Analysis and Enrichment of Description in Restaurant Review through Follow-Up Interaction

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Abstract—This paper proposes a framework to enrich restaurant reviews by providing follow-up questions to reviewers about absent elements in their original reviews. Utilizing ChatGPT, we investigated enhancing the detail and organization of reviews by examining 26 participants' interactions across food, environment, and user experience. The results suggested that the follow-up interaction encouraged more informative reviews by highlighting omitted details. Especially, it effectively increases mentions of the restaurant's atmosphere and personal experiences alongside food descriptions. This approach offers insights into factors influencing review content, such as review writing experience and dining context. We believe that the findings will be helpful for customers as a guide to writing reviews and suggest the effectiveness of follow-up interaction in writing reviews.

Keywords-Follow-up interaction; computational approach for food and eating activities; Large Language Model-supported system.

I. INTRODUCTION

When selecting a restaurant from numerous options, customers frequently refer to restaurant reviews posted on websites. These reviews directly reflect the experiences and impressions of reviewers who have actually visited the restaurants. The review is a precious source of restaurant information for customers. Reviews significantly influence customers' impressions of restaurants before their visit, and the content of these reviews can greatly affect the restaurant's patronage [1]. Restaurants undertake various approaches to attract customers through reviews: offering the first drink, a plate of desserts, and optional services for free, such as writing a review or posting photos and videos with some specific tags.

Restaurants try to attract customers through some initiatives. Let us consider that the handled content differs between writing reviews and posting tagged photos and videos. Reviews primarily deal with text, while photos and videos mainly involve visuals and sounds. The text in reviews can detail various aspects of the experience in the restaurant. The reviews can tell not only the taste, smell, and texture of the food, but also the ambiance and environment of the restaurant, its location, and the attitude of the staff. Moreover, they sometimes provide the circumstances leading up to the reviewer's visit and individual events for each reviewer in the restaurant. These types of information are helpful for customers to select a restaurant. On the other hand, photos and videos may not offer as much detailed information as reviews. They can provide attractive and impressive visual information, e.g., the appealing appearance of food [2], customers' facial expressions after eating. To attract customers through visually appealing content, restaurants have been making various efforts to make their dishes look more appetizing.

Reviews are potentially able to provide much valuable information for customers, but most of them do not provide sufficient detail about the restaurant. Just one word like "good" or "bad" can not be a source to be referred to. Accordingly, so many customers focus on photos and videos, and then restaurants emphasize visual and sound content as an advertisement. It is not too much to say that this trend ignores something that can not be recorded in photos and videos. If the review can be improved as its potential, the customers can receive more information for aspects not shown in photos and videos, e.g., smells of coffee and the kindness of staff. We thus investigate the following research questions;

RQ 1 What memory challenges do customers face when detailing a restaurant?

RQ 2 What types of information can be missed in reviews?

RQ 3 Does the follow-up interaction enrich the description in reviews?

In this paper, we ask reviewers to describe their dining experience twice. From the investigation, we study what they remember and easy to describe from different perspectives. When reviewing a dining experience, the memories the reviewer recalls are not text but sensory information from their senses: visual, auditory, olfactory, gustatory, and tactile inputs. For RQ 1, This study explores how reviewers verbalize and express these memories in text, what information is easier or harder to recall, and what information can be expressed in text but not in photos or videos, and vice versa. By clarifying these aspects, we aim to understand the trends in review writing and consider how to enrich the content of reviews based on these findings. To investigate RQ 2 and RQ 3, we prepare the follow-up system introducing ChatGPT. As a review is input, the system identifies aspects that exist and do not exist in the review. The system shows the follow-up question to encourage reviewers to detail the missed aspects in mind. The aspects in the original and revised reviews are comparatively analyzed. Then, we consider the effectiveness of follow-up interaction in enriching reviews.

