How Generative Artificial Intelligence Impacts Online Content Creation and Engagement

Unnati Narang*

University of Illinois Urbana-Champaign, unnati@illinois.edu

Ruichun Liu

University of Illinois Urbana-Champaign, ruichun2@illinois.edu

*Unnati Narang is an Assistant Professor of Marketing at the University of Illinois at Urbana-Champaign. Ruichun Liu is a doctoral student in Marketing at the University of Illinois at Urbana-Champaign.

1.   Introduction

This document is part of the pre-registration of the experimental design and analysis of a randomized controlled trial studying how generative artificial intelligence impacts online content creation and engagement. This field experiment will be conducted in the online degree programs of a large public university in the U.S. The study was registered and analysis plan prepared before participants had received their randomly assigned experimental interventions.

2.   Study overview

The online courses in our experiment will mainly delivered through Canvas, a popular learning management system (LMS) as well as one synchronous live session delivered via Zoom each week. We will create two types of prompts within Canvas, such that each learner will only see the prompt that is meant for their assigned condition using Canvas' random group assignment feature. The prompts will lay out a discussion question based on each week's course topics. This field experiment takes place in two main stages:

Stage 1: Treatment. We randomly assigned participants to one of the two experimental conditions:

- **AI.** We encourage participants in the *AI* condition to respond to the discussion question using AI inputs.

- **Human.** We encourage participants in the *Human* condition to respond to the discussion question using Human inputs.

Stage 2: Survey. We plan to have weekly survey.

3.   Screening and exclusion criteria

Screening and randomization. The field experiment will be conducted in a Marketing Analytics course in February 2023. A typical course will last four weeks and the expected enrollment is about 300 to 500 learners. Participants in both conditions (i.e., *AI* and *Human*) will access the same Canvas course site upon enrollment. We will use Canvas' random group assignment feature to employ a randomized encouragement design and assign participants to two conditions (i.e., *AI* and *Human*) that will encourage participants to respond to the discussion question using either *AI* or *Human* inputs.

Balance Checks. We will first verify that the participants in both conditions in the experiment are alike in all aspects using individual learner-level data (e.g., age, gender, whether an international student, past course experience, and current degree program).

Additional Validity Checks. While the experimental design (i.e., randomized encouragement design) will provide subtle nudges to comply with certain behaviors (i.e., to use AI), it does not guarantee compliance (e.g., Duflo and Saez 2003). We will conduct five validity checks to verify that the treatment assignment will work as intended and that participants will comply with their assigned prompts.

• We plan to have weekly survey with open-ended questions and find out whether participants in both conditions use AI tools. This will mitigate potential concerns that participants may not be complying with their assigned prompt.

• We will generate responses to the prompts in ChatGPT using GPT-3.5 and analyze the cosine similarity of the AI-generated responses with those posted by participants. If participants in the *AI* condition use AI tools, then we should find a higher similarity between their posts and the content we generate using ChatGPT.

• We will analyze the textual content of the posts made by participants in both conditions. If participants use ChatGPT in the *AI* condition, it is likely that at least some of them mention the AI in their posts.

• We will examine the textual content of posts in the *Human* condition for mentions of AI tools. This will help us address the possibility that even though ChatGPT is not a key theme in the *Human* condition, it could be mentioned as part of a general discussion.

• We will verify that other interactive course components will not mention ChatGPT or other AI tools to make sure that participants assigned to the *Human* condition do not inadvertently find out about the option to use AI in the course.

4. Overview of outcomes

To investigate how generative artificial intelligence impacts online content creation and engagement, we will measure the following outcome variables:

• **Post participation:** Whether a participant posts in the discussion forum at least once (1 = post).

• **Comment received:** Whether a participant receives at least one comment on their post in the discussion forum (1 = receive comment).

• **Post length:** Average word count of post(s) made by a participant.

• **Comment length:** Average word count of comments received by a participant on their post(s).

- **No. of views:** Each participant's total number of views overall in the course community.

- **No. of connections:** Each participant's total number of peers that they "follow" as friends.

- **Reaction received:** Whether a post received participant's reactions in the form of emojis like thumbs-up.

- **Assignment grade:** Each participant's assignment grade.

- **Participation grade:** Each participant's participation grade.

5.   Estimation strategy

We will estimate the key effects of interest using the following regression equation:

$$Y_i = \alpha_0 + \alpha_1 AI_i + \varepsilon_i \tag{1}$$

Where i is the participant, Y is the outcome of interest, AI refers to the assignment to the AI condition encouraging participants to use AI tools like ChatGPT to craft discussion forum responses. ε_i is the error term.

Heterogeneous effects. We plan to evaluate heterogeneous effects based on country, gender, and past course experience. We may use machine learning methods (e.g., text analysis) to investigate the heterogeneous effects in both conditions.

References

Duflo E, Saez E (2003) The role of information and social interactions in retirement plan decisions: Evidence from a randomized experiment. *The Quarterly Journal of Economics* 118(3):815–842.