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Dec 11th, 12:00 AM

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Recommended Citation

WANG, Guangxu; Xu, David (Jingjun); and LIAO, Stephen Shaoyi, "The Effect of Online Review Portal Design: The Moderating Role of Explanations for Review Filtering" (2023). *Rising like a Phoenix: Emerging from the Pandemic and Reshaping Human Endeavors with Digital Technologies ICIS 2023*. 13.
https://aisel.aisnet.org/icis2023/user_behav/user_behav/13

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The Effect of Online Review Portal Design: The Moderating Role of Explanations for Review Filtering

Short Paper

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Abstract

The flood of non-constructive and fake online consumer reviews erects a considerable barrier to consumers making efficient decisions. Various review filtering algorithms have been developed to address this challenge, but the design of post-development review portals continues to lack a consensus. In review portals, disclosing more transparent reviews is efficient for enhancing users' trust. However, it will cause users' diminished focus on recommended reviews, leading to sub-optimal decisions. A research model is then developed to investigate users' cognitive processes in their responses to three review exhibition designs (i.e., informed silent display design, filtered review display design, and composite display design) regarding trust in the review portal and perceived decision quality. We also suggest that explanations for review filtering play a moderating role in users' perceptions, which appears to be a viable resolution to this dilemma. This paper provides significant theoretical and practical insights for the review portal design and implementation.

Keywords: Review portal design, review exhibition design, explanations, trust, perceived decision quality

Introduction

Many studies have demonstrated that online consumer reviews (OCRs) have a significant impact on consumers' purchase decisions (Hu et al. 2017; Zhang et al. 2016; Zhao et al. 2018). However, the vast number of non-constructive reviews forces consumers to spend much effort on a manual filter, which hinders their decision-making efficiency. Furthermore, the prevalence of fake reviews poses a challenge for consumers to differentiate between genuine and fabricated reviews due to individuals' truth bias, unavailable physical cues to deception, and deliberate fabrication in the craft (Zhang et al. 2016), preventing consumers from making effective decisions. The perception of decision quality among consumers captures their performance in product selection based on consumer reviews (Zhao et al. 2018), and it also plays a crucial role in determining the efficiency of e-commerce platforms (Huang and Zhou 2019). These inferior reviews significantly influence the perceived decision quality of consumers. In addition, establishing trust with consumers is of importance for vendors in commerce, as it enables consumers to alleviate the inherent uncertainty and risk associated with monetary transactions (Xu et al. 2016). The existence of fraudulent reviews can undermine consumers' trust in the platform (Ananthakrishnan et al. 2020). Several e-commerce platforms have recognized this challenge and invested in regulating OCRs, aiming to improve

users' perceived decision quality and increase their trust in the platform. These platforms have developed proprietary review filtering systems and implemented regulatory policies, such as distinct review exhibition designs, to monitor and manage OCRs.

It is difficult to determine the optimal review exhibition design for e-commerce platforms since even minor variations in the task or context can significantly impact users' information processing judgment and choices (Fink and Papismedov 2022). The real-world platforms have been struggling to address this problem, resulting in a wide range of review exhibition designs. For instance, Amazon.com and TripAdvisor.com publicly acknowledged censoring fake reviews. Yelp.com separates all OCRs into recommended and not recommended categories. The recommended reviews are prominently displayed on the review portal, while the not-recommended reviews are accessible through a provided link. Dianping.com is a famous eWOM website, similar to Yelp.com, in China. It used to exhibit reviews classified as authentic, but recently introduced a new review exhibition strategy in its mobile application, incorporating a collapsed display function for reviews in certain pilot cities. This update has resulted in three distinct review sections - normal, collapsed, and unexhibited. Taobao.com has also implemented a similar change in its review exhibition design to Dianping.com. Overall, there are currently three popular types of review exhibition designs utilized by these platforms, including the informed silent display design, the filtered review display design, and the composite display design.

