

Making Restaurant Reviews Useful and/or Enjoyable? The Impacts of Temporal, Explanatory, and Sensory Cues

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41 **Making Restaurant Reviews Useful and/or Enjoyable? The Impacts of Temporal,**
42 **Explanatory, and Sensory Cues**

43
44 **Abstract:** The purpose of this study is to explore the impacts of temporal, explanatory, and
45 sensory cues on customers' perceived usefulness and enjoyment toward restaurant online reviews.
46 Text mining approach and econometric analysis are used to examine 186,714 online reviews of
47 300 restaurants collected from Yelp.com. Empirical results show that temporal cues of online
48 restaurant reviews affect review usefulness but not review enjoyment; explanatory cues have an
49 important effect on both review usefulness and review enjoyment; sensory cues show much
50 stronger effects on review enjoyment than on review usefulness. This study contributes to
51 advancing both theoretical and managerial knowledge on online review management of social
52 media platforms.

53
54 **Key words:** temporal cues, explanatory cues, sensory cues, review enjoyment, review usefulness

55 **Highlights**

- 56 • This study explores the impacts of review cues on review usefulness and enjoyment.
- 57 • Text mining approach and econometric analysis are used.
- 58 • Temporal cues affect review usefulness but not review enjoyment.
- 59 • Explanatory cues have an effect on both review usefulness and review enjoyment.
- 60 • Sensory cues show stronger effects on review enjoyment than on review usefulness.

61

1. Introduction

With the rapid development of Internet applications and the proliferation of various social media outlets, consumer-generated online reviews have become tremendous and essential in hospitality and tourism businesses. Latest research has shown the great impact of online reviews on consumption experience (Gretzel & Yoo, 2008; Hu Liu, & Zhang, 2008). One of the most widely used review searching takes place in food-related information, and the most influential site in the U.S. is Yelp.com (Zukin, Lindeman, & Hurson, 2017). The number of restaurant reviews on Yelp has increased from 8.83 million in 2009 to 148.3 million in 2017 (Statista, 2018). Therefore, it is crucial to identify the attributes of restaurant online reviews and understand how they influence consumers' evaluation of online reviews.

Specifically, consumers' evaluations of online reviews mainly rely on their perceived usefulness and enjoyment of the reviews (Sussman & Siegal, 2003; Yoo & Gretzel, 2008). Although online reviews provide customers with tremendous information sources, such an information overload, on the other hand, could increase search costs and decrease cognitive costs (Bellman et al., 2006). Therefore, it is important to understand what makes a review useful and how to extend customer access to such reviews. Additionally, information search is part of the customer overall experience; hedonic motivation cannot be neglected in this process (Liu & Park, 2015). Consumers who enjoy using online reviews as an information source and decision-making tool tend to create more values to the business (Li, et al., 2017). Therefore, perceived enjoyment is also critical in reflecting customer evaluation of online reviews.

Review usefulness is exchangeable with review helpfulness in most studies (Zhu, Yin, & He, 2014), referring to "a measure of perceived value in the decision-making process" (Siering, Muntermann, & Rajagopalan, 2018). Review usefulness is a primary way to measure how consumers evaluate an online review (Mudambi & Schuff, 2010), but more importantly it helps

potential consumers deal with information overloads and facilitates their decision-making (Cao, Duan, & Gan, 2011). Previous literature shows that both reviewer characteristics and review characteristics affect consumers' perceived usefulness of online reviews (Fang et al., 2016; Li et al., 2017; Liu & Park, 2015). Regarding the influence of reviewer characteristics, Li et al. (2017) report that Elite reviewers' reviews are considered more useful than non-Elite counterparts, and the number of reviewers' friends positively influences the review usefulness. Liu and Park (2015) report that review helpfulness is influenced by multiple factors, including the disclosure of reviewers' identities (e.g. name, address, real photo), reviewers' reputations (e.g. the number of fans, friends, Elite awards), and reviewers' expertise (e.g. the number of reviews the reviewer has written). Additionally, review characteristics such as the review sentiment, star rating, readability, length, and posting date all influence perceived review helpfulness (Li et al., 2017; Liu & Park, 2015). Prior literature also reports that review informativeness (Liu et al., 2007) and review subjective emotions (Ghose & Ipeirotis, 2011; Yin, Bond, & Zhang, 2014) predict perceived usefulness of online reviews.

Extracted from intrinsic motivation, the perceived enjoyment is another critical measurement of online reviews, especially for hospitality and tourism products and services (Yoo & Gretzel, 2008). **The perceived enjoyment refers to “the extent to which the reading and understanding of reviews are perceived to be enjoyable in their own right, apart from any performance consequences that may be anticipated” (Liu & Park, 2015, p.143).** Consumers' affective reaction plays a critical role in evaluating products (Mattila & Wirtz, 2000). Prior studies have shown that the perceived enjoyment can be influenced by different factors. For instance, positive reviews are associated more with perceived enjoyment of online reviews (Park & Nicolau, 2015; Xia & Bechwati, 2008), as consumers care about the pleasure and playfulness during the consumption process (Vogt & Fesenmaier, 1998). Perceived enjoyment is also positively

associated with both physical environment images and food and beverage images, which means the more the imagery cues are, the more enjoyable they are perceived by readers (Yang et al., 2017).

Despite the extensive inquiry into online reviews in the hospitality context, there is still a lack of empirical research assessing review usefulness and enjoyment simultaneously or comparing different impacting factors in the hospitality management field (e.g., Cao et al., 2011; Fang et al., 2016; O'Mahony & Smyth, 2009; Park & Nicolau, 2015; Racherla & Friske, 2012). The majority of online review studies focus on review helpfulness (e.g. Ngo-Ye & Sinha, 2014) or the impact of perceived enjoyment on usefulness (Liu & Park, 2015), rather than employing the perceived enjoyment as a primary outcome variable or examining both review usefulness and enjoyment as ultimate responses. Furthermore, although the importance of linguistic and semantic features of online reviews has already been addressed, previous studies have not fully empirically assessed the importance of linguistic features of online reviews on consumer evaluation (Xiang et al., 2017). To address these research gaps, this study aims to examine and compare the effects of several important linguistic and semantic features of online reviews, including temporal, explanatory, and sensory cues, on consumers' evaluations of review usefulness and enjoyment, by using real world online restaurant review data collected from Yelp.com.