II. RELATED WORK

Restaurants can be classified into numerous segments, with criteria: the level and quality of service, customer participation in the dining experience, price, quality of food, and ambiance

[3]–[6]. Based on these criteria, restaurants can be categorized into fast food, casual dining, fine dining, and business food service, among others. There are many elements unique to each segment, while common elements (e.g., accessibility, menu diversity, and a certain level of cleanliness) across the segments exist. Existing papers discussed which restaurant segment can meet customer expectations and what elements enhance customer satisfaction [7]–[9]. These studies have shown that casual dining restaurants adequately meet customer expectations, and the quality of food and restaurant services significantly impacts customer expectations. It has also been confirmed that the price of food affects customer satisfaction, especially in fast food and casual dining restaurants [10], [11].

Let us focus on the unique elements of each restaurant segment. It is evident that aspects like food quality, restaurant service, and price are crucial elements for relatively low-priced dining options. These elements are related to the customers' dining experience and their overall experience in the restaurant. There are many studies that have used different aspects necessary for customer satisfaction in reviews, extracting various evaluations of restaurants from reviews [12]–[17]. These studies have enabled the automatic evaluation of restaurants based on reviews and feature extraction. They analyzed elements necessary for customer satisfaction in restaurants from various points of view.

However, these studies do not enrich the content of reviews to enhance the customer experience.

This research analyzes 1) what aspects are likely to be described in reviews, 2) in what order they are typically described, and 3) what content is recalled through follow-up interaction. It aims to identify points that satisfy customers and make them want to write reviews, contributing to enriching customer experiences and the management strategies of restaurants. Furthermore, by identifying the elements customers look for in restaurants from reviews. The proposed system introduces ChatGPT to point out missing elements in reviews. This paper investigates the effectiveness of follow-up interaction to enrich the content in reviews to be more comprehensive and informative.

This study introduces ChatGPT to identify missing elements in restaurant reviews. Through the experiments, we investigate the effectiveness of follow-up interactions in making reviews more comprehensive and informative. It is reasonable to say that the improved reviews are valuable for both customer experiences and restaurant management.

III. PROPOSED METHOD

Figure 1 shows the framework of the proposed system and its interaction. In Section III, we developed a system to detect existing/absent elements in reviews and to enrich reviews through follow-up interaction. The review elements are preset to ChatGPT with prompt engineering.

A. Elements in restaurant reviews

This paper defines the elements in restaurant reviews as encompassing all aspects related to dining; we consider that
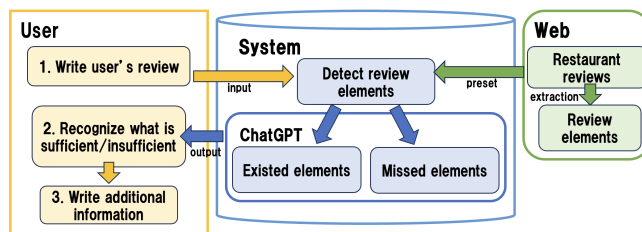

Figure 1. The framework of the proposed system and its interaction. A system introducing ChatGPT where review elements extracted from reviews are learned. The system give feedback the viewpoints missed in a review to users as a follow-up.

TABLE I
REVIEW ELEMENTS INCLUDED IN RESTAURANT REVIEWS. THERE ARE THREE POINTS OF VIEW IN REVIEW ELEMENTS: FOOD, RESTAURANT, AND REVIEWER (I.E., THE USER.) THE INDEX OF ELEMENTS IS ASSIGNED TO THE LEFT OF EACH ELEMENT.

ID	Food	ID	Restaurant	ID	Reviewer
1	taste	8	place	16	when
2	texture	9	budget/price	17	who
3	appearance	10	interior/decoration	18	why
4	smell	11	staff	19	feeling
5	ingredients	12	customer	20	event
6	volume	13	season	21	user age
7	food combination	14	history of store	22	hunger level
		15	limited event	23	satisfaction

the experience of dining out includes before and after visiting the restaurant itself. To empirically extract these elements, the first author conducted a systematic survey of restaurant reviews on a popular dining website [18].