The informed silent display design exclusively displays the recommended reviews and indicates that the reviews filtered as not recommended will not be presented on the review portal. In contrast, all reviews are displayed in platforms employing the filtered review display design, with recommended reviews shown upfront and filtered reviews presented in a collapsed section. Generally, users can access the collapsed section through a link on the same page as the recommended reviews. Similar to the filtered review display design, the composite display design exhibits recommended reviews upfront, but only a portion of filtered reviews are presented in the collapsed section, while the rest remain unexhibited. Typically, the collapsed reviews refer to reviews deemed to be non-constructive, such as reviews that are brief in length, while the unexhibited reviews are reviews that violate review posting guidelines, such as fake or defamatory reviews and reviews promoting bigotry or discrimination. Table 1 provides a demonstration of review distribution in these three review exhibition designs.

	Recommended Reviews	Filtered Reviews	
Informed Silent Display Design	✓	✗	
Composite Display Design	✓	✓	✗
Filtered Review Display Design	✓	✓	

Notes: ✓ refers to the reviews that are directly displayed; ✓ refers to the reviews that are displayed in the collapsed area; ✗ refers to the reviews that are not displayed.

Table 1. Review Distribution in Three Review Exhibition Designs

Ananthakrishnan et al. (2020) have investigated the effect of two main fraudulent review exhibition designs on the trust of consumers. One design hid fraudulent reviews, while the other revealed all of them. The disclosure of fraudulent reviews was found to increase consumers' trust towards the review portal, but it was also found that such revealed fraudulent reviews would cause the consumers cannot effectively distinguish the fraudulent reviews, leading to erroneous decision-making. To date, no researcher has provided an exploration or definitive solution to this trade-off between the enhancement of users' trust in the review portal and their decision quality. Although trust and decision quality have been explored in past studies, they were investigated in a separate manner, lacking an integrated view in a platform design task. Moreover, the potential punishments such as hiding reviews make the trust factor more salient to the platform users. Therefore, it is important for review portal designers to understand how users trade-off trust and decision quality. A research gap regarding review portal design then arises and needs to be filled, which requires an exploration and resolution for the balance between exhibiting transparent filtered reviews to enhance users' trust in the review portal and promoting recommended reviews to improve their decision quality. The new composite display design used by a few platforms possesses the potential to deliver incredible performances in this trade-off problem, as it has the potential to achieve the dual

objectives of exhibiting more transparent filtered reviews and avoiding confusing fake and defamatory reviews. However, its intended effect is still yet to be clear.

Additionally, in response to the erosion effect of exhibiting filtered reviews on users' attention to recommended reviews, a viable solution could be to provide clear explanations for the importance of filtering reviews, the description of expected reviews and illegal reviews, as well as the proposed exhibit-related punishment for these illegal reviews. On the one hand, the explanations can prevent users' confusion about why certain reviews are being recommended while others are being filtered out, thereby eliminating the suspicions that the platform is charging merchants to manipulate reviews (Wang and Benbasat 2008). On the other hand, the explanations set clear expectations of users for the exhibited reviews. In users' review-based decisions, the assessment of review helpfulness will be determined by the extent to which the reviews meet these set expectations, as opposed to their pre-existing subjective expectations (Hu et al. 2017). However, empirical work about the expected effects of explanation for review filtering merits further attention.

To address the research gap and practical business challenge, our first step is to compare the performance of different review exhibition designs, including informed silent display design, filtered review display design, and composite display design. To achieve that, we employ the classical stimulus-organism-response (S-O-R) model (Mehrabian and Russell 1974) to explore users' reactions and cognitive processes in the trade-off problem. Specifically, the three review exhibition designs are regarded as stimulus to verify the response of online platform users' trust in the review portal and perceived decision quality through the organism of users' perceived algorithmic transparency and perceived helpfulness of recommended reviews. Following that, we explore the effect of explanations for review filtering on the trade-off problem. Totally, in this paper, we propose to investigate three research questions: (1) *What is the effect of varied review exhibition designs on the trade-off in balancing users' trust in the review portal and perceived decision quality?* (2): *What are the underlying mechanisms to explain the effects?* (3): *How do the explanations for review filtering moderate the effects examined in research question 1?*