This study contributes to previous literature in several ways. First, Chen and Lurie (2013) and Wu et al. (2017) claim that temporal congruity is closely associated with online review studies but remains underexplored. It is the first study in the hospitality social media context that examines the role of temporal cues on both review usefulness and enjoyment, allowing a better understanding of temporal contiguity in consumers' responses toward online reviews. Second, this study examines the role of sensory cues and particular sensations (e.g. sight, hearing, and feeling) in both review usefulness and enjoyment, which strengthens the importance of sensory marketing in hospitality

social media analytics. Third, in the hedonic hospitality context, this study highlights the function of linguistic characteristics of explanatory cues in online reviews. Rather than focusing on whether individuals make explanations and why they explain (Mezulis et al., 2004; Pennebaker, 1997), this study looks at how the explanations affect review readers' perceptions toward online information. In sum, the findings of this study provide new theoretical and practical insights to the existing digital marketing literature and effective online review management in hospitality and tourism.

2. Literature Review and Hypothesis Development

2.1 Temporal contiguity cues

The concepts of "temporal contiguity" and "temporal contiguity cues" appear in early psychology studies (e.g. Michotte, 1963; Heider & Simmel, 1944), indicating the proximity and closeness between two physical events. Specifically, temporal contiguity refers to the temporal closeness between product/service consumption and the time at which a review is posted (Chen & Lurie, 2013; Yang, Wu, & Yang, 2018, p.120); while temporal contiguity cues refer to the peripheral informational cues that indicate temporal contiguity (Yang, Wu, & Yang, 2018, p.120), or the presence of words and phrases indicating temporal proximity between product consumption and review writing (Chen and Lurie, 2013, p. 463). Anderson (1995) and Kelley (1973) state that time plays a critical role in explaining the causal relations of phenomenon and making attributions about human behavior. Generally, with the presence of the temporal contiguity cues, perceptions of the causality of two events are increased and the process of causal interpretation is enhanced (Buehner & May, 2003; Vrij, 2000). In other words, when there is temporal/time-related information in an online review, review readers would unintentionally consider that it is the review writer's consumption experience that leads to this particular review. Therefore, temporal contiguity cues cannot be neglected when appearing in the online review context.

According to Chen and Lurie (2013), consumers perceive a high value (e.g. perceived helpfulness) of a product's positive online reviews that contains a temporal contiguity cue. Therefore, the causality between a good purchase experience and a favorable online review is enhanced by temporal contiguity cues, meaning that consumers are more likely to attribute a positive review to the positive experience over other reasons when exposed to temporal contiguity cues (Chen & Lurie, 2013). In contrast, when there is an absence of temporal cues, consumers would attribute review writers' positive reviews to their motives to gain financial rewards or enhance positive self-images (Angelis et al., 2012; Wu et al., 2017); however, a helpful and reliable review should be accurately related to the review writer's actual consumption experience (Wu et al., 2017). Consequently, review readers that do not attribute positive reviews to review writers' actual experience would perceive less value of the review.

Although the effect of temporal contiguity cues has been examined in social psychology research (Wennekers et al., 2012; Ginns, 2006; Wasserman & Neunaber, 1986; Kalat & Rozin, 1970), there is a lack of empirical studies in the social media marketing field to examine the impact of temporal contiguity cues on both of consumers' perceived usefulness and enjoyment of online reviews (Chen & Lurie, 2013; Wu et al., 2017). Chen and Lurie's (2013) study firstly emphasizes that reviews with temporal contiguity cues would positively affect review readers' perceived helpfulness of a positive Yelp online reviews. Built upon their findings, this study extends the examination to perceived enjoyment, another important evaluation construct in online review studies. Review enjoyment is seen positively related to review length (Yang et al., 2017) and review valence (Park & Nicolau, 2015); however, its relationship with temporal contiguity cues has not been studied, calling for an exploratory examination of the impact of temporal contiguity cues on online review enjoyment in this study. Inspired by the studies above, the current research attempts to enrich the literature on the effects of temporal contiguity cues on consumer

evaluation toward online reviews in the hospitality context and proposes that:

H1a: Reviews with more temporal cues are more likely to be perceived useful.

H1b: Reviews with more temporal cues are more likely to be perceived enjoyable.

2.2 Explanatory cues

Semantics or words are essential elements of the cognitive processes (Wilson & Gilbers, 2008) that contain rich information and great psychological value (Pennebaker et al., 2015; Weintraub, 1989). One specific social cognitive process is the act of explaining, which assists in understanding and predicting human behaviors as well as making sense of causes and outcomes of events (Pennebaker, 1997; Wilson, Gilbert, & Centerbar, 2003; Jind, 2003; Malle, 2004). Moreover, the act of explanation and its content can influence other people's evaluations and the following choices (Moore, 2015). Previous literature addresses that the act of explanation is more important and influential than the content of explanation (Janoff-Bulman & McPherson Frantz, 1997; Pennebaker, 1997). Similarly, studies have reported that generating explanation can lead to better understanding regardless of the explanation accuracy or content (Baum, Friedman, & Zakowski, 1997; Davis, Nolen-Hoeksema, & Larson, 1998). Therefore, this study focuses on the indication of the act of explanation rather than the content of it.

According to Moore (2015), "explained reaction to hedonic products" refers to how consumers feel the product, by specifying the reasons corresponding to certain features of a product, and these explanations are emotionally dominant. By using experimental design method, Moore (2015) further addresses that explaining languages such as "because" in a review increase consumer's perceived helpfulness of the review. In other words, information or opinions provided by online reviews without specifying the reasons why such information or opinions are generated are not convincing in affecting consumers' perceived helpfulness. In addition, elaborated reviews that contain more arguments could enable others to better evaluate the product, thereby increasing

the perceived review helpfulness (Moore, 2015). Similarly, it has been found that the richness and depth of information affect perceived usefulness (Mudambi & Schuff, 2010; Wu et al., 2011). Moreover, Xiang et al., (2017) also contend that semantic features that contain meaning interpretation of the reviews contribute to readers' perceived helpfulness of online reviews.

