WHAT DO CUSTOMERS SHARE ABOUT EATING-OUT ON FACEBOOK?

Liang (Rebecca) TANG [1]
Department of Apparel, Events, and Hospitality Management, Iowa State University, U.S.A.
ORCID: 0000-0001-9284-980X

Xi WANG
Division of Culture and Creativity, BNU-HKBU United International College, China
ORCID: 0000-0002-0566-5357

Eojina KIM
Hospitality and Tourism Management, Pamplin College of Business, Virginia Tech, U.S.A.
ORCID: 0000-0001-6405-6933

Yi LUO
College of Business Administration, Capital University of Economics and Business, China
ORCID: 0000-0002-9322-7305

ABSTRACT

Discussing the eating-out experience is long-lasting among people around the world, and with the advent of the internet, customers change the way of sharing dining experience online. This study aims to identify the dominant topics and emotional dimensions on Facebook status updates of large-scale individual accounts, as well as the topic variance by users' age and gender. With an adaption of the myPersonality dataset on Facebook, topic modeling and emotion analysis are conducted. Findings indicate that five primary topics are composed of food, happy time, dining experience, coffee time, and people. Males and females demonstrate a significant difference in the theme of people. Positive emotional dimensions generally show stronger extents than the negative ones. This study is a pioneer of exploring Facebook individual accounts in the hospitality and tourism field and expands industry practitioners' comprehension of dominant dining-out themes and emotional responses among distinct consumer groups.

INTRODUCTION

Dining-out has increasingly gained importance in the U.S., accounting for over 50% of total food expenditures. Food sales at restaurants accounted for 71.9 percent of food-away-from-home expenditures in 2017 (US

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[1] Address correspondence to Liang (Rebecca) Tang (PhD), Department of Apparel, Events, and Hospitality Management, College of Human Sciences, Iowa State University, U.S.A. E-mail: rebeccat@iastate.edu

Department of Agriculture Economic Research Service, 2018). Greater educational attainment and rising double-income households have both contributed to the increase of restaurant demands; Americans ate out five times averagely per week in 2018 (US Department of Agriculture Economic Research Service, 2018). Therefore, the restaurant industry has shown greater attention to consumers' eating-out patterns. Industry practitioners have widely agreed that e-WOM is an effective venue for understanding consumers' eating-out patterns (Yamaguchi et al., 2018).

The advent of the internet has fundamentally changed the ways individuals share dining experiences in today's world. Social media support communications in which individuals interact with others; people update, respond, and pass messages to others in a social circle about personal lives, trending topics, and perceptions toward products/services (Chatterjee, 2011). The unique characteristic of social media has made itself as an exceptional channel for people to share their restaurant experience, including topics and emotions, socially instead of keeping it as a personal experience. Since social influence is an important factor in making food choices (Furst et al., 1996), an understanding of what restaurant attributes addressed and what emotions conveyed on social media can provide researchers and practitioners with insights into the dynamic nature of individual's dining experience.

Previous studies (e.g., Kang et al., 2014) have dominantly relied on surveys to explain consumers' dining experience on social media which lack external validity. The massive data warehouse from social media platforms can create opportunities to revisit survey validation and improve external validation (Baesens et al., 2016). However, the existing studies adopting big data analytics (e.g., Wang et al., 2019) have primarily focused on business-oriented platforms (e.g., Yelp, TripAdvisor). People's posts on these websites are goal-oriented (e.g., help others to make restaurant choices), which lack an instinctive self-observation of daily life phenomena. Instead, such "indeliberate" in-the-moment communications about eating out (i.e., eat at a restaurant as an aspect of personal life) are expected to happen in the wide-ranging network of individual accounts on Facebook. Examining a large and random pool of messages from Facebook individual accounts has been proven effective to detect and predict social patterns or trends, ranging from political polling (e.g., MacWilliams, 2015) to monitoring of health issues (e.g., Hawn, 2009), from earthquake tracking (e.g., Muralidharan et al., 2011) to stock market prediction (e.g., Karabulut, 2013), and from identifying user personality (e.g., Garcia & Sikstrom, 2014) to detect emotional changes (e.g., depression symptom) (e.g., Moreno et al.,

