IIAI Open Conference Publication Series
IIAI Letters on Informatics and Interdisciplinary Research
Vol.004, LIIR179
DOI: https://doi.org/10.52731/liir.v004.179

A Case Study on the Comparison of AI-facilitated Threaded Conversation versus Threaded Conversation

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Abstract

In this paper, we present a process for collecting people's opinions by providing the public with and without an AI-facilitated online environment to post their views. Specifically, we targeted online communities on Facebook and directed them to D-Agree, an AI-powered online discussion forum. We want to explore the extent to which user participation in AI-assisted threaded conversation is successful by looking at the depth of threaded conversation while comparing threads not facilitated by AI facilitation. We deemed an AI facilitator to have successfully promoted the engagement if the discussion thread with an AI-facilitated thread had depth compared to discussion threads without an AI facilitator presence. Our analysis indicates that threaded conversation with conversational agent presence are successful. The collected insights can be used as a planning tool for developing conversational AI applications.

Keywords: Threaded conversation, facilitation, case study, online forum, conversational AI, social experiment.

1 Introduction

Online social forums are posed to be the next-generation venues in facilitating collective action [2]. These platforms allow individuals to come together from anywhere to have their voices at any time [2]. For instance, during the Arab Spring, social media was crucial in mobilizing crowds for collective actions [3]. Millions of people worldwide have become connected through online forums, making it easier to mobilize for collective action [4]. This plays a vital role in establishing a virtual social presence for collaborative efforts and benefits individuals and society [4]. However, despite the usefulness of social forums in promoting social conversation for collective actions, they have limitations in resolving problems meaningfully in a collaborative way [5].

Researchers [5] argue that public virtual presence in social conversations alone cannot guarantee meaningful discussions and consultations because they fail to provide supportive means to facilitate problem-solving conversations. Therefore, incentive and facilitation mechanisms are required to stimulate efficient communication and collaboration among online users within online forums at scale [6-8]. Conversational Artificial Intelligence (AI) is gradually changing the way of information processing and communication in the digital habitat, and the

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utilization of social forums to recruit subjects for experimental research is becoming increasingly prevalent in social science for good [9-10].

Previous research studies on promoting social participation in digital communities have primarily focused on the role of AI-assisted online discussion forums in social or controlled experiments [4, 9-10]. Only a few investigated the moderating role of AI-assisted online discussion forums in wild digital social environments, focusing on threaded conversations, particularly in line with Solidarity with Ukraine [2]. Thus, this study is the first attempt to study the effect of conversational agents from the threaded discussion development side, not from the general discussion development/content side.

1.1 Research Questions

The research question of interest to study questions below:

- ✓ **RQ1**: Can Conversational AI improve meaningful discussion, especially in crisis situations?
- ✓ **RQ2**: In what sorts of situations are users engaged in online education process: with presence of AI vs. without presence of AI in online discussion?

To answer above question, we examined the performance informetric of users while using online discussion environmental setting: Threaded conversation with and without AI as facilitator setting. We expected that joining the threaded conversation using AI facilitation support would produce more engagement than discussion threads without AI presence.

1.2 Research Model and Hypotheses

This paper contributes had a social objective of fostering problem-solving discussions in the context of solidarity with Ukraine [2, 5] within a framework of collective action by conducting the social experiment while aiming to investigate the effectiveness of AI facilitation in promoting online discussion while comparing the threaded conversations facilitated by conversational agents with those conducted without their intervention.

Furthermore, building upon above-described information, we put forth below hypotheses (H) to guide our research:

- ✓ **H1:** Conversational agent moderates the positive relationship between thread development and the users' intention to engage in interactive discussion such that the threaded conversation is deeper for the discussion thread with AI-facilitated than the threads without AI facilitator presence.

By investigating the above hypotheses, we aim to enhance our understanding of the environments in using AI agents as facilitators and their supporting infrastructures for online discussion. It will help us restructure online discussion forums to empower meaningful education [12].

The paper is structured as follows. In the next section, we cover some of the related work. Then, we introduce our research methodology. In section 4, we provide the experimental results. Finally, we conclude and highlight the future directions.

2 Related Research

This section provides an overview of relevant related social experiment studies and their user behavior experiments and social impact using conversational agents as facilitators.

As more and more people join Internet-based communication, systems designed to promote and support communication, mainly text-based discussion interactions [1-2]. One such platform is "D-Agree", an online crowdsourcing forum launched in 2018 to address facilitation bias and scalability by introducing a facilitation agent [1].