Despite the effort on emphasizing the importance of explanatory linguistics, Moore (2015) focuses only on the perceived helpfulness in retailing and Xiang et al., (2017) merely compares the semantic differences across different tourism platforms. No studies in the hospitality social media field have explicitly examined the impact of explanatory cues on both of consumers' perceived usefulness and perceived enjoyment with regard to online reviews. According to Moore (2015), future research should examine additional consequences of explanation cues in addition to perceived review helpfulness. Since restaurant dining is a type of hedonic product/service, the perceived enjoyment is proposed as another potential outcome of explaining cues as an exploratory examination in this study. Therefore, the following hypotheses are purported:

H2a: Reviews with more explanation/causation cues are more likely to be perceived useful.

H2b: Reviews with more explanation/causation cues are more likely to be perceived enjoyable.

2.3 Sensory cues

Sensation reflects what people feel, see, hear, smell, and taste when exposed to the external stimulus of a particular environment (Zuckerman, 2014), namely, visual, auditory, and tactile perceptions (Wolfe et al., 2006). Early in 1975, Csikszentmihalyi develops the Flow Theory, "the holistic experience that people feel when they act with total involvement" (p.36) and suggests that individuals' senses should be integrated into the evaluations of marketing communication strategies. On this basis, sensory marketing is proposed as "marketing that engages the consumers' senses and affects their perceptions, judgments, and behaviors" (Krishna, 2012, p. 333), emphasizing the importance of sensations in consumer behavior studies (Kelley, 1967). Moreover,

in the clinical psychology discipline, the Pleasure-Arousal-Dominance Emotional State Model states that stimuli such as floor colors and food smell can affect one's emotional state and consequent evaluations on the product or service (Russell & Mehrabian, 1974). Likewise, Holbrook and Hirschman (1982, p.138) also propose a contiguity principle that "sensations, imagery, feelings, pleasures, and other symbolic or hedonic components" become "mutually evocative and equally important experiential aspects of consumer behavior". Therefore, it is necessary to take sensations into account when it comes to consumer behavior studies.

Sensory cues have been used in marketing. For example, Compeau, Grewal, and Monroe (1998) examine the impact of sensory cues on consumers' responses and perceptions of product quality, and report that the more sensory cues associated with the product, the stronger the affective responses, and consequently the more enhanced subjective evaluations of the product. Veale, Quester, and Karunaratna (2006, p.1) also state that "consumers use both intrinsic and extrinsic cues when forming opinions regarding product quality"; sensory cues are the major intrinsic cues containing physical product attributes such as taste or smell that affect consumers' perceived food quality. In general, sensory cues are deemed to influence consumers' evaluations toward a business (Deliza & MacFie, 1996; Hultén, 2012; Krishna, 2012; Lin, 2004). However, in online marketing where customer reviews play a dominant role in affecting other consumers' evaluations of the business, most of the studies have focused on sentiments, which measure consumers' valence of opinions (positive/negative) (Fang et al., 2016; Kim et al., 2016; Xiang et al., 2017). Few studies have focused on sensory cues, the major subset of sentiment which has significant impacts on consumers' evaluations toward online review information. That being said, there is a lack of empirical studies examining the role of specific sensory cues (sight, hearing, and feel) in consumers' responses toward online reviews in the hospitality/restaurant context (Agapito, Mendes, & Valle, 2013).

Hospitality and tourism products are regarded as typical hedonic products (Rezaei et al., 2016; Bruwer & Alant, 2009; Gnoth, 1997), which strongly emphasize the products' sensory and affective experience and possess intrinsic enjoyment that people are looking for (Dhar & Wertenbroch, 2000). Multi-sensations significantly affect consumers' cognitive responses and perceptions toward hospitality and tourism products (Agapito, Mendes, & Valle, 2013) and sensescapes such as soundscapes, tastescapes, hapiscapes, and smellscapes play an important role in affecting consumer experience and judgment toward the business (Dann & Jacobsen, 2003; Gretzel & Fesenmaier, 2010; Kastenholz et al., 2012). Today, hospitality and tourism consumers are more willing to focus on central cues of online reviews for information processing, and physical attributes such as visual and audial senses help formalize the central cues and affect future users' evaluations of the information (Filieri & McLeay, 2014). For example, consumers who post online reviews with detailed description of the aroma and flavor of beers are deemed to be experts (McAuley & Leskovec, 2013), and review writers' expertise significantly affects reviewer readers' perceived usefulness of such online information (Liu et al., 2008). In addition, López-Bonilla and López-Bonilla's (2008) state that sensation seeking is associated with e-commerce such as social media marketing in hospitality and tourism; online information with sensation attributes could improve consumers' intrinsic motivation such as perceived enjoyment to use such information in decision-making (Ariyasriwatana & Quiroga, 2016; Park, Lee, & Han, 2007; Sotiriadis & Van Zyl, 2013). Based on the literature and in order to further examine the role of sensory cues in the online review setting, this study defines sensory cues as information that contain words or phrases such as "see", "feel", and "taste" in online reviews and proposes that:

H3a: Reviews with more sensory cues are more likely to be perceived useful.

H3b: Reviews with more sensory cues are more likely to be perceived enjoyable.