2011). All of these applications show Facebook's capability of serving as an efficient, low-priced, and reliable technique for monitoring the general public's experience, attitudes, and preferences on a specific perspective of life (e.g., eating out). Considering that eating out is among the most common human behaviors, Facebook status updates (i.e., short messages users post to depict daily routes) randomly selected from a massive pool of individual accounts is a potential data source for gaining the big picture of user-generated content (UGC) on this topic.

To understand the public's patterns and trends of a specific perspective of life (e.g., eating out) through Facebook status updates, two critical questions need to be answered: what are consumers mostly concerned? How do they perceive or express about a given hospitality issue? To answer the first research question of "what", dominant themes are extracted from high-volume messages of Facebook status updates through mapping out the recurrent patterns of terms, which is denoted as topic modeling (Rossetti et al., 2016). Topic modeling has been widely applied to collect relevant features in the hospitality and tourism field, such as destination image themes (Sun et al., 2014), hotel attributes (Xu, 2018), and restaurant-quality features (Huang, 2017). Furthermore, individuals in distinct demographic groups (i.e., age, gender) demonstrate different interests in a given hospitality issue on social media (Bhattacharya, 2015). Therefore, it is necessary to identify the patterns of topics/themes interested in distinct demographic segments through Facebook update status. To the knowledge of the authors, no attempt has been made to identify whether individuals' patterns of sharing dining-out experiences on Facebook vary by gender and age. The present study aimed to fill the research gap.

To answer the second research question of "how", consumers' emotions toward distinct themes (i.e., themes are identified by answering the first research question) are assessed. The one-dimensional scalability of sentiment (e.g., positive vs. negative) in hospitality research that has dominantly adopted is indefensible (Solomon & Stone, 2002). However, the manifold perspectives (e.g., joy, fear) underneath either positive or negative emotions constitute distinct origins, connotations, and consequences (Pfister & Bohm, 2008). As a cornerstone work in psychology discipline, Plutchik's (1994) emotional wheel provides a relative comprehensive (i.e., eight emotional dimensions) and balanced (i.e., four positive and negative ones, respectively) framework, which thus is used in the current study.

The current study aims to excavate message content and demographic variables regarding eating out on Facebook status updates.

The specific goals include: 1) to identify the topics relevant to eating out; 2) to examine pattern variance of the eating-out topics by age and gender; and 3) to investigate emotional variance by eating-out topics. The present study is the first of exploring the eating-out phenomena among the general public through large-scale Facebook individual accounts in the hospitality and tourism field. It is a significant addition to the findings of previous studies collected with traditional approaches (e.g., surveys, interviews, review websites). The findings help practitioners and government officers better understand eating-out patterns or trends from the view of a social phenomenon, and accordingly design effective communication programs with the general public.

LITERATURE REVIEW

Facebook Studies in Hospitality and Tourism Field

Facebook is one of the world's most trafficked sites which had 2.2 billion monthly active users as of 2018 (Stout, 2018). It has become one of the most popular platforms where consumers present their opinions, attitudes, and judgments about products, services, and experiences (Richard & Guppy, 2014). Despite the importance of Facebook, limited studies in the hospitality and tourism area have explored valuable data warehouse on this site. Previous research most relevant to Facebook in hospitality and tourism field is summarized in Table 1.