Literature Review

Stimulus-Organism-Response (S-O-R) Model

The S-O-R model assumes that various stimuli in the environment impact individuals' cognitive processes (organism), which ultimately determine their responses (Mehrabian and Russell 1974). The S-O-R model is extensively applied to understand the cognitive process of diverse stimuli on consumers' responses within the e-commerce context. In this background, stimuli refer to the various design elements presented on e-commerce websites that consumers interact with (Xu et al. 2014). The organism denotes the internal assessment state involved in the response of individuals to stimuli, including cognitive responses and emotive responses. The response pertains to the external and internal reactions of individuals, ranging from observable behavioral responses to intangible attitude changes. This study regards different review exhibition designs as the stimulus. The responses are the two components of the trade-off issue, encompassing online platform users' response to trust in the review portal and their response to perceived decision quality. In terms of the organism, the perceived algorithmic transparency and perceived helpfulness of recommended reviews separately correspond to users' cognitive process regarding trust and perceived decision quality. Specifically, in HCI practices, transparency is directly responsible for building trust among users (Vorm and Combs 2022). For example, transparency has been employed to efficiently increase users' trust in automatic online comment moderation systems (Brunk et al. 2019) and recommendation agents (Wang and Benbasat 2016). In addition, the helpfulness of reviews serves as an indicator of their diagnostic value (Mudambi and Schuff 2010). Reviews deemed helpful are more likely to engage in users' decision-making process. To attain maximum benefits from online reviews, users should focus on the recommended reviews generated by the review filtering algorithm, as the filtering algorithms have been proven to exceed human's review filtering capabilities (Zhang et al. 2016). Therefore, it is crucial for users to improve their perception of recommended reviews' helpfulness to boost the decision quality.

Explanations for Review Filtering

Explanations have been broadly proven to improve users' perceived transparency and trust in technologies and technological artifacts. It is widely recognized that providing explanations can facilitate learning

(Lombrozo 2006) and make the recommendation process more transparent in recommendation systems (Mcsherry 2005). Wang and Benbasat (2008) summarized that providing explanations can bridge the information asymmetry between users and technology, leading to greater transparency of technology performance. This, in turn, improves users’ trust in the technologies. Wang et al. (2018) found that the disclosure of explanations plays a moderating role in affecting the effect of sponsorship disclosure on users’ trust in biased recommendation agents. Thus, it is reasonable to expect that presenting explanations for review filtering could steer users’ perceptions towards the valuable recommended reviews in their decision-making process and affect the effect of review design on perceived algorithmic transparency and perceived helpfulness of recommended reviews.

Hypothesis Development and Research Model

The S-O-R model offers a systematic framework for investigating the effects of Stimulus (different review exhibition design) on Response (trust in review portal and perceived decision quality) via the Organism (perceived algorithmic transparency and perceived helpfulness of recommended reviews). Figure 1 presents a proposed three-stage model integrating pertinent constructs.

