J-057

An IBIS-Focused Diverse Facilitation Timeline for Online Discussion: Preliminary Experiment

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1. Introduction

Online Support Forums are considered the next generation democratic venues for human communication [1, 2, 3]. AI plays a crucial role in facilitating effective discussions on these forums, managing discussions, and promoting diverse opinions [3]. These technologies not only serve as supporting tools to promote online discussions but also act as collaborators [5] to help making informed policy-making [6], such as Automated Facilitation Agent (FA) in D-Agree [1], an AI-assisted online forum which supports discussions and collaborates in leading discussions to help foster consensus-building. The FA have adopted general consensus facilitation policies to promote discussions [7]. The use of such agents aims to overcome the limitations of human facilitators and continuously facilitate ongoing discussions [8]. They can also consider opinions that may be challenging for humans to comprehend and act as fair collaborators, as they are not subject to human biases [1]. However, researchers argue that general facilitation policies have limitations in supporting consensus building because they rely on a single policy throughout the discussion [9]. To address this, the we previously proposed a discussion element-specific facilitation policy that uses different policies to form a diverse consensus on different stage of discussion [9]. However, the study did not propose a timeline for adopting the proposed facilitation policies and evaluating their effectiveness within online discussions. In this study, we proposed timeline for each policy, and conduct preliminary experiment to show the efficiency.

2. Related Work

In the context of D-Agree, a dialogue mapping model [10], Issue-Based Information System (IBIS) [11], and conversational agent (CA) is utilized within online forum to facilitate collaborative design and problem-solving conversations [9]. The Automated Facilitation Agent in D-Agree employs the IBIS to effectively oversee and manage online discussions [12]. IBIS comprises four distinct types of elements of discussion: issues, ideas, pros, and cons, each of which is represented as a node [12]. The relationships between these nodes are referred to as links [12].

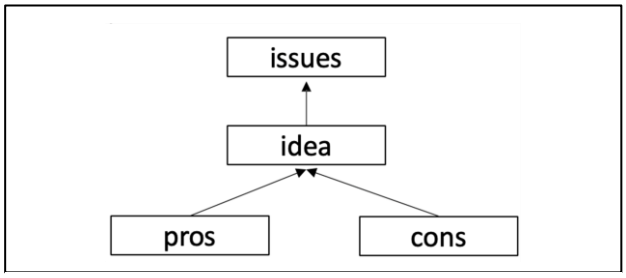

Fig. 1 Showing nodes and links of IBIS structure

Currently the agent posting the facilitation messages based on generation facilitation policy (GFA) on IBIS, while randomly targeting all four nodes within discussion [13] throughout the discussion. This approach facilitates all IBIS elements simultaneously, without considering specific discussion phases.

However, the authors argue that despite their usefulness in promoting the discussion, adopting GFA throughout the discussion have limitations in properly facilitating strategic long term-discussion in post-conflict societies [9]. We believe that in post-conflict societies such as Afghanistan, it is crucial to address not only the identification of solutions for existing problems but also the prevention of recurring actions that contribute to these problems. Therefore, it is importantly to critically facilitate discussion step by setp which follows a proper discussion timeline to foster a diverse consensus for each phase of the discussion process.

Thus, in this study, we proposed different facilitation policies and then timeline for each policy per discussion phase. The purpose of this study is to perform discussion IBIS element-specific node facilitation per each phase. Our assumption is that the proposed facilitation policy will result in a higher number of objections being raised for proposed solutions during the discussion, compared to discussions not facilitated by conversational agent.

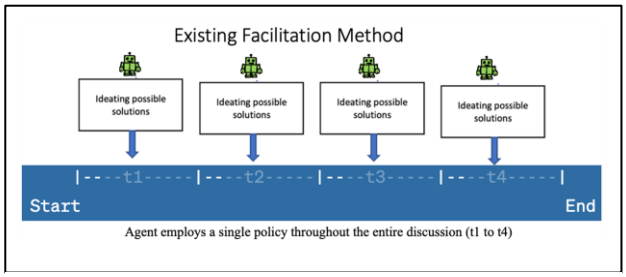

Fig. 2 General Facilitation Policy

3. Methodology

Our general approach is to classify the discussion step by step, while focuse on targeting one specific type of node at a time per each discussion phase. We classify certain nodes and subsequently target them based on the particular discussion phase (n=4).