These studies investigated the utilization of Facebook from either receiver or sender perspectives. Receivers refer to consumers who view content on Facebook. Senders mean message providers, including businesses which create Facebook brand pages and individual owners of Facebook accounts. The 22 studies in Table 1 examined the sender perspective and three out of these focused on the restaurant setting (Gruss et al., 2020) and analyzed the effects of senders' messages on consumers' behaviors in Facebook brand pages. The 22 studies from the receiver aspect examined the relationships of motivations (e.g., benefit, value) (e.g., Kang et al., 2014), webpage features (e.g., cues, participation, experiential flow) (e.g., Perez-Vega et al., 2018), attitudes (e.g., trust) (e.g., Ben-Shaul & Reichel, 2018), and behavioral intentions (e.g., commitment) (e.g., Enter & Michopoulou, 2013) on Facebook brand pages. Among the 22 studies from the standpoint of receivers, only one examined the restaurant setting (Kang et al., 2014). Therefore, the restaurant setting should gain more attention from scholars.

Table 1. *Summary of Literature Most Relevant to Facebook in Hospitality and Tourism*

Perspective	Context	Methodology	Research Ideas	Content Types	Citations
Receiver	Restaurant (1)	Survey	Examine correlations between benefit, community participation, brand trust, and commitment on Facebook brand pages	General	Kang et al. (2014)
	Hotel (13)	Survey		General	Atadil et al. (2010)
		Survey		General	Touni et al. (2020)
		Survey		Message purpose	Kwok et al. (2017)[1]
		Facebook feature analysis		Message delivery media & Engagement formats	Lo and Fang (2018)
		Big-data analysis		message purpose & Message delivery media	Leung et al. (2017)
		Facebook feature analysis	Investigate the impacts of message format and content on Facebook brand pages on consumers' attitudes and behavioral intentions	Usage status	Phelan et al. (2013)
		Survey		General	Wang (2016)[2]
		Survey		General	Choi et al. (2016)
		Experiment		Message purpose & message delivery media	Leung et al. (2017)
		Experiment		Message purpose	Cervellon and Galipienzo (2015)
		Survey		Message purpose & message delivery media	Leung (2012)
		Survey		General	Leung et al. (2015)
		Survey		General	Leung and Tanford (2016)
	Tourism (8)	Survey		General	Ben-Shaul and Reichel (2018)
		Facebook feature analysis		Engagement format	Gunter et al. (2019)
		Survey	Assess webpage cues, motivation, experiential flow, engagement, value, attitude, behavioral intention, and others on Facebook brand pages	General	Escobar-Rodríguez et al. (2017)
		Survey		General	Leung and Jiang (2018)
		Facebook feature analysis		Message delivery media	Mizrachi and Sellitto (2015)
		Survey		General	Senders et al. (2013)
		Survey		General	Perez-Vega et al. (2018)
		Survey		General	Enter and Michopoulou (2013)

Sender	Restaurant (3)	Facebook feature analysis	Examine consumers' messages on Facebook fan pages of restaurants	Engagement format	Gruss et al. (2020)
		Survey		General	Khan and Boehmer (2013)
		Big-data analysis		Message delivery media	Kwok and Yu (2013)
	Hotel (7)	Facebook feature analysis	Examine the features and messages of Facebook fan pages	Message delivery media	Connor (2011)
		Facebook feature analysis		Usage status	Capatina et al. (2018)
		Facebook feature analysis		Engagement format	Su et al. (2015)
		Facebook feature analysis		Message delivery media	Minazzi and Lagrosen (2014)
		Big-data analysis		Message purpose	Kowk and Yu (2013)
		Facebook feature analysis		Usage status	Wang and Kubickova (2017)
		Facebook feature analysis		Usage status	Phelan et al. (2013)
	Tourism (10)	Facebook feature analysis	Examine the features of Facebook brand pages; investigate the impacts of travel photos in Facebook individual accounts on generating travel ideas	Usage status	Hsu (2012)
		Facebook feature analysis		General	Ketter (2016)
		Big-data analysis		Message purpose	Aydin (2020)
		Survey		General	Möller et al. (2018)
		Survey		General	Mariani et al. (2019)
		Facebook feature analysis		Message delivery media	Lalicic et al. (2020)
		Big-data analysis		Engagement format	Mariani et al. (2016)
		Facebook feature analysis		Message delivery media	Moya and Jain (2013)
		Facebook feature analysis		General	Park et al. (2016)
		Facebook feature analysis		Message delivery media	White (2010)
	Event (1)	Survey	Test the relationship between variables about users' experience on Facebook brand pages	General	Lee et al. (2012)
	Airport (1)	Facebook feature analysis	Feature summary	Message delivery media	Wattanacharoensil and Schuckert (2015)

[1,2.] It covers all the hospitality sectors (e.g., hotels, restaurants, tourism attractions, etc.)