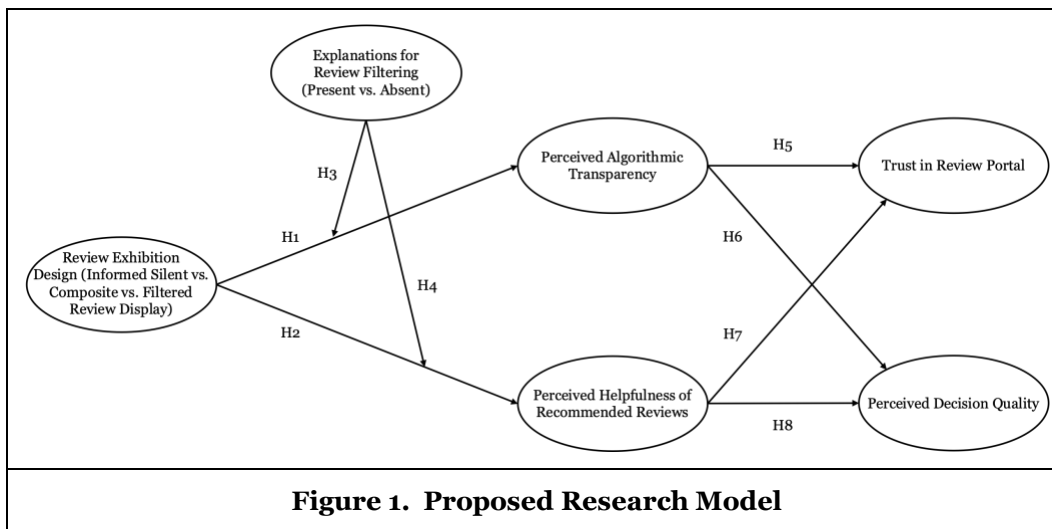


Figure 1. Proposed Research Model

In a review filtering system, a review is labeled as a fixed class at a certain point in time. However, the algorithm bias of the review filtering algorithm might mis-filter OCR. As such, many individuals impacted by the algorithm’s outputs may have queries about the methodology behind how these outputs were produced, which falls under the purview of algorithmic transparency (Dholakia 2023). Algorithmic transparency refers to the volume of information that should be revealed regarding the algorithm’s functioning, thereby enabling users to understand the model’s inputs, outputs, and the process to convert inputs into outputs (Dholakia 2023; Wang 2022). As a stimulus, diverse review exhibition designs yield marked differences in the degree of information disclosure concerning review outputs from the review filtering algorithm. The review exhibition design displaying more comprehensive outputs is anticipated to enhance users’ comprehension of the review filtering algorithm’s functionality, and then improve their perception of algorithmic transparency. The informed silent display design only presents the classified recommended reviews on the review portal website. By contrast, the composite display design exhibits classified recommended reviews on the main page of the review portal website and a portion of filtered reviews in the collapsed area of the website. Users can consult the displayed filtered reviews to examine the misclassification and bias of the algorithm in filtering reviews. Thus, we hypothesize that:

H1a: The review portal with the composite display design will have a higher positive effect on users’ perceived algorithmic transparency than with the informed silent display design.

Reviews that have been filtered out in the filtered review display design are still accessible to users if they want to access them. Compared to the composite display design, it is anticipated that the incremental filtered reviews exhibited in the filtered review display design will provide users with a greater understanding of the review filtering algorithm. The new understanding enables users to conduct a better confirmation about the operation of the review filtering algorithm. This, in turn, helps to mitigate users’

concerns about the possibility of review manipulation behavior by the platform. Indeed, statistics have shown that users worry the manipulated reviews exist in commercial platforms (Lin 2014). Thus,

H1b: The review portal with the filtered review display design will have a higher positive effect on users' perceived algorithmic transparency than with the composite display design.

In users' review-based decisions, they typically seek helpful reviews to guide their choices. Ideally, these desirable reviews should be the recommended reviews presented on the review portal according to the platform standards. This is because the integration of a review filtering algorithm in the review portal is designed to reduce users' cognitive load and prioritize the viewing of these highly valued recommended reviews throughout the decision-making process. In the informed silent display design, the filtered reviews are not visible on the review portal. Therefore, users rely entirely on recommended reviews, which are perceived as helpful in making reasonable decisions. When filtered reviews are exposed on the review portal in the composite display design, users tend to spend more on carefully examining them in order to make a cautious decision (Ananthakrishnan et al. 2020). This is because they attempt to uncover the helpful reviews that may have been filtered due to misclassification by the filtering system. However, it is important to note that individuals have a natural truth bias towards considering reviews as true and helpful when detecting reviews (Zhang et al. 2016). As a result, some of the presented filtered reviews might be perceived as helpful by users, while they may experience diminished perceived helpfulness of recommended reviews.

H2a: The review portal with the composite display design will have a higher negative effect on users' perceived helpfulness of recommended reviews than with the informed silent display design.

