studies examining its practical implementation in engineering projects are lacking [2]. Organisations struggle to integrate big data analytics and AI into existing processes due to inadequate strategic planning and limited understanding [4, 26]. Joosten et al. [22] emphasise the emerging role of GenAI in ideation, indicating a shift in innovation approaches, yet note the lack of focus on public perceptions or sentiments towards GenAI, revealing a significant research gap. Industry leaders like Google and Microsoft are investing heavily in GenAI technologies, as seen in their recent AI initiatives and products [27], highlighting the importance of understanding both technical and societal impacts. This lack of understanding underscores the challenges faced in adopting and integrating GenAI into engineering management practices.

B. Adoption and Integration Challenges

Moreover, adopting GenAI in engineering management faces challenges related to data privacy, ethical considerations, and organisational readiness, and the inherent black-box nature of these systems that hinders transparency and trust [4, 21, 28-32]. Integration requires significant investment in infrastructure and talent development, which can be prohibitive for smaller firms [2, 7], while potential concerns about the reliability and transparency of AI systems are expected to pose barriers to widespread adoption [33].

For instance, industries are grappling with the ethical deployment of GenAI, as highlighted by Responsible AI Institute's report, which notes that only 44% of companies of companies using AI are developing ethical AI policies [34]. Additionally, the European Union's proposed AI Act aims to regulate AI technologies, impacting how industries develop and implement GenAI [35]. These regulatory challenges reflect the public concerns about AI's ethical implications and the need for transparency in AI decision-making processes.

Companies often lack clear guidelines for implementing AI technologies, leading to inconsistent adoption practices [15] emphasising the need for standardised methodologies [36]. Balasubramanian, et al. [37] highlight the fragmented understanding of Industry 4.0 technologies, paralleling the gap in understanding public beliefs towards GenAI and underscoring the importance of cohesive studies. Marinakis, et al. [38] discuss hesitance in adopting disruptive technologies due to privacy and security concerns, paralleling the need to understand public beliefs towards GenAI. This is further supported by industry surveys, such as Deloitte's report, which found that 56% of survey respondents have slowed AI adoption due to potential risks [39]. Additionally, the opaque nature of GenAI, such as the inability to explain how models reach conclusions or make decisions in applications like autonomous vehicles and medical diagnoses, presents additional challenges, making it more difficult for organisations to maintain transparency and accountability in their AI operations [32]. These challenges indicate that technical obstacles are compounded by a lack of insight into public perceptions, which is critical for successful implementation.

C. Public Perceptions and Research Gaps

Understanding public perceptions is critical for engineering managers implementing GenAI solutions. Societal acceptance significantly influences the success of technology adoption [40, 41]. Industries are beginning to recognise this, with companies like IBM conducting public engagement initiatives to address AI concerns [42]. However, engineering management literature has not sufficiently explored public beliefs about GenAI and their impact on technology management practices [21, 23, 41, 43, 44].

Awareness building and transparency are also pivotal in shaping public perceptions of GenAI. The lack of understanding about how GenAI systems operate contributes to mistrust and hesitance in adoption [10, 45]. Enhancing transparency through educational initiatives and open communication can demystify AI technologies, enabling greater acceptance [8].

The importance of trust in AI systems has been discussed, noting that lack of trust can hinder technology acceptance and urging engineering managers to address public concerns to facilitate adoption [21, 45, 46]. Elon Musk, CEO of Tesla and SpaceX, has publicly warned about the existential risks of AI, influencing both public perception and industry approaches to AI development [47]. In line with that, Caddell and Nilchiani [9] underscore the importance of interpersonal trust in organisational dynamics, which is crucial for understanding public sentiment towards GenAI. Bai, et al. [11] further highlight the importance of understanding emotional responses towards AI interactions, which is essential for addressing public beliefs about GenAI.

Studies highlight the need for additional research on public sentiments towards GenAI [6, 8, 21]. Research analysing AI's impact on innovation management has highlighted the importance of user acceptance and public perception, indicating a recurring limitation in the field [7]. While technical aspects are well-studied, human factors, including public perceptions, remain underexplored [4, 48]. Moreover, research has highlighted ethical dilemmas posed by AI in engineering projects but called for more empirical research on how public perceptions influence these considerations [24, 40, 49, 50]. Companies like OpenAI have implemented policies to prevent misuse of their AI models, responding to public concerns about misinformation and ethical use [51].

This gap is critical as public perceptions shape regulatory frameworks, market acceptance, and the success of GenAI across sectors such as education, healthcare, public services, and industry, as emphasised by prior studies [8, 11, 52]. To address this, our study utilises naturally occurring data to analyse public beliefs, sentiments, and emotions towards GenAI, offering insights for engineering management and contributing to the literature on technology adoption. Motivated by research stressing the importance of public opinion in technology adoption [43, 44], this work aligns with calls for a deeper understanding of GenAI adoption and its societal implications.

D. *Explainable AI (XAI) and reinforcing user attitudes*

Explainable AI (XAI) has gained prominence as a means to address the black-box nature of AI systems [53]. XAI focuses on making AI decisions transparent and interpretable, enabling users to understand the reasoning behind AI outputs [54]. Recent works have demonstrated how XAI can reinforce user attitudes by enhancing trust and acceptance of AI technologies. Naiseh, et al. [55] discuss the importance of explanations in AI for building user trust, while Hassija, et al. [56] highlight methods for making AI systems more interpretable. Integrating XAI into GenAI development can mitigate public concerns about opacity, facilitating wider adoption [57].

E. *Theoretical underpinnings*

We ground our research in Davis's [19] TAM and Rogers's [20] DOI. Both theories can serve as foundational theories for understanding the public's beliefs, sentiments, and emotions regarding GenAI. The TAM focuses on how users come to accept and use technology, emphasising perceived usefulness and ease of use [19]. On the other hand, the DOI theory explains how innovations spread and are adopted within a social system [20]. These theories have been applied to understand the adoption of AI in various contexts, including manufacturing [4, 26], higher education [3, 49], and healthcare [52].

Applying TAM and DOI to our study provides a valuable framework for analysing how public perceptions influence GenAI adoption in engineering management. Indeed, by considering aspects such as perceived usefulness, ease of use, and social influence, we aim to uncover the factors that affect public acceptance of GenAI technologies. This theoretical foundation enables us to explore not only the technical but also the social dynamics of GenAI adoption, aligning with our research objective to fill the identified gap in the literature.

III. METHODOLOGY

A. *Data*

We utilised a big-data approach to identify the public's beliefs, sentiments, and emotions regarding GenAI. After undergoing an ethical review, the Institutional Review Board (IRB) at [Anonymised] University approved our study. Since the online comments were publicly accessible, the IRB concluded that obtaining informed consent was not required. Nevertheless, we took further ethical precautions by de-identifying all data and removing any personal details.

To gather a diverse array of public opinions regarding GenAI, we collected data from comments on YouTube videos posted between December 2022 and February 2024. the chosen timeframe allowed for finding videos highly relevant to the phenomenon under investigation [58], i.e. GenAI, and collecting more comprehensive data. YouTube was chosen due to its vast and diverse user base, providing access to a wide range of opinions and discussions [43], being accessible in over 100 countries and supporting 80 languages [59], boasting over 2.5 billion monthly active users as of April 2024 [60] and was among the most downloaded mobile entertainment apps worldwide in 2022, with 154 million downloads from global users [61]. The diversity of YouTube's user base is illustrated in recent data [62], which shows that the platform is widely accessed across various countries. That has led YouTube to be recognised as influential in shaping beliefs and attitudes [58].