We also categorized the papers relevant to Facebook in the hospitality and tourism field based on types of content, message delivery media, engagement formats, message purpose, and usage status. 19 papers which investigated senders or receivers' perceptions of Facebook messages as a general (e.g., Atadil et al., 2010), which were excluded from the categorization based on types of content. Surveys and experimental designs with Facebook users were dominantly used in these studies (e.g., Lee et al., 2012). These traditional methods emphasize isolated and randomly identified respondents, which are inefficient to handle the network structure of Facebook.

The other 25 studies examined either one or more types of content. For example, Facebook messages were classified by distinct purposes, including marketing (Kwok et al., 2017), conversational (Cervellon & Galipienzo, 2015), emotional (Kwok & Yu, 2013), promotion/event, congratulations/condolences, informative (Aydin, 2020), reward (Leung et al., 2017), brand, product, and involvement (Leung, 2012), booking, and discussions (Connor, 2011). Facebook messages were also grouped with engagement formats, including likes, shares, and comments (e.g., Gruss et al., 2020). Some research focused on the usage status (e.g., frequency of posts, language use, number of likes) (e.g., Hsu, 2012). Message delivery media (i.e., text, photo, video, links) were discussed in Moya and Jain (2013), White (2010), Wattanacharoensil and Schuckert (2015), and others. These 25 papers mostly aimed at categorizing and comparing the messages and/or user profiles. Sporadic ones put a specific type of content under microscope to examine the details (e.g., White, 2010). Furthermore, very few of them took advantage of big data technique to analyze Facebook messages (e.g., Escobar-Rodriguez et al., 2017). The present study was the pioneer to identify social trends and patterns of eating out among the general public through examining status updates from a large volume of Facebook individual accounts.

Topics of Eating Out on Facebook and Demographic Information

Multi-attribute attitude model suggests that a consumer's perception of a business (e.g., a restaurant) is influenced by a mixture of business attributes at different extents (Wilkie & Pessemier, 1973). The level of influence is explained by both business attributes (Xiang et al., 2015) and individual consumers' idiosyncratic preference (Heo & Hyun, 2015). Thus, user-generated content which shows consumers' preference is expected to demonstrate distinctions (Brody & Elhadad, 2010) relevant to each attribute of a restaurant. As text data are composed of words, a topic people share on

social media can be expressed by a combination of strongly related words (Jeong et al., 2019). Topic modeling allows researchers to capture latent topic identification. In the present study, topics related to restaurant experience from Facebook status updates were identified by topic modeling.

The demographic factors such as gender and age play an important role in individuals' behavior on eating out (Kardes et al., 2014). Age and gender have been proved in previous studies to be two dominant demographic variables that influence consumers' eating-out behaviors (e.g., Poria, 2008). Males more frequently eat out than females (Dave et al., 2009). Furthermore, consumers' perceptions of restaurant attributes (e.g., food variety, food portion size, food quality, and others) are significantly different based on gender at American-themed restaurants (Heung, 2002).

