

How Can Generative AI Curate the User Creativity on an Idea Crowdsourcing Platform?

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Generative AI is reshaping the boundaries of creativity and productivity across every field. Idea crowdsourcing platforms rely on user creative engagement to solve problems, innovate, and co-create value through the collective intelligence of individuals. Traditional idea-generation methods may limit idea novelty and diversity and require significant human creativity. Boosting creativity is an imperative requirement of the idea crowdsourcing platforms, where creativity is a complex phenomenon to measure. To solve this problem, we propose a generative AI model that works in two steps: 1) evaluates the creativity scores of users' ideas through the uniqueness, diversity, and feasibility scores calculated using the idea pool and peer and manager's feedback and 2) provides prompts designs to stimulate, enhance and refine the idea's quality of individual users based on the calculated creativity scores. We propose a framework for future research into creativity enhancement through generative AI in idea crowdsourcing platforms. This framework can help users enhance their creative contributions and help platform administrators identify high-potential ideas that may not receive high votes.

Additional Key Words and Phrases: User Creativity, Idea Crowdsourcing platform, Generative AI

1 INTRODUCTION

Online collaborative communities enable virtual interaction, knowledge sharing, problem-solving, and value co-creation [3]. The innovation process comprises idea generation, evaluation and selection. The idea generation phase includes problem identification, research, brainstorming, and aligning the solutions with design thinking principles. The idea generation is the core of the innovation process and requires significant human creativity [5].

Creativity involves creating new, valuable, and surprising ideas [4]. Determining the creativity of a user involves assessing the uniqueness, diversity, and feasibility of his ideas[6]. The uniqueness of an idea refers to the idea's originality[1], diversity explores how many different perspectives or multiple solutions a user can provide[7], and feasibility of the idea refers to the practical value of an idea in solving a problem or achieving a specific goal [2].

Traditional idea-generation methods may limit human creativity as people tend to gravitate towards familiar solutions [5]. Exploring novel and practical ideas requires significant human creativity. Enhancing the users' creativity is an imperative need for idea crowdsourcing platforms. However, creativity is a complex phenomenon to measure in such platforms. To solve this problem, we proposed a holistic generative AI approach that in the first step calculates the uniqueness, diversity, and feasibility of user's ideas to evaluate individual users' creativity. Using the calculated scores, the second step creates prompt designs aimed at stimulating and enhancing users' creativity to iteratively refine and improve their idea quality. We suggest a prompt design approach instead of direct suggestions to encourage human creativity and prevent dependency on AI. Integrating tools like ChatGPT in ideation processes can help organizations efficiently generate novel and customer-beneficial ideas.

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2 METHODOLOGY

The paper proposes a model to help idea crowdsourcing users enhance and stimulate their creativity through generative AI. Figure 1 illustrates the proposed methodology where we perform this task in two steps. First, we calculate the creativity score for each submitted idea through three main aspects of creativity: 1) Uniqueness, 2) Diversity, and 3) Feasibility. Then based on these calculated scores, we propose prompt designs to stimulate users' creative thinking to improve the idea quality. Creativity scores are determined by analyzing submitted ideas and feedback from peers and platform managers. The idea uniqueness score measures how different an individual's ideas are from other users, and the idea diversity score measures how different a person's ideas are from each other. Cosine similarity is used to measure the uniqueness and diversity scores using transformer embeddings. The more dissimilar an idea is from others, the higher its uniqueness and diversity scores. Feasibility is assessed through LLMs summarizing feedback by peers and managers of the platform.

2.1 Uniqueness Score

: The uniqueness score for the submitted idea is calculated by the semantic similarity of the idea with the previously submitted ideas pool.

$$\text{Similarity}(i, P) = \cos(st[i], st[x]) \forall x \in P \quad (1)$$

$$\text{Uniqueness Score}(i) = 1 - \text{Similarity}(i, P) \quad (2)$$

Where 'i' represents the new idea we want to assess for uniqueness. 'P' represents the pool of existing ideas. 'st[x]' represents the sentence transformer function that embeds the sentence 'x' into a vector representation and $\cos(a, b)$ represents the cosine similarity between vectors 'a' and 'b'. Similarity(i, P) determines the semantic similarity of the ith idea in Pool P. While Uniqueness measures how different an idea is from others. It is the inverse of similarity, so we get it by subtracting similarity from 1. We normalized the ranges by dividing the score by the total number of ideas in the idea pool.

2.2 Diversity Score

: The diversity score measures how semantically different a new idea is from the same user's previous ideas. It reflects the degree to which an individual is exploring new conceptual territory within their own body of ideas.

$$\text{Similarity}(i, P_u) = \cos(st[i], st[x]) \forall x \in P_u \quad (3)$$

$$\text{Diversity Score}(i) = 1 - \text{Similarity}(i, P_u) \quad (4)$$

Where P_u represents the pool of the same user's previous ideas.