In sum, the framework of this study is presented below (Figure 1):

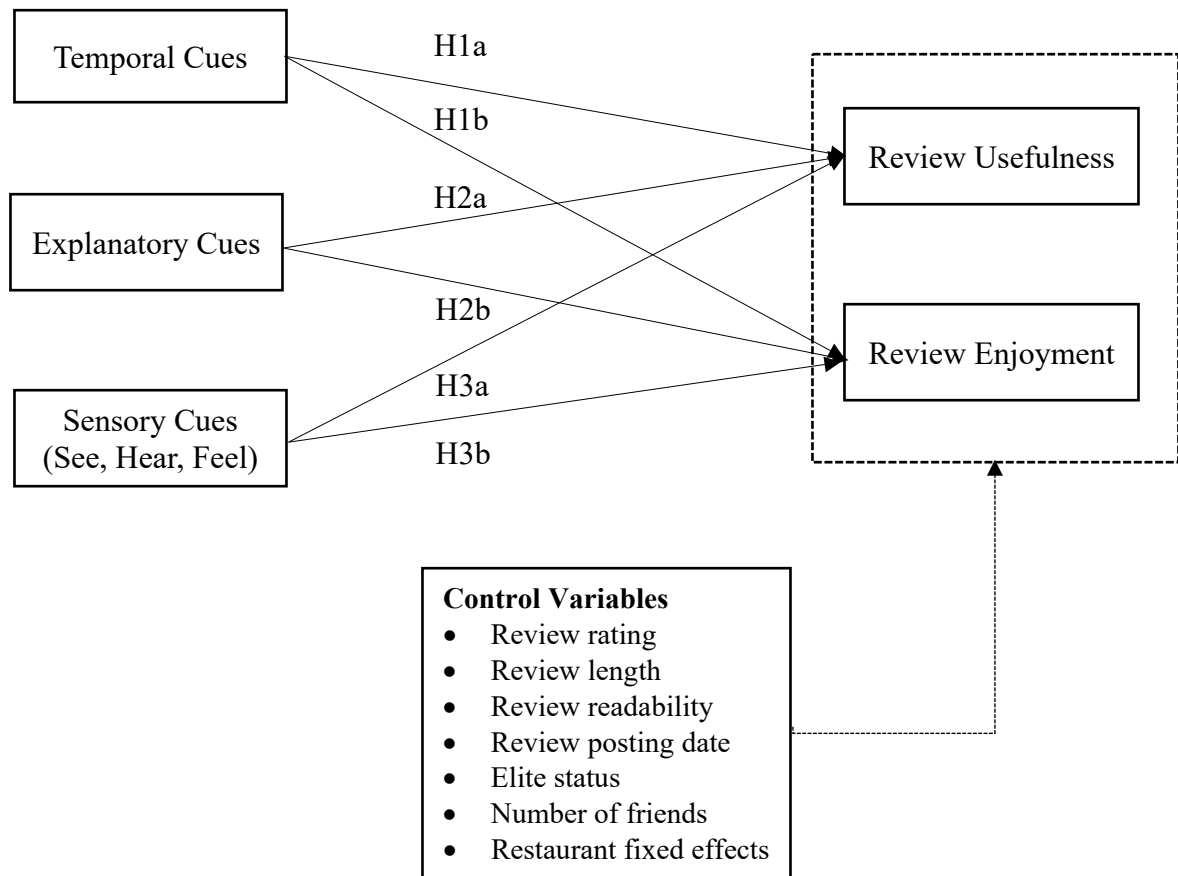


Figure 1. Research Framework

3. Methodology

3.1 Data

This study used the data from Yelp, one of the most popular online restaurant review platforms. Yelp is chosen because it is the only and the primary online review platform allowing review readers to evaluate online reviews in multiple ways. In other words, review readers can rate a Yelp review based on the categories of being “useful”, “funny”, or “cool”, instead of just an assessment of its “useful” feature or an action of “like”. As the dependent variables in the study include not only perceived usefulness but also the perceived enjoyment (see the measurement below), choosing Yelp data for this study well serves the research objectives.

We developed crawlers based on JAVA to retrieve all related information on the website. First of all, the online review data of 300 most popular restaurants in terms of the number of reviews in Las Vegas were collected. Both Chen and Laurie (2013) and Li et al. (2017) applied the similar sample selection method and addressed the reason that the most reviewed restaurants are likely to have a better reader involvement. The restaurant data cover restaurants with different price ranges and cuisine styles in Las Vegas. For each restaurant, all reviews on and before January 8, 2015 were collected. A total of 186,714 online reviews were obtained from the 300 restaurants and used in the data analysis. In addition, specific review information was collected, ranging from reviewer ID, number of “useful”, “funny” and “cool” votes, the detailed review text to the review posting date, and the review rating. Regarding the reviewer information, all reviewers of the 186,714 reviews were identified. We collected the reviewer ID along with all their friends’ IDs, and the reviewers’ “Elite” status in each year, which indicates the reviewers’ reviewing experience and expertise.

3.2 Variable operationalization

Dependent Variables. *Review Usefulness* refers to the total amount of “Useful” votes for each review, which indicates the number of times readers click the “Useful” tab under each specific review (Ghose & Ipeirotis, 2011; Lee, Jeong, & Lee, 2017; Liu & Park, 2015). Pan and Zhang (2011) stated that review usefulness can be used interchangeably with review helpfulness. Similarly, *Review Enjoyment* refers to the total number of “Funny” and “Cool” votes for each individual online review (Liu & Park, 2015; Park & Nicolau, 2015); perceived enjoyment in this study indicates the total number of “cool” and “funny” votes for each online review.

Independent Variables. *Temporal cues* are measured by ($\# \text{time-related words} / \# \text{words in a review}$)*100 (e.g., end, noon, and during). *Explanatory cues* are measured by ($\# \text{Causation-related words} / \# \text{words in a review}$)*100 (e.g., because, effect, and hence). *Sensory cues* are measured by

(#sensory-related words / #words in a review)*100 (e.g., see, hear, and feel). Moreover, sensory cues can be decomposed into seeing cues, hearing cues, and feeling cues.

The text mining software, LIWC program, was used to analyze these three key variables to calculate the percentage of words which were matched to pre-defined dictionaries in the review text (Pennebaker, Booth, & Francis, 2007). LIWC program has been increasingly used in psychology, information system, and marketing studies (Ludwig et al., 2013; Yin, Bond, & Zhang, 2014; Boyd & Pennebaker, 2015; Hong et al., 2016). Table 1 shows the examples of restaurant online reviews, which include temporal, explanatory, or sensory cues.