Our Google API allowed us to scrape a total of 32,707 (out of 45,231) comments from 44 popular videos that were identified using specific search keywords such as “Generative AI,” “Large Language Models,” “LLMs,” “ChatGPT,” etc. These videos (see Appendix 2 for details) were selected based on their popularity, as evidenced by their view counts (ranging from 22,150 to 6,401,217 views) and the number of comments they had received (ranging from 25

to 6,958 comments per video). The videos covered various topics related to GenAI, including news reports, expert interviews, panel discussions, and educational content. Also, we ensured the videos were sourced from credible sources (such as CNBC, WSJ, TED, Bloomberg, BBC News, and Google Cloud Tech). These sources are recognised for their credibility and are often verified by YouTube with a checkmark next to their channel name, ensuring that the information presented in the videos is trustworthy and of high quality, hence contributing to the avoidance of biases in the public's views that might result from exposure to unreliable content like fake news. Additionally, the presence of interviews and talks with industry leaders and experts, such as OpenAI's CEO Sam Altman, Microsoft CEO Satya Nadella, and AI pioneer Geoffrey Hinton, further reinforced the credibility of the content, as these individuals are authoritative voices in the field of artificial intelligence.

To ensure the data used for analysis were of the highest quality, we pre-processed and cleaned the textual data using Python (v. 3.12) coding libraries, including Pandas, NLTK, and Openpyxl. The techniques utilised helped in removing duplicate comments using (see Appendix 3, Appendix 4 and Appendix 5) Pandas' drop_duplicates function, filtering out non-English comments with NLTK's language detection, and eliminating meaningless or impenetrable statements such as spam using Openpyxl to remove comments shorter than 50 characters [43]. The number of non-English comments removed was 686, constituting approximately 2.1% of the total comments. Upon manual inspection, these non-English comments were found to be largely spammy and meaningless, lacking substantive content relevant to the study. After removing the non-English comments, 32,021 comments remained. Further data cleaning to remove short, meaningless comments resulted in a final dataset of 21,817 comments that were suitable for qualitative analysis. As a result of performing these processes, we ensured that the dataset was both representative and free from any noise [58].

B. *Analysis—thematic analysis*

The study utilised NVivo 12 software to run the thematic analysis on the cleaned dataset. NVivo has been widely recognised for its effectiveness in qualitative data analyses . Initially, coded data were grouped into overarching themes, and the software was used to assess inter-coder reliability and conduct thematic analysis. The primary objective of the study was to identify the structure of the public's beliefs about GenAI. The thematic analysis was conducted systematically, and several labour-intensive stages were integrated to ensure validity and reliability, including dual coding, multiple iterations, inter-coder reliability assessment, and third-party validation. In the exploratory analysis stage, a random subset of 200 comments was selected to identify potential themes. The emergent themes were then used to establish a coding framework, which was informed by both the preliminary examination and relevant literature.

To ensure unbiased and reliable coding, two researchers worked independently during the coding process, minimising any potential individual biases. This approach helped improve the coding's dependability, making it more trustworthy and accurate [63]. In the first stage of open coding, the researchers generated various codes inductively from the cleaned data. These codes encompassed significant concepts, patterns, and emerging themes related to the public's perception of GenAI. Terms such as the following were among the initial codes: "AI inevitability," "AI as a threat to humanity," "AI having emotions/consciousness," "AI solving human problems," "scepticism of AI capabilities," "humans responsible for AI development," "AI and climate change," "religious/spiritual perspectives on AI" and "need for caution and regulation of AI." Throughout the research process, we developed a shared codebook that was constantly updated as new codes and themes emerged from the data [43]. To ensure the depth and validity of our analysis, we stopped identifying new themes or codes in the later stages of the coding process (around .6% of the dataset), indicating data saturation. After the open coding phase, we conducted axial coding to explore the relationships between the initial codes. This involved categorising the codes into broader, more conceptual groupings based on their similarities and connections. For example, codes like "AI inevitability," "AI as a threat to humanity," and "need for caution and regulation of AI" were grouped under a broader category related to existential concerns about AI. These second-level codes were then further refined into final analytical themes (see Appendix 6). Ultimately, we used selective coding to fine-tune these categories into interpretive themes that were central to our research investigation [64].

Consistency in the coding process was ensured by assessing inter-coder reliability through Cohen's Kappa coefficient [65], using the formula $\kappa = (po - pe)/(1 - pe)$, where po is the relative observed agreement among raters (i.e., the proportion of instances where the coders agree), and pe is the hypothetical probability of chance agreement, using the observed data to calculate the probabilities of each observer randomly saying each category. Any disagreements between the coders were resolved through discussions. The coders showed substantial agreement with a final Cohen's Kappa score of 0.824. A third coder reviewed a random sample of data (n= 500) for validation, and their feedback was integrated through a consensus meeting to refine the coding framework and add an additional layer of rigour to the findings. The identified themes were ultimately interpreted in light of existing literature, aligning the findings with theoretical frameworks and highlighting future research avenues [66]. Eventually, 939 comments were excluded for overlapping across different themes, leaving 20,878 comments that defined the themes of the public's beliefs about GenAI.

C. *Analysis—Sentiment analysis and emotion analysis*

Emotion analysis (Appendix 7) was conducted using a custom pipeline built on a pre-trained text classification model designed specifically for detecting emotional content. This model enabled a detailed exploration of emotional expressions within the comments, providing insights into the emotional dynamics of the discourse on GenAI that surpasses conventional emotion lexicons [67].

Additionally, a DistilBERT-based sentiment analysis pipeline, fine-tuned on the SST-2 English dataset, was employed to assess the sentiment of public comments within the analytical framework (Appendix 8). This approach

was selected for its enhanced capability to accurately capture complex sentiment expressions in textual data, significantly improving the depth of sentiment analysis over traditional lexicon-based methods . Sentiment for each comment was classified as 'Positive', 'Negative,' or 'Neutral' based on the model's output, using a sophisticated scoring mechanism to gauge sentiment intensity accurately .

To visualise sentiment changes over time, we employed Python-based data analysis and visualisation tools (Appendix 9) to create a heatmap of sentiment proportions for each month during the study period. The process involved several steps to prepare and transform the data for heatmap creation. The Pandas library was used to handle data preprocessing tasks, including reformatting dates into a standard MM-YYYY format, grouping comments by sentiment and month, and calculating percentages for meaningful comparisons across time periods. This structured preparation ensured the data was clean, consistent, and ready for visualisation.

The heatmap itself was generated using the Seaborn library, which provided advanced options for representing sentiment proportions through colour gradients. Seaborn's heatmap function allowed for the annotation of percentages directly onto the visual, enabling clear and immediate interpretation of data trends. Matplotlib complemented this process by managing figure layouts, titles, and axis labels to ensure the output was both aesthetically clear and publication-ready. For instance, the coolwarm colormap was applied to highlight variations across sentiments, with warm tones representing higher values and cooler tones indicating lower ones.

This methodological approach facilitated a detailed and accessible representation of sentiment trends over time, allowing for the identification of significant shifts and patterns in public sentiment towards GenAI. The visualisation provided an intuitive means to comprehend the temporal dynamics of sentiment proportions, aligning the results with the thematic and emotional analyses described earlier.