Food consumption behaviors can vary across the age groups (Kuhns & Saksena, 2017). Americans who are 35–44 years old eat out more often than others, whereas elderly individuals (i.e., over 64 years old) spend eight percent less than others (US Department of Agriculture Economic Research Service, 2018). The demand for full-service restaurants is likely to increase among baby boomers (Kim & Geistfeld, 2003). Harrington et al. (2013) also confirmed the impact of consumers' gender and age on their assessment of restaurant attributes at quick-service restaurants. Females view quality, setting, and dietary attributes as more important than their male counterparts. And older groups place greater importance on quality, setting marketing, dietary, access, and special promotions than their younger counterparts at quick-service restaurants. Considering knowledge, experience, and perceptions of individuals, the significant difference of user-generated content on social media may exist across different demographic segments of individuals, especially those in the distinct age and gender cohorts (Guo et al., 2017). Therefore, gender and age should be considered as significant variables that influence individuals' expressions of dining experience on Facebook status updates.

Emotion

Textual data on social media address individuals' expressions which describe their sentiments and emotion. Emotion was defined as an all-around mental state across physiological, intellectual, and social systems (Mulligan & Scherer, 2012). The investigation of emotions on social media is important based on emotion-as-feedback system theory (DeWall et al., 2016) and emotional contagion theory (Hatfield et al., 1993). Upon the

emotion-as-feedback system theory, conscious emotion of an individual serves as a feedback system which results in actions through the retrospective cognitive process (Baumeister et al., 2007). It explains how emotions expressed in a consumer's review predict his/her patronage behavior (Herzig et al., 2016). Emotional contagion theory indicates that an individual's emotions could directly/indirectly trigger similar emotions in other individuals (Hatfield et al., 1993). Social media offers a venue of emotional synchrony and sharing between individuals. As a result, a reviewer's comment leads to the attitudinal and behavioral changes of readers (Wang et al., 2019). Therefore, emotion conveyed in reviews is an important topic of social media studies.

Considering its multidimensional nature, emotion on social media has gained many scholars' attention in hospitality and tourism field (e.g., Zhang et al., 2011). However, previous studies assumed that all emotions are instinctively classified as either positive or negative (e.g., Kim & Tang, 2016). This postulation is unconvincing because ample proofs support that people's selections do not comply with simple scalability (Tversky & Thaler, 1990). Therefore, Wang et al. (2019) argued that the multi-dimensional framework provides a more powerful diagnostic tool of social media content than the emotion dichotomy.

Several psychological theories proposed multi-dimensional frameworks of human emotions (e.g., Ekman, 1992). For instance, Perse (1990) proposed three emotional dimensions (happy, sad, and angry) consumers generate when watching television news. Ekman (1992) indicated that humans have six fundamental emotional perspectives; anger, disgust, joy, surprise, sadness, and fear. Compared to Ekman (1992), Plutchik's (1994) framework had two supplementary dimensions, including trust and anticipation. Plutchik (1994) presented the emotion wheel with four opposite pairs; sadness-joy, surprise-anticipation, disgust-trust, and fear-anger. Plutchik's wheel of emotion has been broadly applied in varied online textual content mining practices, including consumer review websites (e.g., Atabay & Cizel, 2020; Chafale & Pimpalkar, 2014), social communities (e.g., Bertola & Patti, 2013), blogs (e.g., Abbasi & Beltiukov, 2019), and others. The present research adopted Plutchik's emotion wheel due to four considerations. First, this framework has been widely accepted in psychological investigations. Second, compared with some distinctive alternatives, like Ekman (1992), that negative emotions are prevailing, Plutchik's wheel of emotion offered a symmetric emotional structure with both emotional extremes. Third, this framework is a superset of the emotional facets which previous scholars (e.g., Ekman, 1992) had laid the

foundation. Last but not least, the effectiveness of Plutchik's framework in the social media context in hospitality and tourism field has been proved by Rahmani et al. (2019) and Wang et al. (2019). Specifically, Rahmani et al. (2019) identified affective responses from destination experience with the eight dimensions and examined their influences on tourists' interpretation expressed on travel blogs. Wang et al. (2019) investigated how the eight emotional components embedded in user-generated content influence review helpfulness on Yelp. Therefore, Plutchik's framework is proper to examine multi-dimensional emotions of Facebook status updates in our research.