In contrast to the composite display design, the filtered review display design will present a greater number of filtered reviews to users. The weight of recommended reviews in all exhibited reviews will continue to diminish, potentially leading to a greater perception of such filtered reviews as being helpful. The perceived helpfulness of recommended reviews is anticipated to exhibit a further decrease for users in the filtered reviews display design. Thus, we hypothesize the following:

H2b: The review portal with the filtered review display design will have a higher negative effect on users' perceived helpfulness of recommended reviews than with the composite display design.

The explanations for review filtering of the review portal could explain why the filtering system is required and describe desired reviews, undesired reviews, and the exhibiting rule for the types of reviews that appears in the review portal. H1a and H1b posit the potential positive effect of filtered review disclosure on the perceived algorithmic transparency toward the review filtering algorithm. When the explanations for review filtering are absent, users may rely on their prior beliefs, like personal experience and preferences, to determine whether the presented reviews follow their inner criteria for review filtering. By contrast, providing explanations for review filtering can help users learn the standard of desired and undesired reviews, which enables them to better evaluate the fairness and rationality of review filtering results replying on the provided explanations instead of their prior beliefs. This practice is instrumental for users to more clearly understand the fundamental principles of the review filtering algorithm and mitigate their concerns pertaining to potential platform's wrongdoing in review manipulation (Kumar et al. 2018). Thus, we hypothesize the following:

H3: The positive effect of revealing filtered reviews on perceived algorithmic transparency will depend on the disclosure of explanations for review filtering. The effect will be larger when the review portal presents the explanations for review filtering than when it does not.

Similarly, we conjecture that the drawback of displaying filtered reviews in reducing the perceived helpfulness of recommended reviews will be diminished by the presentation of explanations for review filtering. In both the composite display design and the filtered review display design, without the disclosure of explanations for review filtering, users' truth bias will lead to the phenomenon that a number of filtered reviews that should not be considered in their decision-making are identified as ideal helpful reviews. By contrast, the presentation of explanations for review filtering is expected to reduce users' truth bias and the likelihood of falsely identifying filtered reviews as ideally helpful. This practice serves to enhance the perceived helpfulness of recommended reviews. Therefore, we propose that:

H4: The negative effect of revealing filtered reviews on perceived helpfulness of recommended reviews will depend on the disclosure of explanations for review filtering. The negative effect will be less when the review portal presents the explanations for review filtering than when it does not.

Knowledge-based reason and calculative reason are identified to be two reasons leading to users' response to trust in decision support technologies (Wang and Benbasat 2008). The knowledge-based reason pertains to a user's comprehension of the technology, whereas the calculative reason refers to the concern of the potential illegal gains linked to a trustee's engagement in untrustworthy practices. Greater understanding on the inner operating mechanism of the review filtering algorithm increases users' perception of algorithmic transparency, which fosters trust of users based on the knowledge-based reason. With the understanding, users could conduct a better verification process on exhibited reviews to reduce the concern of illegal gains. This enhances users' trust in the review portal according to the calculative reason. Similarly, users' perceived decision quality, referring to the level of confidence a user has regarding a review-based decision (Huang and Zhou 2019), would improve when they have a deeper understanding of the review filtering algorithm. This heightened understanding instills greater certainty in users about determining which reviews should be considered during the decision-making process, leading to greater confidence in the decisions made. Thus, we hypothesize:

H5: Higher perceived algorithmic transparency will lead to higher trust in the review portal.

H6: Higher perceived algorithmic transparency will lead to higher perceived decision quality.