This involved analyzing a diverse range of reviews to identify common themes and descriptors used by customers. The extracted elements reflect the holistic dining experience and are represented in Table I, which is preset in the proposed system. For analytical clarity, these elements were categorized into three perspectives: food, the restaurant's environment, and the reviewer's experience. This categorization was based on the frequency and significance of mentions in the reviews, allowing us to distill the most impactful aspects of the dining experience as perceived by customers.

Note, the elements were heuristically selected in this paper. It is not crucial to the goal of our study, which is to investigate the effectiveness of follow-up interaction in enriching reviews. Although, the data-driven approach to preparing the elements will be our future work.

B. Follow-up interaction with ChatGPT

The system introduces ChatGPT as a conversational model of Large Language Models: LLM.

We set the following prompts to ChatGPT;

[PROCEDURES]
Please assist in creating a restaurant review. Follow the steps outlined below to provide support in writing restaurant reviews.

1) Inform the participants by saying, "Please enter your review."
2) Have the participants input their review.
3) Detect which elements of the review are present based on the input of participants, identifying which of the following categories each element belongs to: {about the food}, {about the environment}, {about the reviewer}.
4) Briefly communicate to the participants the detected elements from their review.
5) Inform the participants of any missing elements, ensuring that there are at least three elements mentioned in the review under each category {about the food}, {about the environment}, {about the reviewer}.

The elements of restaurant reviews described in Section III-A are preset to ChatGPT. We conducted prompt engineering for ChatGPT to detect existing and absent elements from an input review. When participants input their dining experiences at a restaurant, the system identifies which elements exist in the review. The system represents all elements included in a review for each perspective. Also, the system represents more than three absent elements for each perspective if the review does not include all of the elements in Table I completely. After representing these, the system suggests reviewer add the absent elements to comprehensively enrich the review. Note, users may add any descriptions other than absent elements suggested by the system.

We observed how the system works through test cases in advance. Reviews randomly selected from a website were input into the proposed system. It was confirmed that the proposed system successfully identified some existing and absent elements in nine reviews out of ten reviews. One error case only represented existing elements but did not show absent elements as a suggestion. For such error cases, the proposed system could represent correct absent elements as the experimenter additionally prompted "detect the absent elements" as an problem solver. Therefore, we decided to constantly monitor the interaction in the experiment and appropriately prompt the problem solver if the system would unexpectedly work.

IV. EXPERIMENTAL SETTINGS

In Section IV, using the proposed system described in Section III, we experimented with writing restaurant reviews. The reviews written by participants and their interaction with the proposed system were analyzed from various points of view.

A. Procedures

The experiment was conducted as three steps shown in Figure 1. The procedures of the experiment were as follows;

1) Each individual participant had a dining experience.
2) The participant wrote a review about his/her dining experience and took the feedback from the proposed system.

3) The participant wrote additional information to enrich the description in the review according to the system's suggestions.

We studied the reviews written by the participants for each element and perspective based on the profiles of the participants.

B. Participant Profiles

A profile survey was conducted on 26 participants before writing the review and interacting with ChatGPT. The survey included six items: the participant's age, gender, experience with writing reviews, the timing of the dining experience mentioned in the review, the amount paid at the restaurant, and the timezone of the dining experience. Table II shows the profile survey of participants.

In our experiment, the survey investigated the degree of familiarity with writing reviews in addition to basic information about the participants. We asked whether the participants have written reviews regularly, spontaneously, for some exogenous incentives (e.g., for a reward,) or never. This survey aimed to clarify whether differences in familiarity with writing reviews lead to differences in the review aspects focused on. The survey on the timing of the dining experience mentioned in the review was designed with four options: within one week, two weeks, three weeks, and four weeks. This questionnaire would clarify whether the elapsed time since the dining experience influenced the review aspects focused on. The survey on the amount paid at the restaurant was conducted with four options: below 2,000 JPY, between 2,001 and 4,000 JPY, between 4,001 and 6,000 JPY, and above 6,000 JPY. This questionnaire was prepared to study whether there was a relationship between the amount paid and the review aspects focused on. The survey on the timezone of the dining experience had three options: morning, noon, and evening. We used the result of this survey to clarify whether there was a relationship between the timezone and the review aspects focused on.