METHODOLOGY

Data Collection

The present study adopted the secondary data from the myPersonality application on Facebook (Stillwell & Kosinski, 2018). The application was created by Dr. David Stillwell at the University of Cambridge and Dr. Michal Kosinski at Stanford University, which complied with Facebook's policies and was supportive by Facebook. At this application, users voluntarily took psychometric tests and reported demographic information, and opted to (i.e., did not have to) donate their Facebook data for academic research purposes. The myPersonality application is one of the largest social science research databases in history (The Psychometric Centre, 2018), which have been used to generate over one hundred academic papers in social sciences. Over six million volunteers participated in the psychometric tests, and around 40% of them shared their Facebook profiles. The sub-dataset could be available upon request from the administrators of myPersonality project upon the sound proposal. We got approval from the administrators in Feb 2018 to access the sub-datasets of participants' self-reported age and gender, as well as Facebook status updates in the myPersonality database.

Data Cleaning

By referring to diverse sources relevant to restaurants in both academia and industry practices (Meeroona, 2018; Wikipedia, 2018; Winsight, 2018), an initial list of 2,322 keywords was identified which specified the food service context. The word categories included foodservice business types (e.g., fast food, cafeteria, coffeehouse, café, pub, and others), dining-related terms (e.g., waitress, menu), and major chain restaurant names (e.g., MacDonald's, KFC) in the U.S. Four researchers with the specialization of

restaurant management at two primary research universities in the U.S. screened the keyword pool and kept 2,002 ones for screening the Facebook status updates. After screening all the Facebook messages in the MyPersonality database, 100,168 ones written in English were kept.

Although these Facebook status updates were composed of at least one keyword we identified, some outliers may exist which did not refer to the restaurant context. Two researchers reviewed all Facebook status updates separately and crossed-checked the findings to confirm results were consistent. Accordingly, 198 Facebook status updates were further deleted. The textual cleaning procedure was processed in statistics software R 4.0.5. The next step followed Miner et al. (2012), including escaping HTML characters, removal of stop-words and punctuations, apostrophe and slangs lookup, and many others. Since the primary purpose of the present study was to analyze text content (i.e., topics and emotions extracted from texts), we used the textual cleaning technique proposed by Miner et al. (2012). All punctuations, special characters, and numbers were not considered and thus removed in the data cleaning process. And Table 2 displays removed information categories with sample words.

Table 2. *Removed information and stop words in data cleaning*

Removed information	Sample
Punctuation	",", ".", "?", ":"
Special character	"/", "@", "\\", "|"
Number	"1", "2", "3", "4"
Stop word	"seem", "what", "via", "lots"

The cleaned data groups described above (age, gender, Facebook status updates) were merged into one database. The users with missing data in any of the three categories were removed. Accordingly, the dataset of 47,935 users with 99,970 Facebook status updates was kept for further analysis. Among 47,935 users, 41.05% were male and 58.95% were female. The average age of users was 33. The respondents were classified into seven groups, including 20 or less (0.28%), 21-30 (54.71%), 31-40 (23.89%), 41-50 (13.05%), 51-60 (5.41%), 61-70 (1.69%), and 71 and above (0.97%). The dominant age group of 21-30 wrote 39,460 Facebook status updates.

Data Analysis

Topic modeling was used to detect the latent restaurant themes in Facebook status updates. Among several topic modeling approaches (e.g., Non-negative Matrix Factorization, Latent Semantic Analysis), Latent Dirichlet

Allocation (LDA) is particularly effective on social media (Hong & Davison, 2010), since LDA aggregates unrelated language information (e.g., Facebook messages) into meaningful topics with an iterative machine learning method. By analyzing status updates at a single word level, LDA was adopted to do the topic modeling. Cross-tabulation, T-test, and ANOVA were used for the relationship between topics and demographic variables (i.e., age and gender). With a series of iterative algorithm processes suggested by Nidhi (2017), LDA was performed by using statistic software R 3.6.2 with a package called "topicmodels".