3.1 Approach

In order to classify the discussion step by step, our approach focuses on targeting one specific type of node at a time.

To enhance the specificity of the discussion structure, we introduce a "Discussion Timeline" as an additional component within the IBIS framework. We inrodcue four phases as shown in

Fig 3. We classify certain nodes and subsequently target them based on the particular discussion phase (Fig. 4).

In our approach, both the discussion and facilitation structures are based on the IBIS framework, with the aim of facilitating the nodes within the discussion.

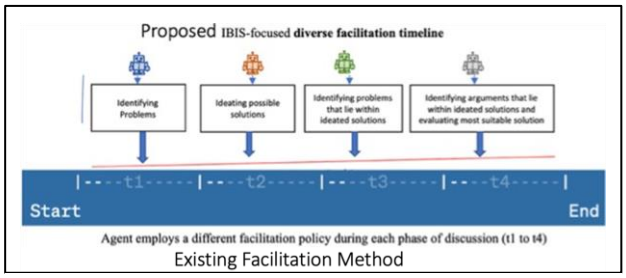

Fig. 3　Proposed Approach

3.2 Discussion Timeline and Phases Definitions

We facilitate nodes as the discussion progresses through four distinct phases, namely 1) issue prioratization phase, 2) ideation phase, 3) identification of challenges within ideated phase, and finally 4) identifying arguments on ideated phase while evaluating most suitable solutions.

In first phase, participants prioritize the identified issues. In second phase, participants generate and propose potential solutions. In third phase: Participants explore and identify challenges associated with the proposed solutions. And finally, during final phase, participants engage in discussions, providing arguments and evaluating the most appropriate solutions.

Throughout these four phases, we ensure the to adopt a facilitation of nodes configuration in line with phase behavior to foster a comprehensive and productive discussion.

4. Experimental Configurations

We setup the configurations of agent during each phase (n =4).

4.1 Experimental Setups

We predefined four discussion phases. Each phase behaviors are illustrated in Fig.4.

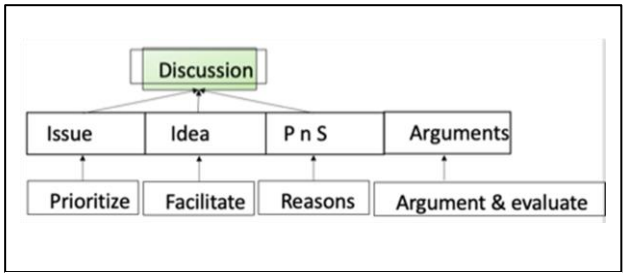

Fig. 4　Structure of proposed discussion model and their FA policies configurations

4.1.1 Phase 1

In first phase, we proceed to adopt an agent behavior to target issue specific type of node at a time while prioratizing needs challenges for raised issues. We assume it promote participants engagement to prioritize the identified issues.

4.1.2 Phase 2

In second phase, we proceed to adopt an agent behavior to target issue specific type of node at a time. while promoting ideas for raised issues. We assume it incentivize participants to promote the ideations.

4.1.3 Phase 3

In third phase, we proceed to adopt an agent behavior to target idea specific type of node at a time while identifying the problems that lie within ideated solution. We assume it promote participants engagement to prioritize the ideas that can be easily adopted within local communities. The agent behaviors during phase 3 is illustrated in Fig.5.