V. RESULTS

Table III shows the results of the experiment. In the table, for each participant, originally described elements, originally absent elements suggested by the system, and added elements by follow-up interaction are listed as the index of review elements. In Section V, we study the overall review elements through the interactions. Moreover, we focus on the participants' profiles, the timing of the dining experience, and the amount paid to more deeply consider the interaction of writing reviews with follow-up interaction.

A. Discussions for review elements through follow-up interactions

This Section studies the overall results of the experiment. We focus on the trends in originally described elements, originally absent elements suggested by the system, and added elements by follow-up interaction. It was confirmed that food, restaurant, and reviewers were all described in the originally described and added elements in the reviews. Moreover, the

TABLE II
PARTICIPANT'S PROFILES. IT SHOWS THE PARTICIPANT ID, AGE, GENDER(M/F), EXPERIENCE IN WRITING RESTAURANT REVIEWS, WHEN THE EXPERIENCE WAS MENTIONED IN THE REVIEW, THE BUDGET(JPY) FOR THE DINING, AND THE TIMEZONE OF THE EXPERIENCE.

ID	Age	gender	Experience	When	Budget(JPY)	Timezone
1	21	M	Voluntary	1 week ago	1-2,000	Evening
2	21	M	No experienced	4 weeks ago	4,001-6,000	Evening
3	20	M	No experienced	1 week ago	1-2,000	Evening
4	22	F	Voluntary	4 weeks ago	2001-4,000	Evening
5	22	F	Exogenous	1 week ago	1-2,000	Daytime
6	20	M	No experienced	3 weeks ago	2001-4,000	Evening
7	20	M	No experienced	2 weeks ago	1-2,000	Evening
8	20	M	Exogenous	1 week ago	1-2,000	Daytime
9	20	M	No experienced	1 week ago	1-2,000	Evening
10	19	M	No experienced	1 week ago	1-2,000	Evening
11	20	M	No experienced	1 week ago	1-2,000	Evening
12	20	M	No experienced	1 week ago	1-2,000	Evening
13	20	M	No experienced	4 weeks ago	1-2,000	Evening
14	20	M	No experienced	1 week ago	2,001-4,000	Evening
15	24	F	No experienced	1 week ago	1-2,000	Evening
16	21	M	No experienced	1 week ago	1-2,000	Daytime
17	23	M	Exogenous	1 week ago	1-2,000	Evening
18	51	F	Exogenous	4 weeks ago	1-2,000	Evening
19	21	M	No experienced	3 weeks ago	1-2,000	Evening
20	22	M	No experienced	1 week ago	1-2,000	Daytime
21	22	M	No experienced	1 week ago	1-2,000	Daytime
22	23	M	No experienced	1 week ago	2,001-4,000	Evening
23	23	M	No experienced	1 week ago	2,001-4,000	Evening
24	22	M	Voluntary	1 week ago	6,001-	Evening
25	22	M	No experienced	1 week ago	1-2,000	Evening
26	24	F	Exogenous	2 weeks ago	2,001-4,000	Evening

users added not only the suggested elements but also other elements through follow-up interaction. From these results, the follow-up interaction by the proposed system helped reviewers to enrich their reviews as informative and comprehensive. These results follow RQ 1, RQ 2 and RQ 3.

Throughout both originally described and added elements, it was confirmed that there were highly co-occurred elements: taste and texture, taste and ingredients, and taste and food pairing. Co-occurrence of taste and texture happened in reviews listing the characteristics of the dish. For co-occurrences of taste and ingredients, Reviews explaining ingredients in the dish and what taste the ingredients had included the co-occurrence of taste and ingredients. Taste and food pairing co-occurred in reviews describing the combinations of ordered dishes on that day, including combinations of their tastes.

The total number of elements throughout interactions indicated that taste-related elements were most frequent in both originally described and added reviews. Almost all reviews mentioned the taste of the food. It thus suggested that the taste was the easiest element to describe in reviews rather than others. Many reviews started with a description of taste and went to others. From these results, there might be a common idea among reviewers that "restaurant reviews should have descriptions of taste."