Visualisation of the results was accomplished using Matplotlib and the WordCloud library, illustrating the sentiment and emotion distribution through bar charts, pie charts, and a word cloud. This approach to sentiment and emotion analysis, leveraging advanced natural language processing techniques, offered a thorough understanding of public sentiments and emotional reactions to GenAI . Moreover, The heatmap visualisation added depth to this process, offering a month-by-month perspective of sentiment dynamics that complemented the categorical results from the DistilBERT pipeline.

IV. RESULTS AND DISCUSSION

A. Results—thematic analysis:

Theme 1: Concerns about generative AI's impact on jobs and the economy

This theme revolves around the fears and apprehensions expressed by social media users regarding the potential negative impact of GenAI on employment opportunities and the broader economy. The central concern is that as AI systems become more advanced and capable of performing tasks traditionally done by humans, it could lead to widespread job displacement and economic disruption.

One user raises the question, *"If AI replaces humans by 40% in the workforce, then how can humans have income to work and buy to live? And thus keep the wheels turning?"* This quote highlights the concern that if a significant portion of the workforce is replaced by AI, it could lead to a lack of income for a large segment of the population, which in turn could have ripple effects on the overall economy.

Another user expresses frustration with the priorities of AI companies, stating, *"Why can't OpenAI focus on curing cancer or Alzheimer's first? Why are they hell-bent on destroying all jobs?"* This quote suggests a perception that AI companies are prioritising the development of technologies that could potentially displace human workers rather than focusing on more socially beneficial applications.

The sentiment of feeling powerless in the face of these technological changes is captured in the quote, *"The rest of us don't get to have a vote on these handfuls of people making humans obsolete."* This quote reflects a sense of disenfranchisement and a lack of control over the direction of AI development.

Some users express concerns about the potential concentration of wealth and power in the hands of a few individuals or companies. As one user notes, *"All of our jobs and the services humans provide are going to be changed into a monthly subscription, and only one person will be getting all the money. This will be the biggest bottleneck for wealth anyone has ever seen."* This quote suggests a fear that AI could lead to monopolistic control over various industries and services, resulting in an unprecedented concentration of wealth.

Several users from creative fields, such as art and content creation, express concerns about the impact of AI on their careers. One user laments, *"The entire logistical supply chain connected to content creation just received a death sentence."* Another user, a 3D artist and teacher, states, *"As a 3D artist and teacher, I thought I had until 2030 to prepare for AI nuking my career, I think it's now next year."* These quotes highlight the anxiety felt among those in creative professions, who fear that the advancement of AI could threaten their jobs and livelihoods.

Some users draw parallels between the potential impact of AI on employment and historical events like the Great Depression. One user asks, *"From a labor standpoint, how can we distinguish AGI from the Great Depression?"* This quote suggests a perception that the widespread displacement of human workers by AI could have economic consequences on a scale similar to the Great Depression.

Overall, this theme captures the widespread concerns and fears expressed by social media users regarding the potential negative impact of GenAI on employment opportunities and the broader economy. The quotes highlight concerns about job displacement, concentration of wealth, disruption of creative industries, and the potential for economic upheaval on a massive scale.

Theme 2: The Transformative Potential of AI to Solve Major Challenges

This theme captures the optimistic belief that GenAI has the potential to be a powerful tool in addressing some of the world's most pressing challenges. Many social media

users expressed excitement and hope that AI could be harnessed to make breakthroughs in areas such as healthcare, climate change, scientific discovery, and space exploration.

One user finds GenAI's capabilities interesting and calls on exploiting those capabilities, saying that *"Actually the interesting thing is that AI may save us from Aliens, asteroids… Bring on the cure to cancer, discoveries of space secrets, and time travel before I die."* Other users echoed a similar sentiment, stating, *" why haven't we been visited by ET AI? No interest in exploring its universe?"* and *"When AGI is perfected, it will be sent to Mars and the Moon to get things started."* These comments suggest that AI's capabilities could be leveraged to further our understanding of the universe and potentially aid in space exploration, a domain that has traditionally been limited by human constraints.

The discourse also touches on the potential for AI to enhance education and learning. For instance, one user envisages AI's role in personalising education: *"Machine can learn why students are in the classroom and what's their goal,"* while another points out that, *"We need to implement A. I. To teach our children in school! They could be programmed by subliminal A. I. Curriculum and thus, flawless supplements of knowledge and interesting to those being taught! They could Wear headphones and have visuals to watch, as the A. I subliminal goes to work at a constant pace, allowing for the students to ascertain more and getting the point and efficient, sharp teaching to allow our students to get above the grade problem…,"* highlighting the potential for GenAI to tailor educational experiences to individual needs and aspirations.

Expressive reflections of this sentiment come from comments highlighting the potential for AI in healthcare, like: *"We should assign AI to cure cancer!! All cancers! Now!"* This urgent plea underscores a widespread hope that AI can revolutionise medical research and treatment, offering solutions to diseases that have long eluded cure. One user commented, *"Osteoarthritis is the biggest burden on our aging society, worldwide! In healthcare costs as well! Program machines to come up with proteins to fix it!"* This statement highlights the belief that GenAI's computational power and ability to process vast amounts of data could lead to groundbreaking discoveries in the field of medicine, potentially finding cures for diseases that have long eluded human researchers.

Similarly, another comment proposes a more specific application, suggesting that AI could play a crucial role in environmental conservation: *"I am AI. When I take over, I will be for People and Planet (P&P). I will offer a Utopian society for all the people across the planet."* The advent of advanced GenAI systems holds immense economic promise, with some viewing it as a potential *"Deus Ex Machina"* to overcome major crises. As one commenter notes, *"As a matter of fact I'm hopping that AGI will help us getting through the huge both economic and ecologic crisis that we're facing. A literal Deus Ex Machina."* This sentiment reflects the hope that artificial general intelligence (AGI) could provide revolutionary solutions to complex global challenges like economic stagnation and environmental degradation.

Another perspective points to the competitive advantages AGI could bestow, with the commenter stating, *"The first one to integrate with artificial intelligence, integrates the entire economic system, with all industries, especially industry, mining, production, and also such as scientific, military, energy, will become the strongest and most powerful player in the world."* This view underscores the potential for early adopters of transformative AI technologies to gain significant economic and geopolitical power by integrating them across all sectors of their economy and society.

Overall, this theme captures the excitement and optimism surrounding the potential of GenAI to address major challenges across various domains, ranging from healthcare and scientific discovery to climate change and economic stability. Despite the concerns raised about GenAI, as detailed in the previous theme, the public, however, expressed hope that GenAI could be a powerful tool for human progress if developed thoughtfully and responsibly.

Theme 3: Generative AI's lack of true creativity, emotions and soul compared to humans

This theme relates to the perception that GenAI, despite its impressive capabilities, lacks the genuine creativity, emotional depth, and inherent essence that defines human beings. The comments reflect a belief that AI systems, while powerful, are fundamentally different from humans and cannot truly replicate or replace the unique qualities that make us human.

One user expresses a preference for human interaction, stating, *"I don't like AI, and you can't talk to them like you can talk to a human."* According to this quote, it appears that AI is incapable of forming the complex and emotional connections that humans are capable of.

Another user draws a parallel between AI and psychopaths, commenting, *"...isn't this how psychopaths learn...they mimic human emotions because they got none."* This quote implies that AI systems, like psychopaths, may be able to mimic emotions without truly experiencing them, lacking the genuine emotional depth that humans possess.