A study conducted in Nagoya city shows that agents as facilitators support contributions in online discussion [1]. Another work studied the benefits of deploying conversational agents in Afghanistan's online debate [9]. The authors stated that conversational agents support online discussion.

A study [4] shows the benefits of using online discussion support forums from the municipal governmental informed decision-making point of view. It lists strategies and improvements to mitigate the challenges, leading to a more participatory platform.

Hadfi et al. [10] studied the quality of discussion and women empowerment in online discussion by deploying a conversational agent. They found that conversational agents allow women to collaborate in online discussions. Another study [11] found that conversations in online forums led to the construction of new knowledge as individuals share learning and negotiate information through conversations. Discussion in the online platform also supports the development of skills for working in virtual teams and the effects on offline (civic) engagement [12].

Despite the increasing use of AI-powered online discussion, few studies explore the moderating role of AI-assisted online discussion forums on discussion threads development while focusing on users informetric such as number of r*eplies*, and *likes*. Thus, this study is the first attempt to study the effect of conversational agents from the threaded discussion development side, not from the general discussion development/content side.

3 Methods

Our general methodology adopts a quantitative case study, specifically focusing on how conversational agents can support human participants to develop threaded development. The study conducts two experiments: (1) participation in an online discussion with a conversational agent as a facilitator and (2) participation in an online discussion without the support of a conversational agent as a facilitator. The general research pipeline is shown in Fig. 1.

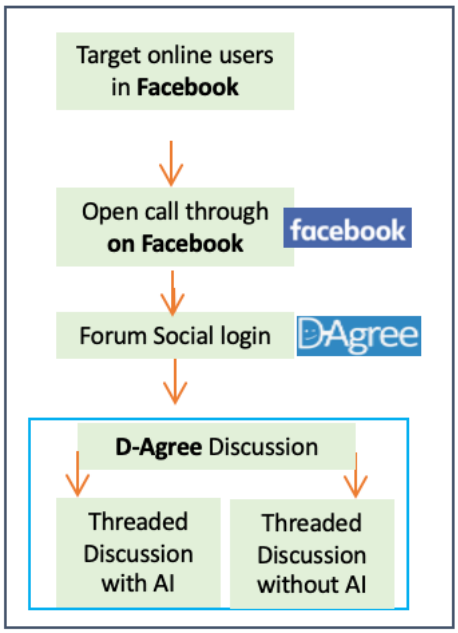

Figure 1: Research methodological pipeline

3.1 Study Instrumentation

The research used D-Agree [1], an AI-assisted text-based discussion tool designed for collaborative interactions. D-Agree consists of an artificial agent and a web platform that enables participants to exchange text with the agent and their peers.

The automated facilitation agent fulfills a range of functions, including observing the textual content contributed by users, identifying argumentative expressions through the Issue-based Information System (IBIS) [13] framework, generating facilitation messages according to predefined guidelines, and posting these messages on the discussion board as responses to other participants' contributions (for more details about D-Agree, please refer to [1]).

3.2 Data Collection and Analysis

Data were gathered from individuals' logs (n =125) and postings (n =346) on D-Agree, who were directed from Facebook to D-Agree through a convenient open call [2]. Ninety-two user threads were collected for analysis, spanning over a year, specifically from March 1, 2022, to March 31, 2023.

Since the number of threaded conversations with and without an agent was unequal, we selected the initial 22 threads with AI and 22 threads without an agent out of 92 threads as a case for evaluation purposes. We want to explore the extent to which user participation in AI-assisted threaded conversation is successful by looking at the depth of threaded conversation while comparing threads that are not facilitated by AI facilitation. We deemed an AI facilitator to have successfully promoted the engagement if the discussion thread with an AI-facilitated thread had depth compared to threads without an AI facilitator presence. The number of replies and likes on

threads was used to analyze conversational agent efficacy on threaded conversation development while comparing it with threaded conversations without agents.

3.3 Experimental Setting

We set a discussion space and randomly selected the threshold of the conversational agent facilitations such that the conversational agent posts a facilitated message to some threaded conversations (please refer to Fig. 2) and ignores others (Fig. 3). The consented population can see all threaded discussions, with and without AI, and they can voluntarily join based on their preference and availability.