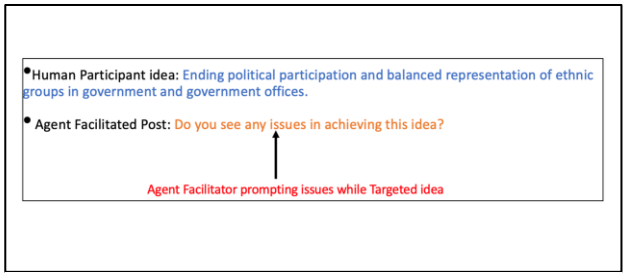

Fig. 5　Agent behavior during third phase

4.1.4 Phase 4

In final phase, we proceed to adopt an agent behavior to target agrumentative specific type of node at a time while evaluating most suitable ideated solution. We assume it promote participants engagement to prioritize the argumentative discuss that can be easily adopted as a tool for informed decision making for selecting suitable ideated candidates.

4.2 Evaluation

To assess the proposed approach quantitatively, we conducted a set of preliminary experiments targeting specific phases of the discussion. For example, we conducted a set of experiments to evaluate the efficiency of agent behavior.

Two distinct experimental studies were undertaken, with each study spanning a duration of 15 days. These studies employed separate conversational agents, namely Agent A that adopt General Facilitation Agent (GFA) and Agent B that adopt the behavior of phase 3. The agent A adopt GFA while facilitating all IBIS elements at once without considering discussion phases behavior. In GFA policy, the discussion is more centric on raising ideas. On other hand, agent B adopt an agent behavior to target idea specific type of node at a time while identifying the problems that lie within ideated solution. We assume number of genereted ideas is lower for raised issues in Agent B (targetted facilitation) compared to Agent A (general facilitation).

The results of the discourse quantified data of both studies are shown in Figure 6.

In the general facilitation (GFA) approach, the number of ideas is significantly greater than the number of issues when

compared to targeted facilitation. This result demonstrates statistical significance at $p < .05$ when comparing the quantity of ideas versus issues between the two studies.

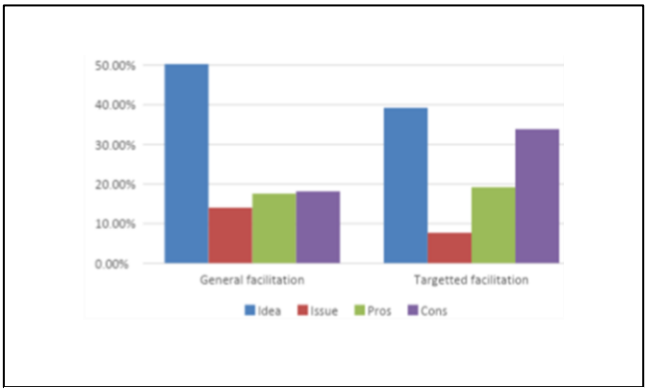

Fig. 6　Comparing GFA's node facilitation with proposed approach

5. Discussion

The experiments were conducted using two different settings, representing distinct agent facilitation scenarios. The results from the experiments demonstrated that the targeted facilitation approach outperformed the general facilitation approach in achieving the predefined goals set for targeted facilitation.

The analysis of the evolution of IBIS counts on contents reveals that the dicussion element-specific facilitation based on IBIS approach primarily emphasizes on defined facilition policy. The prescribe goal here was to promote discussion, particularly number of issues that lie within proposed solutions during the discussion. This result is consistent with our hypothesis that implementing a predfined discussion element-specific facilitation policy, in this case phase 3 that facilitates solutions (ideas nodes) and encourages discussing issues within proposed solutions would increase diverse discussion to prioritize the ideas that can be easily adopted within local communities. As a result, it will lead to diverse discussion, compared to discussions facilitated by a conversational agent (GFA).

This evolution shows the success of proposed approach, and could be very helpful as a precondition on setting to critically facilitate and question proposed solutions in order to form a diverse consensus on common problems and their solutions.

Although the proposed facilitation policy can be a complement tool to effectively collect people's insights and concerns on proposed solution, but faces several limitations and challenges that must be addressed in the future. For instance, to effectively assess the efficiency of the proposed approach, it is necessary to compare it with an existing facilitation approach, such as a general facilitation policy. Although the proposed approach proves to be a valuable tool for facilitating step-by-step facilitaiton, it is important to acknowledge certain limitations and challenges that need to be addressed in future analyses. These limitations include issues such as the inequality of threaded conversations with and without an agent (targeted facilitation) and the limited control over subjects for conducting post-questionnaire surveys.