Table 1. Examples of Online Reviews with Temporal, Explanatory, and Sensory Cues

Temporal Cues

- (1) “Service was great, and always an interesting time on a *late Saturday night*.”
- (2) “Estimated delivery time *45 minutes* actually delivery time *120 minutes*. Pizza Hut, a pizza of last resort.”

Explanatory Cues

- (1) *Since* the changed menu yuk! Will not return.
- (2) One star off *because* the service is hit or miss. But their curry makes up for everything else. Seriously the best curry in town!

Sensory Cues

- (1) “*Tasty*, yet not *greasy*, kushi katsu skewers. The sashimi was good, the small size is plenty for 3 or 4 people. Beef tongue was thinly sliced, but *MOIST & JUICY*, as Ken Tom would say.”
- (2) “Been twice and really enjoyed both visits. The drunken noodles are *tasty* and *flavorful* without being overly *spicy*.”
- (3) “Awesome! Best pecan pie I've ever tasted! Not too *sweet*, *buttery crust*, not *soggy*, lots pecans toasted good for that good flavor - truly *orgasmic*!!”

Source: Yelp online restaurant reviews

Control Variables. To isolate the impacts of temporal, explanatory, and sensory cues, factors that are considered important in prior literature are controlled from three different levels, namely review level, reviewer level, and restaurant level (Li et al., 2017; Park & Nicolau, 2015; Yang et

al., 2017). First, review level control variables include review rating, review length, review readability, and review posting date. It is expected that the review rating has negative effect on perceived review usefulness; while review length, review readability and review posting date have positive effects on perceived review usefulness. Regarding perceived review enjoyment, all these review-level control variables are expected to show positive effects on perceived review enjoyment. Second, reviewer level control variables include reviewer Elite status and the number of reviewers' friends. It is expected that reviewer Elite status and reviewer's number of friends have positive effect on both perceived review usefulness and review enjoyment. Third, the restaurant characteristics/heterogeneity may also influence consumers' perception toward restaurant review usefulness and enjoyment (Li et al., 2017); therefore, similar as Amato and Amato (2007) and Li et al. (2017), this study included the restaurant-level fixed effects by creating a series of restaurant dummies to control possible systematic differences among different restaurants.

Table 2 displays the dependent variables, independent variables, control variables, and how they are measured. Table 3 presents the descriptive analysis of the proposed variables in this study.

363 **Table 2. Variable Description**

Variable	Description
Dependent variables	
Usefulness _{ijk}	Number of “useful” votes for a review
Enjoyment _{ijk}	The summated numeric total of both funny and cool votes for a review
Independent variables and Moderators	
Temporal _{ijk}	(#time-related words / #words in a review)*100
Explanatory _{ijk}	(#Causation-related words / #words in a review)*100
Sensory _{ijk}	(#sensory-related words / #words in a review)*100
Seeing _{ijk}	(#seeing-related words / #words in a review)*100
Hearing _{ijk}	(#hearing-related words / #words in a review)*100
Feeling _{ijk}	(#feeling-related words / #words in a review)*100
Control Variables	
Review Level	
Stars _{ijk}	Star rating of a review
Length _{ijk}	Total number of words in a review
Readability _{ijk}	Gunning-Fog Index readability index (Gunning, 1969) of a review text. The Gunning-Fog index is an estimator of the text complexity when determining its education level. The index’s value locates from 1 to 12, meaning the educational grade level required to understand a review. The following equation is used to calculate the index: $\text{Fog} = 0.4 \times \left(\frac{\text{Number of Words}}{\text{Number of Sentences}} + 100 \times \frac{\text{Number of Complex Words}}{\text{Number of Words}} \right).$
Date _{ijk}	The number of days since a review has been posted, measured by the difference between the data collection date and the review posting date.
Reviewer Level	
Elite _{ijk}	Whether the reviewer was named “Elite” when a review was posted (Yes=1; No=0).
Friends _j	Reviewer’s number of friends
Restaurant Level	
R _j	Restaurant fixed effects. It is measured by n-1 restaurant dummy variables with n being the restaurant number. The dummy variable takes on 1 if the observation falls within the restaurant and otherwise 0 (Amato & Amato, 2007). As the dataset included 300 restaurants, 299 dummies were incorporated in the econometric model.

Table 3. Variable Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Usefulness _{ijk}	186,714	.9512142	2.182678	0	126
Enjoyment _{ijk}	186,714	1.078462	3.292557	0	152
Temporal _{ijk}	186,714	4.41784	3.363706	0	66.67
Explanatory _{ijk}	186,714	.86085	1.136471	0	33.33
Sensory _{ijk}	186,714	2.537012	2.90482	0	100
See _{ijk}	186,714	.6191648	1.125761	0	50
Hear _{ijk}	186,714	.3242122	1.215196	0	100
Feel _{ijk}	186,714	.4637191	.9541774	0	50
Stars _{ijk}	186,714	3.847258	1.198129	0	5
Length _{ijk}	186,714	134.2243	120.8954	1	1015
Readability _{ijk}	186,714	8.490271	3.252587	.0190476	194.1887
Date _{ijk}	186,714	888.0131	661.728	0	3726
Elite _{ijk}	186,714	---	---	0	1
Friends _j	186,714	43.1534	116.4163	0	1261

3.3 Econometric specification—Negative Binomial Regression 2 Model

The majority of online reviews received relatively a small number of evaluation votes, while only a small number of reviews received a large number of evaluation votes. Given that the dependent variable of this study is a count variable and its mean is smaller than its variance (see Table 3; $\text{Mean}_{\text{usefulness}} = 0.95 < 2.18 = \text{Variance}_{\text{usefulness}}$; $\text{Mean}_{\text{enjoyment}} = 1.08 < 3.29 = \text{Variance}_{\text{enjoyment}}$), the negative binomial regression with robust standard errors was applied in this study accordingly (Cameron & Trivedi, 2005; Chen & Lurie, 2013; Li et al., 2017).