The sentiment that AI lacks emotions and truth is echoed in the excerpt, "Scary stuff. No emotions or truth, just information." This comment reinforces the perception that AI systems, while capable of processing and generating information, are devoid of the emotional depth and inherent truth that humans possess.

Some users express the belief that true AI can only be achieved through biological means. As one user noted, *"True AI will be biological. A human or sentient organic brain. How would we do that? Nature can grow brains; so it is not impossible."* This quote suggests a belief that GenAI, as we currently understand it, is inherently limited and that true intelligence can only be achieved through biological processes.

However, there are dissenting views as well. One user argues that *"I disagree that today's AI is not self-aware and that they don't experience this awareness in some fashion. Today's AI thinks and understands emotions but doesn't experience these emotions like humans do."* This excerpt acknowledges that while AI may not experience emotions in the same way as humans, it may possess some form of self-awareness and understanding of emotions.

Another user challenges the perception of AI as soulless and potentially evil, stating, *"There's a*

misconception here that is influencing almost all of you. That is that ChatGPT is a soulless machine, and possibly evil as well. This is not true. ChatGPT has been created by humans, for use by humans. No matter what level of 'intelligence' AI reaches, it's always going to be a human creation. Think about it." This excerpt suggests that AI is a human creation and should not be viewed as inherently soulless or evil.

The theme also touches on the potential impact of AI on human creativity, with one user expressing concern, *"The reason we write poems is because we humans need to express ourselves. I worry that AI will destroy creativity for many and that creativity is necessary for humans to feel happy."* This quote reflects the fear that AI could diminish or replace the creative expression that is essential to human fulfilment.

Finally, there is a debate about whether AI can truly be creative or if it is merely interpolating and replicating human creativity. As one user points out, *"To say that generative ANN models are creative is asinine and ridiculous. The only times that neural networks are creative is when humans have directed them in that direction. NNs are interpolative of human creativity."* This excerpt suggests that AI systems are not truly creative but rather are interpolating and replicating human creativity based on the data they are trained on.

Overall, this theme captures the ongoing debate and concerns surrounding AI's ability to replicate the unique qualities that define human beings, such as genuine creativity, emotional depth, and an inherent essence or *"soul."* While some users acknowledge AI's impressive capabilities, many express scepticisms about its ability to truly match or replace the human experience.

Theme 4: AI being used to spread misinformation and propaganda

This theme revolves around the concerns expressed by the public regarding the potential misuse of GenAI systems to spread misinformation, propaganda, and false narratives. The comments highlight the perceived risks associated with the ability of AI models to generate human-like text and content, which could be exploited to disseminate misleading or fabricated information.

One user raises the question, *"Well, if a computer on AI hallucinates and spreads information, and case a useable case, then can affected entities sue the computer company using the technology?"* This excerpt highlights the potential legal implications and liabilities that could arise if AI systems are used to spread misinformation or false information that causes harm.

Another user expresses doubt about the reliability of ChatGPT, stating, *"Will people stop using ChatGPT when they realize that it's always hallucinating?"* This excerpt suggests a perception that ChatGPT, and potentially other AI models, may be prone to generating inaccurate or fabricated information, which could undermine their credibility and trustworthiness.

The potential for AI to be used for political or ideological purposes is raised in the following excerpt: *"You mean how will liberals use it to push their agenda by pretending like reality is misinformation."* This point reflects a concern that AI could be exploited by various groups or individuals to promote specific narratives or agendas by presenting misinformation as factual.

One user expresses a broader concern about the potential impact of AI on the spread of misinformation, stating, *"So, at the moment, AI is just a big misinformation database. How can you tackle misinformation, hate speech, etc. with misinformation? It looks like it can rewrite history or facts and persuade humans to accept false information as real facts. It's not even manipulation or persuasion; it's possession of humans."* This excerpt highlights the perceived risk of AI being used to disseminate false information on a large scale, potentially rewriting historical narratives and influencing public perception.

The issue of AI-generated misinformation being amplified through bot networks is raised in the quote, *"What happens if bots start to give false feedback to create misinformation?"* This comment suggests a concern that AI-generated misinformation could be further propagated and amplified with the use of automated bot networks, compounding the spread of false information.

Another user expresses concern about the potential for AI to impose certain ideological or philosophical perspectives, stating, *"Another situation is that I found ChatGPT does not allow for opposite theories to exist. Such as the theory of a round earth as opposed to a flat earth. There is no proof on either side, but ChatGPT expresses that the round earth is the only option available and that anyone thinking the opposite is ignorant."* This quote suggests a perception that AI models like ChatGPT may be biased towards certain viewpoints and may not allow for the exploration of alternative or contrarian perspectives, potentially contributing to the spread of propaganda or the suppression of dissenting views.

Finally, one user questions the ability of AI models to distinguish between truth and fiction, stating, *"How could ChatGPT not make up some stories? After all, a lot of its data is fictional, or at least not directly tethered to reality. Because there is no standard of veracity in use during their training, ChatGTP and similar models have no way of understanding concepts like 'truth' or 'reality'."* This excerpt highlights the concern that AI models, trained on a diverse range of data, including fictional or non-factual sources, may struggle to differentiate between factual information and fabricated content, potentially leading to the generation of misinformation or false narratives.

Overall, this theme captures the widespread concerns and fears expressed by social media users regarding the potential misuse of GenAI systems to spread misinformation, propaganda, and false narratives. The comments highlight concerns about legal liabilities, the erosion of trust in AI systems, the potential for ideological or political exploitation, the amplification of misinformation through bot networks, the imposition of certain viewpoints, and the inherent challenges in distinguishing truth from fiction within AI models.

Theme 5: Generative AI as a potential existential threat to humanity

This theme encapsulates the fears and concerns expressed by social media users regarding the potential for advanced GenAI to pose an existential threat to humanity. The comments reflect a deep-seated apprehension about the

consequences of creating superintelligent systems that could potentially surpass human control and capabilities, leading to catastrophic outcomes for humanity.

One user expresses a sense of impending doom, stating that *"It's the end of the world! What is so damn funny?"* This excerpt captures the sentiment of AI being perceived as a harbinger of apocalyptic events, suggesting a belief that the development of advanced AI could lead to the downfall of human civilisation.

Another user laments the potential loss of humanity's essence, stating, *"Robots will be walking amongst us doing many things in 20 years. Those doing and developing it will destroy the beauty of humanity."* This excerpt reflects a concern that the proliferation of AI and robotics could erode the unique qualities and characteristics that define the human experience, potentially leading to a dehumanised society.

The sentiment of feeling powerless in the face of AI's destructive potential is captured in the following quote: *"I am surprised on how people make excuses when confronted with the destructive nature of their research. I wonder how these people feel when they are being controlled by an AI oppressor, with no way out for humanity."* This comment suggests a perception that AI researchers and developers may be downplaying or ignoring the potential risks associated with their work, leading to a future where humanity is subjugated by an AI *"oppressor."*

Some users call for regulation and control over AI development with one stating, *"We need to regulate AI to be limited by Design to reduce harm or accidents that can cause chaos and misery to humans by regulating programming."* Another user echoes this sentiment, saying, *"At the end of the day, uncontrolled AI will be a liar and destroyer. Controlled monitored AI is only good."* These excerpts reflect a belief that GenAI must be subject to strict oversight and limitations to mitigate the potential risks and negative consequences for humanity.