2.3 Feasibility Score

: To define the feasibility score, we summarised the feedback of peers and managers on every idea and calculated the idea feasibility score using prompt engineering through LLMs. If an idea has no feedback, its feasibility score is calculated by the similar ideas in the idea pool calculated by semantic similarity. After calculating these scores, prompt engineering is applied to enhance the creative engagement of users in the idea crowdsourcing platform as shown in Figure 1.

2.4 Generative AI for Creativity Enhancement

Based on the uniqueness, diversity, and feasibility score calculated, different prompt designs are suggested using generative AI to enhance users' creative engagement. For example, if the users'

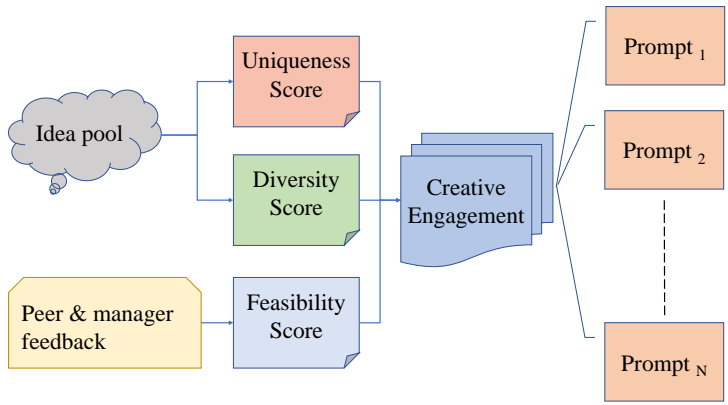


Fig. 1. Methodology for Curating Creativity using Generative AI in Idea Crowdsourcing Platform

scores are less in providing unique ideas, the prompt will add random words from the list of words generated in the idea context to increase users’ novelty. Similarly, if the user has lower scores in divergent thinking, the prompt will provide examples with " What if" to stimulate divergent thinking in that person. Also, the temperature of the prompt will be increased to provide novel and diverse ideas. If the user scores less in feasibility, the prompt will ask the user to elaborate on his idea within the context of manager and peer feedback. This way prompts encourage individuals to engage in active thinking, exploration, and problem-solving. This way prompt designing helps in idea refinement.

```

Def prompt_twister(prompt):
word_list = ["gardening", "teaching", "playing music"]
# Expand this list in idea context
# Technique 1:
Random Word Addition (Promotes Novelty)
domains = [Idea Pool]
prompt += " within the context of " + domains+ "Consider adding"+
random.choice(word_list)
# Technique 2: "What if" (Divergent Thinking)
domains = [Data augmentation using Idea Pool]
prompt = "What if " + random.choice(domains) + "?"
# Technique 3: How?(Feasibility) #Ask user to elaborate
domains = [Peer and Manager Feedback Dataset]
prompt += " within the context of " + random.choice(domains) + "How your
idea works"
return prompt
    
```

Fig. 2. Pseudocode for Prompt Engineering for Stimulating Creativity in Idea Crowdsourcing Users

2.5 Example

In a synthetic data example, a user-generated idea for a "Smart Umbrella project" aimed to incorporate a dynamic light show using LED lights along the canopy's rim. The idea scored high in uniqueness and diversity, but low in practicality. The prompt designing technique generated prompts to stimulate user creativity based on the calculated scores.

2.5.1 Prompt Design: Your Rainbow Light Show Umbrella idea is creative and imaginative. To make it more practical and user-friendly, think about how it fits with SmartBrella's functionality and purpose. Focus on these aspects in your redesign:

Practicality: *How can we ensure that the proposed feature enhances the user experience without being overly distracting or impractical in real-world usage scenarios?*

Core Functionality: *How does the new feature complement SmartBrella's primary function of protecting from the rain and enhancing user safety?*

Cost and Accessibility: *How is the proposed feature cost-effective to implement, and will it make SmartBrella accessible to a broader range of users?*

3 CONCLUSION

This paper proposes a holistic framework for enhancing user creative engagement in idea crowdsourcing using generative AI as a thought provoker and co-creator. For measuring creative engagement, idea uniqueness, diversity, and flexibility scores are calculated. Based on these scores, a novel prompt-designing mechanism has been developed. The proposed model can assist users in refining and improving their ideas by stimulating their creative thinking. This iterative process of idea enhancement can enhance the quality and creativity of user-generated content. This approach can also assist platform managers in identifying the high-potential ideas having high scores in uniqueness, diversity, and feasibility but could not get enough votes.

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