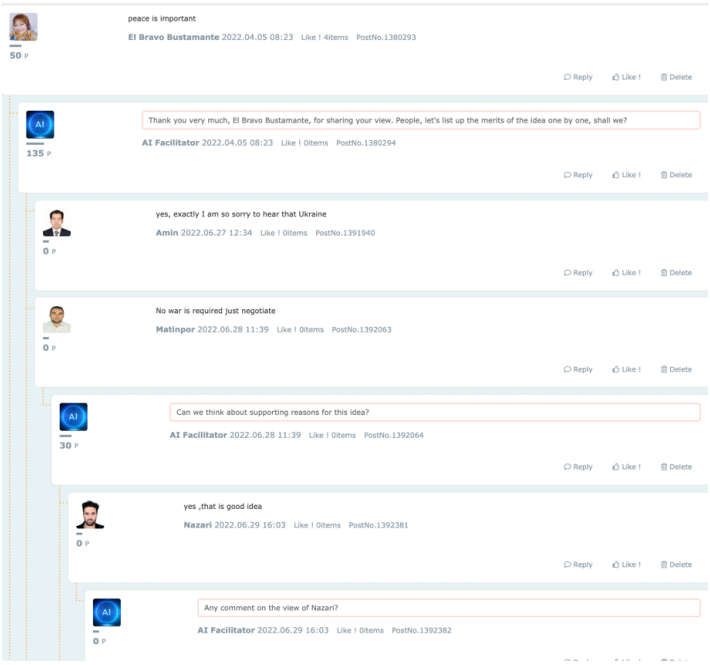

Figure 2: Threaded conversation with AI facilitation presence

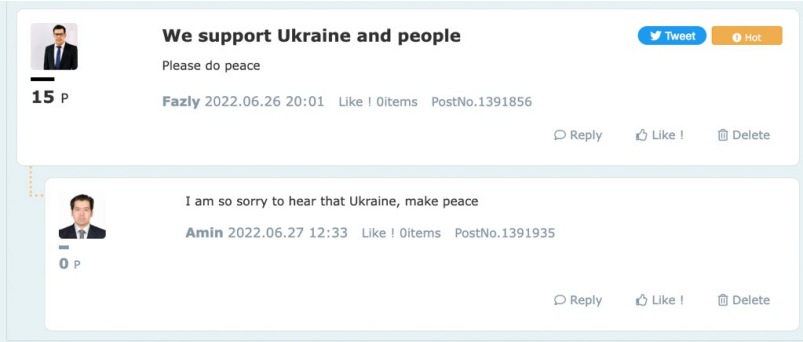

Figure 3: Threaded conversation without AI facilitation

3.4 Evaluation

The research procedures were structured to investigate the efficiency of conversational agent in the online threaded discussion, guided by distinct task-based observation while looking at the discussion with and without conversational agent presence as a facilitator.
We relied on the distinct task-based observations that contain:

1. Number of replies
2. Number of likes

We then used measures to compare the development of both experiments. We want to explore the extent to which user participation in AI-assisted threaded conversation is successful by looking at the depth of threaded conversation while comparing threads not facilitated by AI facilitation. We deemed an AI facilitator to have successfully promoted the engagement if the discussion thread with an AI-facilitated thread had depth compared to discussion threads without an AI facilitator presence.

4 Results

The results of the performance metrics quantified data are shown in Figure 4 and Figure 5. Our analysis indicates that threaded conversations with conversational agents are successful, supporting **H1**. Our research revealed that the threaded conversation with conversational agents received the highest average number of replies (n =4.2) on D-Agree, compared to threaded conversations without agents (n =0.8), respectively (Fig. 4 vs. Fig. 5).

From a positive relationship between thread development and the users' intention to engage in interactive discussion standpoint, the analysis suggests that the threaded conversation with conversational agents received the highest average number of likes (n =3.5) on D-Agree, compared to threaded conversations without agent (n =0.5), respectively (Fig. 4 vs. Fig. 5). Our findings are in good agreement with H1.

5 Discussion

It is essential to promote civic discussion for the social and democratic good by incentivizing digital communities to participate in civic debate. Using conversational agent as a facilitating tool with digital communities can promote their interaction and engagement, promoting collective intelligence. As a result, the collected insights might be used for informed policy-making.

Our research reveals that conversational agents positively affect interest and intent to engage in an online discussion, promoting dialogue consistent with a previous study [8][9]. This evolution demonstrates that conversational agents could be a helpful precondition for setting up crowd engagement for problem-solving conversations in global communities.

When users see more engagement in threaded conversations, they think they can gain more knowledge about threaded topics; as a result, they show interest in joining and liking the threaded discussions. Concentrating on developing the threaded conversation can have a correspondingly more significant increase in interest. This needs to be investigated further in future research in a large-scale controlled experiment.