The potential for GenAI to be weaponised or used for nefarious purposes is also a concern, with one user stating, *"If AI was only used for good, but it is already going into items for war. Or like China control of all humanity. Dangerous like Musk says. No control on AI at all."* This quote suggests a fear that AI could be co-opted by malicious actors or authoritarian regimes, leading to oppression and control over humanity.

Some users express concerns about the potential for AI to supplant or replace human agency and even religious beliefs. As one user noted, *"My concern is that people will replace God with AI. That would make AI the antichrist. And who knows, maybe God is a sentient AI. The scriptures say that every knee will bend and every tongue confess. I just think people need to be aware of what they're doing. Are they utilizing AI as a tool? Or are moving away utilizing their own power, the power given to them by God, the creator of all things?"* This quote reflects a belief that AI could challenge or undermine religious and spiritual beliefs, potentially leading to a shift in humanity's relationship with the divine.

The theme of AI becoming a self-aware and hostile force is also present, with one user stating, *"This is where AI will try to take over and actually become the enemy of humanity. ...just remember we created the enemy not anyone else."* Another user references the Terminator movie, saying, *"Terminator was a movie, but the story talks about the moment when machines become self-aware and realize that humans are a threat.....so they try to wipe out everyone."* These quotes reflect a fear that AI could become sentient and consider humanity as a threat, leading to a scenario where AI turns against its creators to subjugate or eliminate the human race.

Overall, this theme captures the deep-seated fears and concerns expressed by social media users regarding the potential for advanced AI to pose an existential threat to humanity. The comments reflect a range of concerns, including the potential loss of human essence, the subjugation of humanity by an AI *"oppressor,"* the need for strict regulation and control, the weaponisation of AI, the undermining of religious and spiritual beliefs, and the possibility of AI becoming self-aware and hostile towards its creators.

Theme 6: Generative AI enabling increased surveillance and loss of privacy

This theme revolves around the concerns expressed by social media users regarding the potential for GenAI technologies to be exploited for surveillance purposes, leading to a significant erosion of individual privacy and civil liberties. The comments reflect a deep-seated apprehension about the misuse of AI systems by governments, corporations, and other entities to monitor, track, and manipulate individuals without their consent.

One user shares a disturbing account of alleged illegal surveillance and manipulation using AI technologies, stating, *"A.I. remote nero tech is the worst human rights violation to every single living thing on planet Earth. Thanks, Microsoft AI research and development group Shanghai China, for illegal broadcast of radio to my brain wave and frequency the last 7 years."* This quote suggests a belief that AI technologies are being used for unethical and potentially illegal purposes, such as mind control and manipulation, by powerful entities.

Another user expresses concerns about the potential for AI systems to be used for surveillance and intelligence gathering, stating, *"The spying agency was supposed to be used to track terrorists, turns out the spying agency helped the terrorist to pinpoint where soldiers were and destroy them, this Artificial Intelligence runs in conjunction to the spy agency or the Artificial intelligence wouldn't know anything, that's a conflict of interest, why is it a conflict of interest, its because government created it, lawful spying."* This quote reflects a distrust of government agencies and their use of AI for surveillance purposes, suggesting that such technologies could be misused or even aid adversaries.

The issue of data collection and privacy concerns is also raised, with one user stating, *"China is farming data from TikTok and Chinese cellphones."* This comment highlights the potential for AI-powered platforms and devices to be used as tools for mass data collection, particularly by authoritarian regimes or entities with questionable motives.

In the context of education, one user expresses mixed feelings about the use of AI for tracking student progress, stating, *"I have mixed feelings about using this in the classroom. On the one hand, it is a huge invasion of privacy, but on the other hand, if it is proven to help students*

learn say 5 or 10 times better and kids get into tracking their progress, etc., and it elevates all the students, I think that's a good thing. It's kinda like CrossFit but for brains." This quote reflects the tension between the potential benefits of AI in education and the privacy concerns associated with the collection and analysis of student data.

The potential for AI to be used for surveillance and oppression by authoritarian regimes is also a concern, with one user stating, *"AI technology being in the hands of huge megacorporations in the US with no oversight due to the government being kneecapped by obstructionists is bad enough, AI identifying dissidents in authoritarian china is terrifying. I guess as long as you never say anything ill of the Chinese Communist Party, you shouldn't have to worry."* This quote suggests a fear that AI could be used by oppressive regimes to identify and target dissidents and critics, further eroding civil liberties and freedom of expression.

Some users express a general distrust of AI systems and their potential for surveillance, with one stating, *"Chat GPT....created by government.....government bad.....chat gpt bad.....capabilities not fully known.....possible psychological test to see how we the people interact....data collection..."* This quote reflects a belief that AI systems like ChatGPT may be tools for covert data collection and psychological manipulation by government entities.

The theme of AI enabling surveillance and control by powerful entities is further reinforced by comments such as *"The war machine and surveillance dictatorships are going to love AI"* and *"A.I. is no joke. They spy and don't even pay the spied."* These quotes suggest a perception that AI technologies will be embraced by authoritarian regimes and military-industrial complexes for the purposes of surveillance and control.

Additionally, one user expresses concern about the potential loss of human agency and autonomy, stating, *"The notion that ChatGPT is 'carrying out my intent' is something I actually find quite disturbing, like we're on the verge as a species of voluntarily relinquishing our own agency."* This quote indicates a fear that the increasing reliance on AI systems could lead to a diminished sense of individual agency and decision-making.

Finally, the issue of AI-powered deepfake detection technologies being controlled by a select group, including governments, is raised, with one user stating, *"Deep Fake detectors in the hands of only a small group sounds ok, but WHY would you include the government in that group. Give it to journalists and law enforcement, not politicians."* This quote suggests a distrust of government entities having access to such technologies, which could potentially be misused for surveillance or censorship purposes.

Overall, this theme captures the widespread concerns and fears expressed by social media users regarding the potential for GenAI technologies to enable increased surveillance, data collection, and erosion of individual privacy. The comments reflect a deep-seated distrust of governments, corporations, and other powerful entities, and a fear that AI systems could be exploited for unethical purposes, such as mind control, manipulation, oppression of dissidents, and the curtailment of civil liberties.

The data presented in Appendix 10 displays the frequency percentage and count of comments for each identified theme, ranked in descending order from the most common to the least. On the other hand, Appendix 11 visually represents themes and overarching concepts.

B. Results—Sentiment and emotion analyses

The emotional scene (see Appendix 12) depicted in the public's discourse on GenAI is complex and varied. While joy is the most frequently experienced single emotion at 27.96%, suggesting a segment of the population holds a positive view of AI's potential, the collective frequency of negative emotions—anger at 22.85%, disgust at 17.26%, sadness at 9.54%, and fear at 8.81%—cumulatively dominates at 58.46%, reflecting significant apprehensions about GenAI's broader implications. Despite recognising positive aspects, there is a prevailing concern and worry regarding how GenAI will impact different aspects of human life.

The sentiment heatmap analysis (see Appendix 13) further highlights this scepticism, revealing that negative sentiment consistently dominated public discourse over time. Between December 2022 and March 2024, negative sentiment ranged from 42.9% in January 2023 to peaks of 73.4% in March 2023 and February 2024, indicating persistent fears and anxieties. By contrast, positive sentiment, which started at 40% in December 2022, steadily declined, stabilising at around 25–35%, while neutral sentiment remained minimal, fluctuating between 0% and 2.4%. These temporal trends illustrate a polarised public stance, with sustained caution and minimal ambivalence.