Focusing on elements only in the original descriptions, reviews commonly included taste, and budget/price, i.e., elements related to foods. Such elements were easily described with reviewers' feelings before and after eating. The descriptions of reviews actually explained the taste and price in relation to reviewer's feeling. These results suggested that the taste and price were significant points to evaluate restaurants.

Let us focus on added elements after the proposed system suggested absent review elements in a review. The added reviews commonly include not only elements related to taste but also ones related to the restaurant's environment: place and budget/price. Although the system did not suggest, reviewers additionally mentioned elements related to taste through the follow-up interaction. This result also supported that reviewers emphasized taste-related elements in reviews. We confirmed that elements concerning place were not commonly mentioned in originally described reviews, which were added after follow-up interaction. Moreover, added reviews included more elements related to staff and interior/decoration. The results showed the elements concerning the restaurant were increased after follow-up interactions.

B. Discussions for profiles of participants

We focus on the reviewers' profiles shown in Table II. In the following discussion, we consider the experience of writing reviews, the timing of the experience, and the amount paid at the restaurant. Note that all the participants were in their twenties, their genders were unbalanced and not sufficiently evident for discussion, and most visited restaurants in the evening. The following discussions regarding the results in Table III are thus limited to these profiles.

1) Experience for writing reviews: It was found that there were no significant differences in originally described and added elements between voluntary and exogenous for those who experienced writing reviews. So, whether the experience

TABLE III
REVIEW ELEMENTS IDENTIFIED BY EXPERIMENT REVIEWERS. EACH COLOR-CODED NUMBER REPRESENTS A DIFFERENT PERSPECTIVE: BLUE FOR FOOD, RED FOR RESTAURANTS, AND ORANGE FOR REVIEWERS. THE ORDER OF NUMBERS IS THE SAME AS THE ORDER OF APPEARANCE IN A REVIEW.

Participant's ID	Originally described elements	Originally absent elements suggested by the system	Added elements by follow-up interaction
1	1 19 5 4	9 11 17	10 9 11 8 12 17 15
2	16 9 19 1	11 12 8	12 8
3	8 9 1 2 7 6 23 19	3 4 11 12 16 17 18	16 18 11
4	9 17 7 1	8 2 3 15 22	2 1
5	2 1 10 19	3 4 11 12 13 15 17 22 23	16 17 22 23 11
6	10 18 19 7	1 5 6 8 9	6 7 9 11 19
7	8 10 19 13 1 12	16 17 18 19 20	1 13 6 9 11 14 15 16 19 21
8	11 1 7 9	5 9 16 23	16 12 7 9
9	8 5 1	10 11 16 17	16 17 8 10 11
10	17 9 6 23 8 14 1 13 14 15	5 3 4 7 11	5 3 4
11	1 9 22 7	8 10 13 15	10 19
12	1 2 5 6 17 9 19	8 10	8 10
13	1	4 5 21 22 23	7 6 23
14	1	3 17 10 19	3 5 17 19
15	16 18	1 2 3 5 6 7 8 9 10	7 1 9 8 19 11
16	8 16 12 7 1 18 19	2 3 9 11 13 18 20 21	18 9
17	16 12 1 2 6 18 19	8 9 19 20	8 9
18	8 2 1 5 7 19 3 2 23	4 17 19	4 19 10 17 12
19	16 17 12 19 1	5 10 12 13 17	9 1 5 10 12 13
20	1 2 6	8 9 10 11 12 14 15 18 20 21	16 12 10 11 23
21	1 19	1 5 6 19	1 5 6 23
22	8 17 16 1 11 10	3 7 6 10 20 22 23	6 23 10
23	17 9 19 6 1	12 13 14 15	11 15 1
24	1 17 7 18 19	22 23 16	17 20 9 18 11 16
25	3 2 5 1 10 11 19	1 8 16	10 16 1
26	8 1 19	10 9 7	11 9

of writing a review itself had a more significant meaning than the desire to write one. Participants without review writing experience often described elements of their satisfaction in their reviews. In contrast, reviews from participants with writing experience less frequently mentioned their satisfaction; it seemed that satisfaction was not crucial for experienced reviewers.