We believe that users' perceived helpfulness of recommended reviews will increase their trust towards the review portal and perceived decision quality in selecting a product. As users perceive more recommended reviews to be helpful, they will perceive that the review portal makes a greater effort to understand their needs for valuable reviews. The promotion of the platform's attentiveness subsequently enhances users' trust in the review portal. Prior literature has indicated that a better service quality from a website showing empathy towards users will enhance their trust (Zhou et al. 2009). Besides, the information processing theory has indicated that an individual's ability to process information is limited by cognitive load (Xu et al. 2014). When the recommended reviews are perceived to be helpful, users can focus on those reviews and make a better choice in selecting the right product, enhancing their confidence in their product decisions. When the recommended reviews are not perceived to be helpful with low-quality review unfiltered, users' abilities in discerning a quality product are impaired due to their limited cognitive load space in filtering a large amount of unfiltered reviews. Thus, we posit that:

H7: Higher perceived helpfulness of recommended reviews will lead to higher trust in the review portal.

H8: Higher perceived helpfulness of recommended reviews will lead to higher perceived decision quality.

Methodology

We propose to conduct seven-scenario experiment, covering six scenarios in a between-subjects design with 3 types of review exhibition design (informed silent display design vs. composite display design vs. filtered review display design) and 2 levels of explanations for review filtering (present vs. absent), and a control group utilizing a review exhibition design displaying all reviews mixed. The subjects will be randomly assigned to one of the scenarios. Restaurant selection is a frequently encountered decision-making scenario by individuals. In addition, various review-related studies are conducted in the restaurant setting (Ananthakrishnan et al. 2020; Zhang et al. 2016). Therefore, an experimental restaurant review portal and reservation system will be designed and implemented in the experiment. The proposed review portal will present the reviews of one restaurant based on the real data crawled in the study of Wang et al. (2021). In each scenario, the implemented review portal will be correspondingly fixed to fit the change of designs.

For the condition of informed silent display design, participants will be informed that the review portal exclusively displays recommended reviews and does not present filtered reviews. In the filtered review display design condition, participants will learn that the recommended reviews are directly displayed, while the reviews filtered as not recommended are displayed in a collapsed section that could be accessible via a link at the bottom of the main page. In the composite display design condition, participants will be informed that the recommended reviews are displayed on the main page, while the reviews that are relatively non-constructive are available to be accessed in the collapsed area, and the reviews violating review posting guidelines are not presented. In the control group, participants will be informed that all reviews are directly presented on the review portal. Figure 2 shows the wireframes of the proposed review portal in the scenarios with three different review exhibition designs and the scenario of control group.



Figure 2a. Wireframe of Informed Silent Display Design

Figure 2b. Wireframe of Mixed Review Display Design (Control Group)

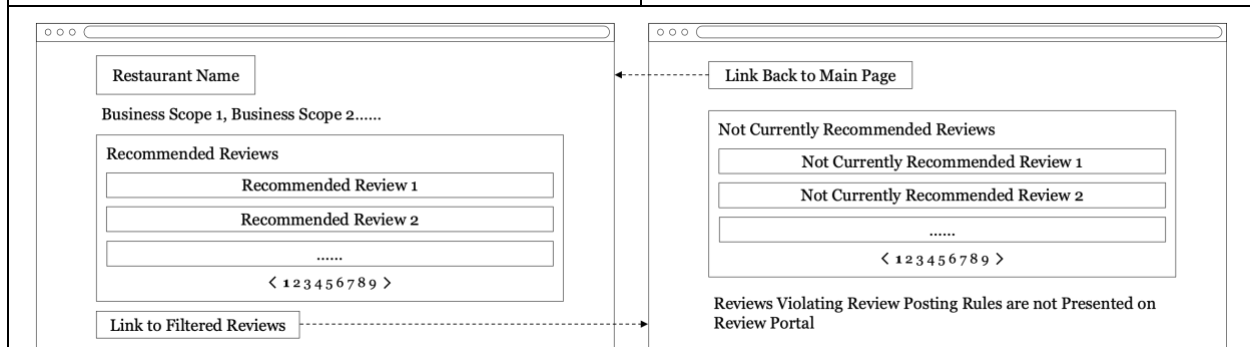


Figure 2c. Wireframe of Composite Display Design

Note: the filtered review display design is same as the composite display design in Figure 2c but lacks the description of “Reviews Violating Review Posting Rules are not Presented on Review Portal”.