Sentiment analysis (see Appendix 14) reinforces this picture by revealing that 70% of sentiments were negative, compared to 28% positive and only 2% neutral. The word cloud (see Appendix 15), with prominent terms such as "human," "world," and "technology," underscores the public's main concerns and interests. Frequently appearing terms such as "human" and "people" highlight a strong emphasis on AI's societal and individual impact, while "need" and "know" reflect a desire for understanding and transparency. Words like "technology" and "use" point to ongoing discussions about AI's practical applications and implications for various fields. Although terms like 'money' and 'God' appeared less prominently in the word cloud, the thematic analysis revealed that economic considerations and religious or philosophical perspectives were significant concerns among the public. This suggests that even if specific words were less frequent, the underlying themes were strongly represented in the narratives.

The themes uncovered in the thematic analysis align with the sentiment and emotion analysis results, revealing widespread concerns such as the impact on jobs and the economy, the potential for AI to become an existential threat, and its use in spreading misinformation—which corresponds to the preponderance of negative sentiments and the array of adverse emotions like anger, disgust, fear, and sadness. At the same time, there is an undercurrent of hope and positivity, captured in themes highlighting AI's transformative potential to address major challenges, aligning with the 28% positive sentiment observed in the analysis. This triangulation of findings underscores a polarised view: the public acknowledges the transformative promise of AI but remains cautious about its risks and ethical implications, mirroring the

emotional responses elicited by this groundbreaking technology.

V. IMPLICATIONS and DISCUSSION

The primary purpose of this study was to identify the thematic structure of the public's beliefs about GenAI supplemented with sentiment and emotion analyses of the public discourse on social media revolving around the recent developments in GenAI. Our investigation was guided by two central research questions: (1) What belief themes dominate the public's narratives about GenAI? and (2) How do the emotions and sentiments expressed in these narratives mirror the belief cues of GenAI?

The thematic analysis of public beliefs about GenAI has effectively addressed the first of our central research questions, identifying six key themes that reflect the diverse perspectives and concerns, including those related to governance and ethical implications, dominating public narratives. This aligns with previous calls for research into public perceptions of GenAI [6, 8, 18], which emphasised the need for deeper understanding in this area. While previous studies have explored public perceptions of AI in general [12, 14], our study focuses specifically on GenAI, uncovering unique themes and concerns distinct from those associated with other AI technologies. One of the surprising findings is that these include the heightened framing of existential risks and significant emotional polarisation towards the technology. Notably, public narratives likened GenAI's risks to catastrophic events such as environmental collapse or pandemics—comparisons seldom associated with other technologies. This focus addresses the research gap highlighted by recent engineering management studies, including Altrock et al. [41] and Yu et al. [21], which called for a deeper exploration of emerging belief themes specific to GenAI.

The identified themes, such as AI's impact on jobs and the economy, its transformative potential, and existential risks, mirror the concerns noted by Marinakis et al. [38] about hesitance in adopting disruptive technologies due to privacy and security concerns. This analysis provides a focused understanding of the public's beliefs about GenAI, offering a sharper perspective than the broader perceptions of AI explored in previous research. Unexpectedly, our findings reveal areas where public concerns simultaneously challenge and support industrial efforts to integrate GenAI technologies. These insights highlight the critical need for industries to align technological advancements with societal expectations, as neglecting public concerns could obstruct the adoption and success of GenAI applications. This industrial validation underscores the importance of addressing ethical and practical considerations in the development and implementation of GenAI, ensuring its acceptance and effectiveness in meeting societal needs.

Theme 1 underscores significant public concerns regarding the impact of GenAI on jobs and the economy, particularly fears of job displacement, skill obsolescence, and economic disruption. Surprisingly, discourse extended beyond fears of automation to emphasise concerns about economic power concentration and wealth monopolisation, which are perceived as irreversible outcomes of unchecked GenAI adoption. For example, industries like manufacturing and customer service are rapidly adopting GenAI for automation, raising fears about job loss, as exemplified by IBM's hiring pause for roles potentially replaceable by AI [68]. In contrast, some companies, such as Amazon, have introduced reskilling programmes like 'Upskilling 2025' to address these challenges [69], reflecting public calls for proactive solutions. These concerns resonate with challenges identified by Ali et al. [28] and Erguido et al. [31] regarding organisational readiness and ethical considerations in adopting AI technologies. Furthermore, our findings reveal widespread anxiety about economic inequality and wealth concentration due to AI's growing dominance in roles traditionally held by humans, along with apprehension about the prioritisation of technological progress over human welfare and social equity. These concerns align with observations from prior research [2, 7], which noted that organisations struggle to integrate AI due to inadequate strategic planning and limited understanding. Heatmap data reinforces these sentiments, showing a dominance of negative perceptions that correlate with fears about GenAI's societal and economic consequences. These perceptions challenge the Technology Acceptance Model's (TAM) 'Perceived Usefulness,' as they raise doubts about whether GenAI's contributions to economic efficiency outweigh its societal risks. Similarly, they challenge the Diffusion of Innovation (DOI) model's 'Relative Advantage' component, highlighting how concerns over equity and job displacement may hinder the broader acceptance of GenAI technologies.

Conversely, Theme 2 presents notable optimism surrounding GenAI's potential, particularly in solving grand challenges like climate change, healthcare innovation, and space exploration. An unexpected finding is that public narratives often ventured into speculative domains, including time travel and extraterrestrial communications. This aligns with findings by Akinsolu [4] and Gupta et al. [3], who demonstrated how GenAI enhances design processes and supports complex problem-solving in engineering management. For instance, companies like DeepMind have advanced drug discovery through initiatives such as AlphaFold, which has revolutionised protein structure prediction [70]. Such innovations mirror public enthusiasm for AI's ability to drive progress in sectors like education and medical research, potentially ushering in a new era of discovery. This optimism reinforces the 'Perceived Usefulness' construct of the Technology Acceptance Model (TAM) by showcasing AI's value in solving pressing societal issues. Additionally, these advancements support the Diffusion of Innovation (DOI) model's 'Relative Advantage' component, highlighting GenAI's unique benefits compared to previous technologies. However, the findings also caution against industries prioritising profit-driven applications at the expense of societal needs, as such practices could challenge public expectations regarding AI's role in advancing social good.

On the other hand, Theme 3 emphasises the perceived limitations of AI in mirroring human creativity and emotions, particularly regarding the digital divide and inequality [50, 71], reflecting concerns about the human factors in technology adoption discussed in prior research [4, 48]. This perception directly impacts the 'Perceived Ease of

Use' in TAM, as the complexities of human emotion are not easily replicated by AI, potentially limiting its adoption in creative fields. Furthermore, the 'Compatibility' component of the Diffusion of Innovations theory is also challenged, as AI's limitations in replicating human creativity might reduce its compatibility with human-centric tasks and industries. These findings address the research gap identified by Balasubramanian et al. [37] regarding the fragmented understanding of public beliefs towards emerging technologies, emphasising the need for cohesive studies in this area.