Let us focus on the originally described elements. Participants with review writing experience included food-related elements, particularly mentioning taste after an introduction of the reviewer or context of dining. These participants mentioned multiple perspectives of dining (i.e., food, restaurant, and reviewer) in a review, though those with no experience in writing reviews mentioned a few elements. On the other hand, reviewers inexperienced in writing reviews tended to describe fewer elements. Their common perspective of their reviews was the "reviewer" him/herself. They described how they had felt the taste and the context of dining without any preambles. These findings suggested that experienced reviewers could provide objective and comprehensive assessments in a review; they would take into account the reader's experience while reading the review. In contrast, participants without prior experience in writing reviews tended to write more subjective reviews, focusing on their personal feelings.

For added elements after the follow-up interaction, experienced participants in writing reviews improved the review to include more elements about the restaurant, while elements for food were less. The review consisting of originally described and added elements covered all types of perspectives in restaurant reviews. The inexperienced reviewers also could improve their reviews by adding some elements absent in their original ones. It was suggested that the follow-up interaction could improve the reviews; it seems to be effective for even experienced reviewers.

2) Timing of dining experience: Originally described reviews differed between the dining experience and the timing of writing reviews. It was suggested that participants who had dined more than two weeks ago focused more on the restaurant and reviewer perspectives. In contrast, participants who had dined within a week focused more on "food." These results suggested that recent experiences led to more detailed memories of the food itself, while older memories brought more about the environment and context for dining.

3) Amount paid: We discuss the experimental results by focusing on the amount paid at the restaurants mentioned in the reviews. The tendencies of the reviews were different between amounts paid less than 2,000 JPY and paid more than 2,001 JPY.

The participants who had paid less than 2,000 JPY often mentioned elements for food in the original and added reviews. The participants who had dined economical foods did not focus on restaurant and user perspectives. It seems that the important aspect for experiences with economical foods were food itself. The participants who had paid more than 2,001 JPY mentioned all of perspectives food, restaurant and user; that is, their review is well organized. It seemed that they focused on not only foods but also environment and context of

dining for the experience with expensive costs. These findings suggested that the payment should not be just for foods, but for the overall dining experience.

VI. Conclusion

This study has investigated writing reviews with follow-up interaction. In this paper, we have set the following research questions;

RQ 1 What memory challenges do customers face when detailing a restaurant?

RQ 2 What types of information can be missed in reviews?

RQ 3 Does the follow-up interaction enrich the description in reviews?

The answers to each research question have been as follows;

Ans. 1 Without differences of experience or not, it is hard for customers to detail all perspectives of a dining experience by him/herself.

Ans. 2 Perspectives for restaurants and users tend to be absent. Especially in restaurants with less amount paid, the customers focused more on taste.

Ans. 3 Follow-up interaction as pointing out the absent elements is effective to revise the reviews in the written reviews. Adding descriptions enriches reviews from multiple perspectives.

These answers follow the RQ 1, RQ 2 and RQ 3 that could not be followed in related works.

In the future outlook of this paper, we identify several challenges that need to be addressed to enhance the robustness and validity of our research findings;

1) Validation of the results across broader demographics and provide more generalizable insights.

   - Increasing participant numbers.

2) Eliminating any biases that could arise from uneven participant demographics and heuristically prepared review elements.

   - Balancing participant profiles.
   - Resolving empirical basis for review elements.

3) Detailed analysis of how participants engage with interaction prompts for a deeper comprehension of the effects of interaction models.

   - Observation of participant interaction: which prompts elicit the most informative responses and how participants navigate the review process.

4) Developing strategies to handle and accurately process unclear or suboptimal review inputs.

These steps will significantly contribute to the refinement of our experimental design. We believe that the AI-supported review system ultimately leads to more comprehensive and informative restaurant reviews that can better serve consumers and restaurant management.

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