Figure 2. Wireframes of Proposed Review Portal in Different Scenarios

In the conditions of presenting explanations for review filtering, the explanations, including the content of why the filtering system is required and the descriptions of desired reviews, undesired reviews, and the exhibiting rule for the types of reviews that appears in the review portal, will be announced to participants. In detail, participants will be informed of the explanations with the format of an alert box when they enter the implemented review portal website. The alert box will only be allowed to close after 60 seconds via a bottom button with the content “I have understood all the content above”. The participants could also access the explanations via a link on the review portal.

In the experiment, we will recruit a minimum of 280 subjects, with 40 subjects in each group to ensure adequate statistical power of the experimental results (Wang et al. 2018), and the recruited subjects are required to have experience in the online e-commerce platforms. The experimental task is to determine whether the participants are willing to reserve the restaurant and fill in manipulation check questions as well as the questionnaire measuring the perceived algorithmic transparency, perceived helpfulness of recommended reviews, trust in review portal, and perceived decision quality. To develop these items, we will utilize existing measures from relevant literature and make necessary modifications to suit the context. Survey questionnaires for mediators, dependent variables, and control variables are summarized in Table 2. ANCOVAs will be conducted to analyze the main effects of review exhibition designs on users and determine whether the interaction effect exists between different review exhibition designs and the presence of explanations for review filtering. If the interaction effect exists, a contrast analysis test will be conducted to identify the best combination for enhancing users’ perceived algorithmic transparency and perceived helpfulness of recommended reviews. Finally, SEM will run the whole model.

	Constructs	Sources
Mediators	Perceived Algorithmic Transparency; Perceived Helpfulness of Recommended Reviews	Brunk et al. (2019), Yin et al. (2014)

Dependent Variables	Trust in Review Portal; Perceived Decision Quality	Wang et al. (2018), Xu et al. (2014)
Control Variables	General attitudes toward computers; general online platform use experience; comfort with the Internet	Wang and Benbasat (2016)
	Preference for the restaurant type	Kim et al. (2011)
	Familiarity with review exhibition design type	Li (2014)
Table 2. Survey Questionnaire' Constructs		

Discussion and Conclusion

Our study offers significant theoretical and practical contributions. Theoretically, we contribute to IS literature by both exploring users' cognitive processes involved in the trade-off challenge of balancing the desire to enhance their trust in the review portal against the need to promote their decision quality, and presenting a viable resolution to this challenge. Specifically, this study employs S-O-R model to elucidate the underlying mechanisms, i.e., perceived algorithmic transparency and perceived helpfulness of recommended reviews, in users' responses to three popular review exhibition designs regarding the two objectives of trade-off challenge. We also introduce the role of explanations for review filtering and explain how these explanations may impact users' cognitive processes to solve this challenge. In practice, this study also provides valuable insights for online e-commerce platform organizers to design a competitive review portal. We propose that presenting explanations for review filtering on the review portal is expected to be beneficial for platforms regardless of their adopted review exhibition design. Besides, when the explanations are presented, the filtered review display design and the composite display design are expected to obtain an overall better effect than the informed silent display design in the interaction with users.

Our study also has some limitations. First, the experimental platform is built for this study. In real-world scenarios, some extra factors might impact users' perception and choice, like the publicity of restaurants. Second, our experiment is proposed to be conducted in a restaurant setting. It needs to be cautious when generalizing the proposed effects in this study to the platforms in other industries. We will expand the impact of platform industry and some other broader factors in our future research.

Overall, this study centers on the problem of how to design the review portal after developing a review filtering system, highlighting the feasibility of explanations for review filtering as a potential resolution to a key trade-off challenge concerning users' trust and decision quality improvement within three distinct review exhibition designs. Our findings are beneficial to understand users' responses to reviews across varied review portal designs and assist practical e-commerce platforms in the review portal implementation.

Acknowledgements

The work described in the paper was partially supported by grants from the Strategic Research Grants of the City University of Hong Kong (Grant No. 7005595) and the National Natural Science Foundation of China (Project No. 72271210).

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