$$\begin{aligned} \text{Usefulness}_{ijk} = & \beta_{10} + \beta_{11}\text{Temporal}_{ijk} + \beta_{12}\text{Explanatory}_{ijk} + \beta_{13}\text{Sensory}_{ijk} \\ & + \beta_{14}\text{Stars}_{ijk} + \beta_{15}\text{Length}_{ijk} + \beta_{16}\text{Readability}_{ijk} + \beta_{17}\text{Date}_{ijk} + \beta_{18}\text{Elite}_j \\ & + \beta_{19}\text{Friends}_j + \sum_j \lambda_j * R_j + \varepsilon_{ijk} \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Enjoyment}_{ijk} = & \beta_{20} + \beta_{21}\text{Temporal}_{ijk} + \beta_{22}\text{Explanatory}_{ijk} + \beta_{23}\text{Sensory}_{ijk} \\ & + \beta_{24}\text{Stars}_{ijk} + \beta_{25}\text{Length}_{ijk} + \beta_{26}\text{Readability}_{ijk} + \beta_{27}\text{Date}_{ijk} + \beta_{28}\text{Elite}_j \\ & + \beta_{29}\text{Friends}_j + \sum_j \lambda_j * R_j + \varepsilon_{ijk} \end{aligned} \quad (2)$$

where i represents review ($i = 1, \dots, I$), j represents reviewer ($j = 1, \dots, J$), and k represents restaurant ($k = 1, \dots, K$); R_j indexes a vector of restaurant fixed effects; ε_{ijk} is the standard error with normal distribution.

4. Results

Tables 4 and 5 show the estimation results of the negative binomial regression 2 model. The model specification is assessed with the assumption that dispersion parameter alpha is equal to zero. The likelihood-ratio tests indicate a rejection of the null hypothesis (i.e. Poisson regression model), so negative binomial regression 2 models are appropriate for this study.

The estimation results for the review usefulness are shown in Table 4, while Table 5 shows the estimation results for the review enjoyment. Model 1.1 and Model 2.1 include only control variables as independent variables, whereas Model 1.2 and Model 2.2 include additional independent variables of the study interest (e.g. temporal, explanatory, and sensory cues). The estimation results show that temporal cues have a significant and positive influence on review usefulness (coefficient = 0.0032857, $p < 0.01$; coefficient = 0.0034001, $p < 0.01$), while the influence of temporal cues on review enjoyment is statistically insignificant. Therefore, Hypothesis 1a stating that “reviews with more temporal cues are more likely to be perceived useful” is supported, while Hypothesis 1b stating that “reviews with more temporal cues are more likely to be perceived enjoyable” is not supported.

In terms of the influence of explanatory cues, the results demonstrate that explanatory cues have significantly positive effects on both review usefulness (coefficient = 0.0296508, $p < 0.01$; coefficient = 0.029777, $p < 0.01$) and review enjoyment (coefficient = 0.0481565, $p < 0.01$; coefficient = 0.0482611, $p < 0.01$). In other words, a review text with more explanatory cues is likely to generate more peer evaluation votes on perceived usefulness and enjoyment. Therefore,

Hypothesis 2a and Hypothesis 2b stating that “reviews with more explanatory cues are more likely to be perceived useful and enjoyable” are both supported.

Table 4. Empirical Results—Review Usefulness

	Review Usefulness	
	Model 1.1	Model 1.2
Constant	-1.318597*** (-18.46)	-1.36928*** (-19.05)
Stars	-.0719095*** (-23.00)	-.0706025*** (-22.56)
Length	.0030102*** (104.02)	.0029878*** (103.00)
Readability	.0027637** (2.44)	.002539** (2.24)
Date	.0000992*** (16.71)	.0001*** (16.83)
Elite	.6826307*** (81.03)	.6830948*** (81.06)
Friends	.0029781*** (96.56)	.0029779*** (96.61)
Temporal cues		.0032857*** (2.69)
Explanatory cues		.0296508*** (8.63)
Sensory Cues		.0026882* (1.83)
Restaurant Fixed Effects	Yes	Yes
Alpha	.8338986	.8326862
Likelihood-ratio test of alpha=0	5.3e+04 (P=0.000)	5.3e+04 (P=0.000)
Log Likelihood	-212951.17	-212909.47
LR Chi2	61495.79	61579.19
Pseudo R2	0.1262	0.1263

Note: The values in parentheses indicate the z ratio. The asterisks indicate that the coefficient is significant at the *10%, **5%, and ***1% level.

In addition, the estimation results demonstrate that sensory cues have a positive effect on review usefulness with a coefficient of 0.0026882, but being significant only at 0.1 significance level. Meanwhile, sensory cues show a significant and positive effect on review enjoyment (coefficient = 0.0071531, $p < 0.01$). Therefore, Hypothesis 3b stating that “reviews with more sensory cues are more likely to be perceived enjoyable” (Hypothesis 3b) is supported, while

Hypothesis 3a stating that “reviews with more sensory cues are more likely to be perceived useful” needs further investigation in the future. In addition, the absolute value of the coefficient of sensory cues on “enjoyment” votes (0.0071531) is much larger than the coefficient of sensory cues on “useful” votes (0.0026882), meaning that sensory cues exhibit a greater impact on review enjoyment than on review usefulness.

Table 5. Empirical Results—Review Enjoyment

	Review Enjoyment	
	Model 2.1	Model 2.2
Constant	-2.053133*** (-22.78)	-2.107894*** (-23.27)
Stars	.0068204* (1.71)	.0086294** (2.17)
Length	.0033212*** (84.13)	.003281*** (82.98)
Readability	-.0036198*** (-2.61)	-.0041118** (-2.97)
Date	.0002276*** (31.42)	.0002273*** (31.36)
Elite	.7911183*** (72.78)	.7911356*** (72.79)
Friends	.0043532*** (85.99)	.0043494*** (86.04)
Temporal cues		-.0005087 (-0.33)
Explanatory cues		.0481565*** (11.26)
Sensory Cues		.0071531*** (3.95)
Restaurant Fixed Effects	Yes	Yes
Alpha	1.934194	1.929971
Likelihood-ratio test of alpha=0	1.5e+05 (P=0.000)	1.5e+05 (P=0.000)
Log Likelihood	-209231.66	-209161.94
LR Chi2	53038.51	53177.96
Pseudo R2	0.1125	0.1128

Note: The values in parentheses indicate the z ratio. The asterisks indicate that the coefficient is significant at the *10%, **5%, and ***1% level.