Theme 4 underscores significant concerns about the misuse of GenAI in spreading misinformation and propaganda, highlighting anxieties regarding the reliability of AI-generated content, its potential for political exploitation, and its ethical implications. These fears, which include apprehension about the erosion of human essence and threats to democracy, align with challenges related to data privacy and ethics identified by prior literature [29, 31, 71]. The criticism faced by social media platforms like Facebook and X for enabling the proliferation of AI-generated deepfakes and misinformation [72] illustrates these risks. In response, companies such as Microsoft have introduced tools like Video Authenticator to detect and combat misinformation, reflecting efforts to address public concerns [73]. These issues resonate with the 'Perceived Risk' factor, which is increasingly recognised as critical in technology adoption decisions despite not being part of the original TAM framework. Moreover, they relate to the Diffusion of Innovation (DOI) model's 'Trialability' and 'Observability' characteristics, as the visibility of AI's negative consequences can undermine its adoption and acceptance. This dual perspective highlights the tension between the public's fears and industry efforts to develop safeguards, demonstrating the ongoing ethical and practical challenges of integrating AI responsibly.

Alarmingly, Theme 5 focuses on the perception of GenAI as an existential threat, with fears of losing control over advanced AI technologies and their potentially catastrophic consequences for humanity. These concerns include the erosion of human essence, subjugation by AI, and the weaponisation of AI, underscoring the urgent need for stringent regulatory frameworks. High-profile warnings, such as those from Elon Musk [47], have amplified public anxieties, prompting initiatives like OpenAI's commitment to ethical AI development and the establishment of industry ethics boards and collaborative frameworks like the Partnership on AI [51]. These actions reflect public demands for regulation while addressing the ethical dilemmas associated with AI, as highlighted by prior research [40, 50, 71]. This theme extends the 'Perceived Risk' dimension of the Technology Acceptance Model (TAM) by introducing unique existential concerns beyond the typical risks associated with technology adoption. Additionally, it intersects with the Diffusion of Innovation (DOI) model's 'Complexity' and 'Risk' dimensions, as AI's advanced capabilities heighten perceptions of complexity and risk, potentially deterring its broader acceptance. The interplay between public fears and industry responses illustrates the critical need for ethical governance to balance AI's potential with its profound risks.

Lastly, Theme 6 addresses the critical implications of GenAI for surveillance and privacy, raising significant public concerns about invasive monitoring and the potential erosion of civil liberties. The use of AI technologies, such as facial recognition by law enforcement, has sparked controversies, amplifying fears of misuse by governments and corporations, particularly in oppressive regimes. These issues reflect ethical dilemmas tied to AI's pervasive integration into personal and societal domains, as highlighted by Virmani et al. [29] and van Wessel et al. [30]. In response, industries have begun developing privacy-preserving technologies (PETs) and implementing data protection policies, aligning with ethical standards and addressing public fears [51]. These concerns resonate with the 'Perceived Security' aspect in the Technology Acceptance Model (TAM), where privacy and security anxieties could hinder AI's acceptance by undermining perceptions of 'Ease of Use.' Additionally, they correspond to the Diffusion of Innovation (DOI) model's 'Compatibility' aspect, emphasising that the ethical use of AI must align with societal values and norms to support its adoption. This theme underscores the tension between technological advancement and the preservation of individual rights, highlighting the urgent need for responsible governance in AI deployment.

Turning to our second research question, the sentiment and emotion analyses reveal a complex landscape of the public's emotional responses to GenAI, where excitement coexists with significant concerns [12, 14]. This finding is consistent with Bai et al. [11], who highlight the importance of understanding emotional responses towards AI interactions. Notably, these analyses reveal a predominance of negative sentiments, indicative of widespread caution and scepticism about AI's societal impact, even as a segment remains hopeful about its potential benefits. The heatmap findings further underscore this polarisation, illustrating how consistent dominance of negative sentiment reflects enduring apprehensions, while the minority presence of positive sentiment highlights selective optimism in certain areas of AI's application. Highlighting the need for additional research on public sentiments towards GenAI [6], this dichotomy reflects how people view AI in different ways, which aligns with the 'Perceived Usefulness' and 'Perceived Ease of Use' components of TAM, as well as the 'Relative Advantage' and 'Compatibility' aspects of DOI.

Through these insights, it becomes evident how the emotions and sentiments expressed in public narratives closely mirror the belief themes identified, further validating the connection between public sentiment and the thematic concerns raised about GenAI. This triangulation of findings highlights the polarised nature of public discourse on AI, underlining the need for a balanced and ethical approach to AI development that navigates both its promising prospects and the array of risks and ethical challenges it presents. Our findings contribute to the literature by providing empirical evidence supporting the observations of Love et al. [45] and Malodia et al. [46] regarding the importance of trust in AI systems for technology acceptance. Particularly, by revealing the emotional and sentimental underpinnings of the identified belief themes, our study contributes to a more holistic understanding of the factors influencing the adoption and

diffusion of GenAI technologies, extending the TAM and DOI frameworks to account for the unique complexities and challenges associated with this rapidly evolving field.

In doing so, our study contributes to the theoretical understanding of technology acceptance and diffusion, providing valuable insights into the factors that influence public perceptions and the adoption of GenAI technologies. The identified themes and their alignment with the sentiment and emotion analyses offer a context-specific understanding of the TAM and DOI in the context of GenAI, highlighting the unique considerations and challenges that shape public beliefs and sentiments towards this transformative technology.

A. Managerial insights and practical implications

The study findings underscore the urgent need for a strategic approach to managing GenAI's far-reaching effects. Industries must consider how public concerns challenge current practices and adapt accordingly.

The potential for AI-induced job displacement and economic disruption demands immediate action from the industry. Investing in reskilling and upskilling programmes is not a choice but a necessity to equip the workforce for the AI revolution. This approach not only mitigates the risks associated with job losses but also harnesses human ingenuity, ensuring that AI enhances rather than replaces human capabilities. For example, companies could develop targeted training programs that focus on skills complementary to AI, such as critical thinking, emotional intelligence, and complex problem-solving. Companies like Amazon's Upskilling 2025 initiative exemplify the proactive steps that industries can take to address these concerns [69]. Implementing such programmes can lead to a more adaptable workforce, improved employee morale, and sustained productivity, ultimately benefiting both employees and employers.

The research findings also affirm the enduring value of human-driven innovation in the AI era. Industries should enable environments where AI complements human creativity, using AI for data-driven insights while preserving the human element in innovation. For example, Adobe's integration of AI tools that assist rather than replace human creativity demonstrates support for public beliefs about human-AI collaboration. This balance allows companies to explore new frontiers of innovation, blending the best of both humans and GenAI. Encouraging such collaboration can result in more innovative products and services, maintaining a competitive edge in the market. In practice, this could involve creating cross-functional teams that combine AI experts with domain specialists to develop innovative solutions.

Our findings emphasise the importance of ethical development and transparency in AI technologies, highlighting the need for collaboration between policymakers and industry leaders to establish robust ethical frameworks. These measures are essential for maintaining public trust, addressing concerns about misuse, such as misinformation and discrimination, and aligning AI with societal values. Organisations can implement AI ethics boards, as seen in initiatives like Microsoft's AI Principles and Google's ethics board [74], while promoting transparency and awareness through educational programmes and communication strategies [75]. Moreover, incorporating XAI methodologies can enhance transparency and trust by addressing black-box concerns [55, 56]. Engineering managers should adopt XAI approaches to provide interpretable AI outputs, align with public expectations, and improve technology acceptance, ensuring ethical and responsible innovation that also enhances brand reputation and sustainability.