Furthermore, while the results provide only quantifications of the IBIS for phase 3, we believe, this paper would benefit from further elaboration to conduct more set of experiment on other phases. Also, a mix of quantitative and qualitative comparative analysis of current study would strengthen the discussion to compare the user acceptance and stafisfications while engaging with different facilitation policies within discussion and with only facilitation policy (GFA) throughout the discussion.

6. Conclusion

To conclude, we proposed a discussion timeline while adopt a facilitations policy by extracting concrete discussion structures based on discussion phases at a time.

The objective was to introduce discussion phases while increase facilitations policy by extracting concrete discussion structures based on discussion phases. Furthermore, we aims to promote the role of Machine from tool to collaborator by adopting different policy in line with discussion nature.

We conducted set of experiments with and without conversational agent that adopt targeted facilitation to validate the efficient of our proposed approach.

It is worth to note that, this study contributes to the understanding of how conversational agents can impact user interest in engaging in interactive online discussions during a only third phase. However, it is essential to conduct more controlled research to gain a deeper understanding of the specific effects and directionality of other phases as well (first, second and fourth phases). As a future work, we will go deeper into mix quantitative and qualitative comparative analysis of current study and conduct a comparative evaluation of our proposed facilitation timeline approach throughout discussion.

Acknowledgments

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Reference:

[1] Takayuki Ito et al. D-agree: Crowd discussion support system based on automated facilitation agent. In 35th AAAI conference, 2020.
[2] T. Ito, R. Hadfi and S. Suzuki, "An Agent that Facilitates Crowd Discussion: A Crowd Discussion Support System based on an Automated Facilitation Agent", Group Decision and Negotiation Journal, 31(1), 621-645, 2022
[3] P. Louise and J. Salvatore. 2015. Individual and social benefits of online discussion forums, Computers in Human Behavior, 50:211-220.
[4] R. Hadfi et al. 2021. "Argumentative Conversational Agents for Online Discussions". Journal of Systems Science and Systems Engineering. 30(1): 450:464.
[5] Isabella Seeber et al, Machines as teammates: A research agenda on AI in team collaboration, Information & Management, 57 (2), 2020
[6] J. Haqbeen et al. "Using decision support system to enable crowd identify neighborhood issues and its solutions for policy makers: An

online experiment at Kabul municipal level". Sustainability, 13(10): 5453, 2021.
[7] J. Haqbeen et al. Promoting discussion with AI-based facilitation: Urban dialogue with Kabul City. In: ACM Collective Intelligence Conference (ACM CI 2020)
[8] J. Haqbeen et al. In Solidarity with Ukraine through conversational AI via Facebook Ads: A vase study of online discussion in 15 countries. in: Proceedings of the 24th Annual International Conference on Digital Government Research (DG.O 2023)
[9] S. Sahab et al. Facilitating the Problems that lie within the Solutions using Conversational AI: A Case Study of Post-2021 Afghanistan. In: Proceedings of the 24th Annual International Conference on Digital Government Research (DG.O 2023)
[10] Conklin, J. Dialogue Mapping: Building Shared Understanding of Wicked Problems, Wiley, Chichester. (2005)
[11] Kunz, W., and Rittel, H. W. Issues as elements of information systems (Vol. 131). California: Institute of Urban and Regional Development, University of California (1970)
[12] Shota SUZUKI et al. Extraction of online discussion structures for automated facilitation agent. Proceedings of the Annual Conference of JSAI, JSAI2019:2F1E302–2F1E302, 2019.
[13] J. Haqbeen et al. How did discourse shift among Afghan citizens during the fall of republic: Early insights using conversational AI platform. in: Proceedings of the 23rd Annual International Conference on Digital Government Research (DG. O 2022): 480–482.