Then the sensory cues are decomposed into three sensory components, namely, seeing, hearing, and feeling cues. These three sub cues are incorporated into the model by replacing

“sensory cues”. The estimation results are shown in Model 3.1 and Model 3.2 (Table 6), which indicate that seeing cues (or visual cues) has significant and positive effects on both review usefulness and review enjoyment. The absolute value of the coefficient of seeing cues on “enjoyment” votes (coefficient = 0.0294154, $p < 0.01$) is much larger than the coefficient of seeing cues on “usefulness” votes (coefficient = 0.0148785, $p < 0.01$), indicating that seeing cues display a greater impact on review enjoyment than on review usefulness. As to the impacts of hearing cues and feeling cues, they both show significant and positive effects on review enjoyment (coefficient_{hearing} = 0.0173612, $p < 0.01$; coefficient_{feeling} = 0.0134835, $p < 0.01$), while their effects on review usefulness are statistically insignificant. The estimation results shown in Table 6 are consistent with and similar to the estimation results shown above.

455 **Table 6. Alternative Operation of Sensory Cues**

	Review Usefulness	Review Enjoyment
	Model 3.1	Model 3.2
Constant	-1.377232*** (-19.16)	-2.123757*** (-23.45)
Stars	-.0703463 *** (-22.44)	.0095619** (2.40)
Length	.0029802*** (102.55)	.003263*** (82.38)
Readability	.0026118** (2.30)	-.0038894*** (-2.81)
Date	.0000995*** (16.76)	.0002263*** (31.22)
Elite	.6828078*** (81.02)	.7911173*** (72.80)
Friends	.0029743*** (96.49)	.0043426*** (85.93)
Temporal cues	.0034001*** (2.80)	-.0004256 (-0.28)
Explanatory cues	.029777*** (8.67)	.0482611*** (11.29)
Sensory Cues		
Seeing	.0148785*** (4.04)	.0294154*** (6.38)
Hearing	.0038475 (1.25)	.0173612*** (3.93)
Feeling	.0059645 (1.40)	.0134835*** (2.59)
Restaurant Fixed Effects	Yes	Yes
Alpha	.8322543	1.928259
Likelihood-ratio test of alpha=0	5.3e+04 (P=0.000)	1.5e+05 (P=0.000)
Log Likelihood	-212901.32	-209137.52
LR Chi2	61595.50	53226.79
Pseudo R2	0.1264	0.1129

456 Note: The values in parentheses indicate the z ratio. The asterisks indicate that the coefficient is
457 significant at the *10%, **5%, and ***1% level.

458
459 Moreover, the estimation results reveal that readability has a positive effect on review
460 usefulness, which implies that the more complex of an online review, the more perceived
461 usefulness of this particular review. This finding is consistent with studies investigated by Li et al.
462 (2017), Liu & Park (2015), Liu et al. (2007) and Fang et al. (2016). The review readability in this
463 study is measured by FOG, which primarily focuses on the proportion of complex words and the

average sentence length of a given text and calculates the level of review readability required. Therefore, this result is not hard to be explained as that consumers tend to get more information from more complex reviews and thus perceive them as more useful. On the contrary, readability shows a negative effect on review enjoyment, which is similar to the finding of Yang et al.'s (2017) study. That is, the less complex of an online review, the more perceived enjoyable of this review. Liu and Park (2015) argue that if users perceive the review to be more complex and obscure, their cognitive costs increase accordingly. Therefore, it is not surprising to understand that review readability, which to some extent reflects review length and complexity, exerts a negative influence on perceived review enjoyment.

Table 8 summarizes the hypotheses testing results, as follows:

Table 8. Summary of Hypotheses Testing Results

Hypotheses	Empirical Support
Hypothesis 1a (H1a): Reviews with more temporal cues are more likely to be perceived as useful.	√
Hypothesis 1b (H1b): Reviews with more temporal cues are more likely to be perceived as enjoyable.	X
Hypothesis 2a (H2a): Reviews with more explanation/causation cues are more likely to be perceived as useful.	√
Hypothesis 2b (H2b): Reviews with more explanation/causation cues are more likely to be perceived as enjoyable.	√
Hypothesis 3a (H3a): Reviews with more sensory cues are more likely to be perceived as useful.	Need further Investigation
Hypothesis 3b (H3b): Reviews with more sensory cues are more likely to be perceived as enjoyable.	√

5. Discussion and conclusions

The current study adopts a nascent method and develops a holistic theoretical model to explore the joint influence of temporal cues, explanatory cues, and sensory cues on customers' perceived usefulness and enjoyment in the context of restaurant online reviews. The findings shed

light on a better understanding of customers' responses on Yelp reviews utilizing big data analysis, extending the existing literature on the influence of online review linguistic characteristics for hedonic hospitality products in the context of restaurant online reviews. Additionally, the results of this study provide important implications for industry practitioners such as online review website designers, restaurant owners, and social media marketing professionals.

Specifically, the conclusions of this study are as follows: First, temporal contiguity cues exert a substantial impact on review usefulness, while its impact is not significant on review enjoyment. Second, all sensory cues (seeing, hearing, and feeling) have strong influences on review enjoyment, while only cues related to seeing have a light impact on review usefulness. Moreover, sensory cues are more influential on review enjoyment than usefulness. Such findings are consistent with previous literature in that the hedonic feature of hospitality and tourism products is more generated from emotions and feelings (Koufaris, 2002; Dhar & Wertenbroch, 2000). Third, explanatory cues show significantly positive effects on both review usefulness and review enjoyment.