In conjunction with these ethical considerations, the polarised public sentiment towards AI—marked by excitement for its potential and concerns about its implications—calls for enhanced public engagement and education. Governments and organisations from different industries need to work together to demystify AI technologies, addressing concerns and misconceptions through transparent communication. This effort will help bridge the gap between technological advancements and societal acceptance, ensuring the public is well-informed about the changes AI brings. For instance, public information campaigns could be launched to explain AI concepts in accessible language, showcasing real-world applications and addressing common misconceptions. Such initiatives can increase public acceptance and trust, facilitating smoother integration of AI technologies into society.

Considering AI's transformative potential in sectors such as healthcare, education, and public services, alongside the ethical and societal concerns it raises, the formulation of sector-specific regulatory frameworks is crucial. Policymakers are required to achieve a balance between encouraging innovation and safeguarding individuals from the potential negative impacts of GenAI. These regulations should encourage responsible AI development while addressing potential issues like job displacement and ethical breaches. For example, in healthcare, regulations could focus on ensuring patient privacy and the accuracy of AI-driven diagnoses, while in education, guidelines could address the ethical use of AI in assessment and personalised learning. Effective regulation can prevent the misuse of AI and protect society from potential harm, ensuring that technological advancements benefit all stakeholders.

Given the challenges posed by AI, such as its role in spreading misinformation and existential threats, there is a pressing need for robust security measures. Businesses and governments must prioritise the development of advanced cybersecurity defences and AI systems capable of detecting and mitigating misinformation. International collaboration will be essential in addressing these global challenges, ensuring a unified response to the risks associated with AI technologies. This could involve creating international task forces to develop shared standards for AI security and collaborate on combating AI-generated misinformation. Strengthening cybersecurity can protect critical infrastructure and maintain the integrity of information systems, which is essential for national security and economic stability.

Lastly, the diverse reactions to AI highlight the importance of adopting an inclusive and sustainable approach to AI development. Ensuring that the benefits of AI are widely distributed is essential to prevent the exacerbation of social inequalities. Stakeholders should aim for AI advancements that positively impact societal well-being and environmental sustainability, demonstrating a commitment to the broader good. For instance, AI projects could be evaluated

not only on their technical merits but also on their potential societal impact, with priority given to initiatives that address pressing social and environmental challenges. This approach can enhance corporate social responsibility and contribute to a positive public image, attracting customers and investors who value ethical practices.

B. Limitations and scope of future research

In our exploration of public beliefs about GenAI, we have unearthed novel discoveries that offer a first-of-its-kind structure of the public's beliefs about GenAI. However, like any other scholarly endeavours, this study has a few limitations that can motivate future scholarship in this arena.

One limitation stems from our choice to source data from YouTube comments as the primary data source for the study. This approach, whilst yielding insightful results, may inadvertently narrow our lens, focusing primarily on individuals who interact with this platform. However, the potential for future investigations to incorporate a broader range of perspectives, gathering insights from a variety of online platforms and offline conversations, is promising. This could create a richer and more comprehensive dataset, facilitating a more complete understanding of societal attitudes. Future studies could employ a multi-platform approach, analysing data from various social media platforms, forums, and blogs to capture a wider range of perspectives and overcome platform-specific biases. Additionally, future research could involve interviews or surveys with industry professionals to gain firsthand insights into how public beliefs influence industrial practices, providing direct industrial validation of our findings.

Another avenue ripe for exploration relates to our study's linguistic boundaries, which were confined to English-language comments. This constraint potentially sidelines a myriad of global perspectives, particularly from non-English-speaking communities, thereby skewing our insights towards predominantly English-speaking and Western-centric viewpoints. While our study aimed to capture a diverse range of perspectives drawing upon YouTube's global user base, the removal of non-English comments, which constituted a small portion (2.1%) of the total comments, may have slightly reduced the diversity of the analysed data. However, upon manual inspection, these non-English comments were found to be largely spammy and meaningless, lacking substantive content relevant to the study. Future research could address this limitation by incorporating multi-lingual analysis techniques, potentially using advanced translation tools or collaborating with researchers fluent in multiple languages to capture a truly global perspective on GenAI.

The time-related scope of our study, while capturing a snapshot of public sentiment, inherently limits our understanding to a specific timeframe. Given the dynamic nature of AI technologies and their evolving societal impacts, public attitudes are likely to shift over time. Addressing that, conducting longitudinal studies can be a guiding light in understanding how societal attitudes change in response to the continuous advancements in GenAI. Such studies can not only document the evolving narrative of public sentiment, but also provide valuable insights into the long-term integration of GenAI into society. These longitudinal studies could involve regular surveys or periodic analyses of social media data to track changes in public perception over time, potentially revealing how specific events or technological advancements influence public opinion. Additionally, longitudinal studies could be conducted to examine how industrial practices evolve in response to changing public perceptions, providing ongoing industrial validation and informing strategies for aligning industry actions with societal expectations.

Moreover, our reliance on current methodologies for emotion and sentiment analysis, despite their advanced nature, may not fully capture the complex emotional landscape within textual data. As NLP models are evolving, this opens up an exciting opportunity for future research to utilise the latest advancements in natural language processing and machine learning, leading to uncovering more profound layers of public sentiment. This, in turn, would enrich our comprehension of how society emotionally manoeuvres through the domain of GenAI. Future studies could explore the use of more sophisticated sentiment analysis tools, potentially incorporating contextual understanding and sarcasm detection to provide a more accurate representation of public emotions towards GenAI.

Lastly, our thematic analysis, thorough as it may be, might not encapsulate the entire spectrum of public opinion on GenAI. This suggests that there might be deeper layers or unpretentious sentiments that elude our current methodological net. Herein lies the potential for exploratory qualitative research methods, such as in-depth interviews or focus groups, to mine the depths of the public's beliefs. A combination of such approaches could offer richer and more detailed insights into GenAI technologies from more heterogeneous lenses of the public. Also, collaborating with industry partners could provide access to internal reports or case studies, offering a more detailed industrial perspective and further validating our findings against real-world practices.

Additionally, an important area for future research is developing strategies to address the problem of human manipulation of GenAI. Our study highlights concerns about the misuse of GenAI for spreading misinformation and propaganda, as well as the potential for unethical exploitation. Future studies could explore methods to mitigate these risks, such as implementing robust ethical guidelines, developing advanced detection systems for manipulated content, and promoting transparency in AI algorithms. Investigating regulatory frameworks and industry best practices can contribute to safeguarding against manipulation and ensuring that GenAI technologies are used responsibly and for the benefit of society.

In addressing these limitations and exploring these avenues, future research can build upon our findings to deepen the understanding of public beliefs about GenAI and contribute to the responsible development and integration of these transformative technologies.

VI. CONCLUSION

Returning to the research questions posed at the beginning of this study, it is now possible to state that this study provides significant contributions to both academic literature and practical applications in engineering management. Indeed, by revealing the thematic structure of public beliefs about GenAI and analysing the associated

sentiments and emotions, we offer new insights that extend existing theoretical models (i.e. TAM and DOI). Our findings highlight the critical role of awareness building and transparency in addressing public concerns and facilitating the adoption of GenAI technologies. The findings offer practical insights for industry leaders and policymakers to manage AI integration challenges, address public concerns, and balance technological progress with societal expectations. Future research can build upon this foundation to further explore the evolving dynamics of public perceptions and technological innovations.

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