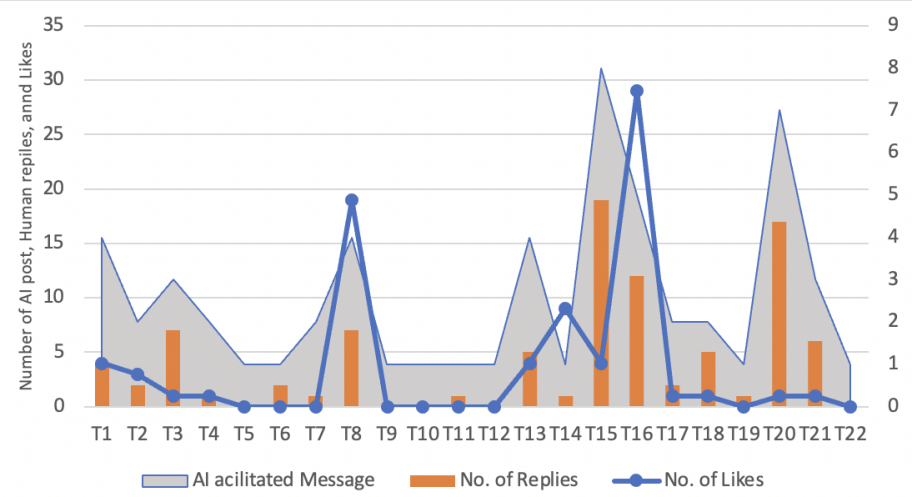

Figure 4: Discussion Metrics of Threaded conversation with AI facilitation

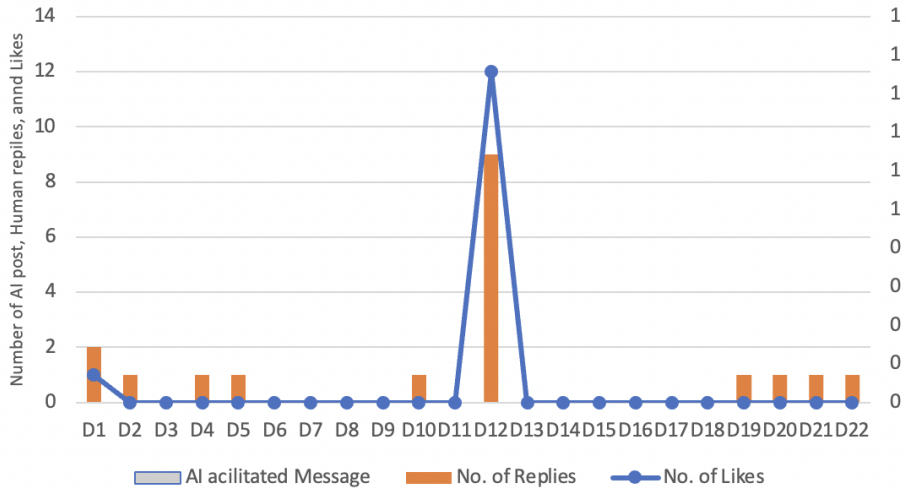

Figure 5: Discussion Metrics of Threaded conversation without AI facilitation

5.1 Limitations and Future Directions

While our study demonstrated the value of an AI-driven discussion platform, it has limitations. Although the proposed case study approach can be a complementary tool to collect people's insights on global problems effectively, it faces several hurdles and challenges that must be addressed in the future, for example, inequality of threaded conversations with and without an agent, not much control on subjects to conduct post-questionnaire survey, etc.

There are many directions for future work. For example, while this study's results only provide quantifications of the performance metrics, this paper would benefit from further elaboration and explanation.

6 Conclusion

Our research has shed light on the efficacy of AI-driven discussion platforms. Overall, this study contributes to understanding the impacts of conversational agents in developing user interest to engage in interactive online discussion.

We present a process for collecting people's opinions by providing the public with and without an AI-facilitated online environment to post their views. We want to explore the extent to which user participation in AI-assisted threaded conversation is successful by looking at the depth of threaded conversation while comparing threads not facilitated by AI facilitation. We deemed an AI facilitator to have successfully promoted the engagement if the discussion thread with an AI-facilitated thread had depth compared to threads without an AI facilitator presence. The collected insights can be used as a planning tool for authorities.

Acknowledgement

This research was supported partially by the JSPS KAKENHI (Grant Number: 23K17164, Japan, Japan) and JST CREST fund (Grant Number: JPMJCR20D1, Japan). Additionally, we would like to extend our appreciation to all those who participated in this study.

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