5.1 Theoretical implications

Although there are studies focusing on customers' perceived usefulness or enjoyment of online reviews at various social media outlets, the linguistic characteristics in review texts are under researched in the hospitality management literature. Specifically, this study contributes to the literature in the following three ways:

First, this study is one of the few studies which examine the influence of review temporal contiguity cues in the context of online WOM context. Previous studies, through experimental design, demonstrate that the presence of temporal contiguity cues increases consumers' perceived trustfulness of online reviews and consequent evaluations as well as purchase intentions toward the reviewed business (Wu et al., 2017). Built upon prior research, this study further categorizes perceived review value into two specific and essential dimensions – perceived usefulness and

enjoyment – to extend the existing literature in the hospitality social media era. Thus, this study is innovative in that it jointly examines the role of temporal contiguity cues on both review usefulness and enjoyment, allowing a better understanding of the effects of time on consumers' responses toward online reviews. Moreover, the current study contributes methodologically by analyzing a large amount of online review text data in the real-world settings.

Second, this study extends Moore's (2015) experimental study in both theoretical and methodological aspects, adding to the body of knowledge on review helpfulness and online review management. Based on a series of experiments, Moore (2015) reveals that explanations in online reviews enhance readers' perceived helpfulness. This study contributes to the literature methodologically via analyzing online review text data by using text mining technology. Moreover, it is found that the explanatory cues in the online reviews not only influence review readers' perceived usefulness, but also perceived enjoyment of Yelp online reviews. In other words, a review with explanatory words is considered influential not only because it is useful, but also because it is enjoyable; therefore, this study supplements the existing literature in explanatory cues and online review perceptions.

Third, built upon the conceptualization of the sensory dimension of consumer experiences and sensory cues marketing, this study for the first time analyzes sensory cues by using text mining method, and applies sensory cues to the context of Yelp online review analysis by using big data, contributing to the existing literature theoretically and methodologically. Moreover, the current research jointly examines the role of sensory cues on both review usefulness and enjoyment, and finds that the sensory cues exert stronger influence on review perceived enjoyment than usefulness, contributing to the literature on sensory marketing and consumer responses toward online reviews, as well as online reviews management in the social media context.

5.2 Practical implications

This study makes contributions to managerial insights on online review management. In the digital era, online reviews have become a crucial and increasingly influential marketing tool for restaurant managers. Consumers choose to trust other consumers' reviews and ratings more than those provided by businesses (Senecal & Nantel, 2004), thus understanding what affects consumers' perceptions toward others' online reviews is critical for practitioners. Instead of a top-down assessment mechanism, practitioners have started to develop a bottom-up evaluation system to manage the effectiveness of online reviews, which is to understand and control what review writers do on business platforms and how review readers perceive such information. Specifically, the findings demonstrate the following implications for practitioners.

Posting reviews with temporal contiguity cues to increase perceived usefulness. This study exhibits that consumers perceive reviews with temporal contiguity cues more useful. Temporal contiguity cues in a review reflect one's solid memories of the event (Friedman & Johnson, 2000), which increases potential review readers' trust and perceived value of the information (Olsson & Shogenji, 2004). Therefore, marketers should encourage consumers to post their reviews of the products or services with information cues showing temporal closeness between their dining and the review time. The prompt message could be, for example, "If you enjoyed the meal, please leave your valuable reviews and comments on Yelp and tell us when you were here!" Restaurant owners or online review website designers can also provide promotional rewards for those who explicitly communicate their dining experiences. A message could be sent to consumers when they pay the meal saying "Please post your experience with us now and tell us when you had your meal to enjoy a discount for your next visit!"

Encouraging consumers to include explanations in their online reviews. The results show that reviews with more explanatory cues are more likely to be perceived useful and enjoyable.

Therefore, practitioners should come up with more efficient strategies to make consumers provide

value-added and in-depth reviews to explain why he/she liked or disliked the products or services, rather than simply posting a positive or negative review without further explanations. On this basis, online review platforms or restaurants can encourage consumers to use appropriate action explanations in their reviews by giving specific writing instructions. These instructions available online will remind review writers to explain why they choose certain products and how they evaluate their experiences. In addition, online review websites should also detect reviews which contain explanation words (e.g. “I tried the lunch box and it was good because the ingredients were fresh.”) as they are perceived as more useful and enjoyable, and list them on the top of review page to facilitate consumers’ dinning decision making.

Embedding sensations to increase perceived enjoyment. This study finds that sensory cues exert a greater influence on consumers’ perceived enjoyment of online reviews, which means that reviews containing words related to sight, hearing, and feeling contribute to a higher level of enjoyment for review readers. Therefore, restaurants and online review platforms should encourage review writers to provide reaction words that communicate feelings, emotions, and subjective evaluations as well as experiences in their reviews. On one hand, online review platforms can design various emoji icons to represent sensations (e.g. smell, taste, and sight etc.) and emotions (e.g. joy, anger, and excitement, etc.) that are easy to be used by review writers and understood by review readers. On the other hand, to facilitate review readers or potential consumers to find enjoyable and useful reviews, online review websites and apps developers can redesign the system by allowing readers to sort reviews by sensation or emotion filters.

5.3 Limitations and future research

Similar to other studies, this study is subject to limitations. Frist, this study focuses on only one type of services, the restaurant. Future studies are suggested to involve other types of services such as hotels and tour experiences to redress generalizability. Second, this study only examines

explanation-related words in general, not specific types of explanations. Similarly, temporal cues are generated in a general manner without specifying whether different expressions such as “1:00pm” and “last month” have the same effect on consumers’ responses. Future studies are recommended to examine the explanatory cues and temporal cues at the more specific magnitude. Third, the current study does not take consumers’ differences into consideration. Review readers’ perceptions may vary depending on their demographic and psychographic differences, shedding lights on a more meaningful and comprehensive understanding of consumer response to online reviews in the future research.

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