Emotional analysis was used to assess consumers' emotions expressed on Facebook. The eight emotional dimensions of Plutchik (1994)'s framework embedded in Facebook status updates were detected with the Word-Emotion Association Lexicon (EmoLex). EmoLex was created by National Research Council (NRC) to compare the weight of words in a specific dimension by its own developed lexicon (Pennebaker et al., 2015). The Emolex dictionary was input the Linguistic Inquiry and Word Count 2015 (LIWC) which is a software that counts the percentage of emotion words in textual status updates. Eight kinds of consumer emotions were detected by comparing the percentage of words in a specific dimension with the EmoLex dictionary in the LIWC software. The steps of data processing are demonstrated in Figure 1.
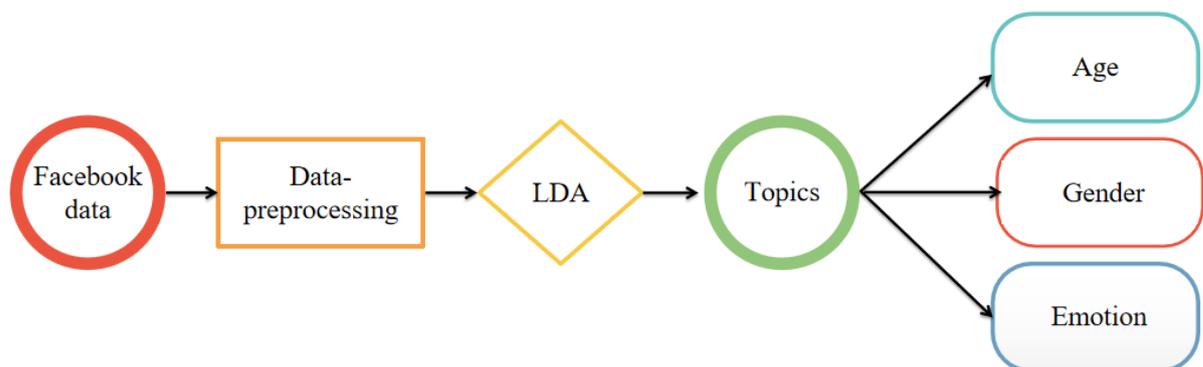

Figure 1. *Facebook data processing procedure*

RESULTS AND DISCUSSIONS

Themes of Facebook Status Updates

In LDA a series of iterative algorithm computing and data cleaning (e.g., remove stop words like "via", "what".) were taken, which identified five dominant themes of Facebook status updates; *food*, *happy time*, *dining*

experience, *coffee time*, and *people*. The description of each theme and corresponding 15 sample words are demonstrated in Table 3. Furthermore, the 15 sample words for each theme by the sequence of word frequencies are shown in the word clouds of Figure 2.

Table 3. *Sample words in eating-out topics*

No.	Topic	Definition	Sample word
1	Food	Directly relate to food name or eating-out behavior	Food(5.64%), McDonald's(4.04%), menu(8.87%), eat(16.69%), buffet(3.16%), taco(3.06%), KFC(3.08%), eating(2.90%), pizza(2.27%), burger(2.78%), chicken(1.77%), breakfast(1.60%), ate(22.11%), dinner(4.00%), Wendy(1.17%)
2	Happy time	A pleasant period of time at pubs or bars with family and friends	Pub(49.91%), night(11.25%), tonight(4.57%), great(4.87%), bar(4.11%), happy(3.22%), best(3.11%), fun(4.37%), awesome(2.10%), nice(2.28%), weekend(1.64%), amazing(1.63%), Sunday(1.08%), wonderful(0.95%), Saturday(0.90%)
3	Dining experience	Dining-out experience about restaurant, food, or service	Service(8.42%), bill(8.18%), private(4.90%), group(4.44%), spending(2.81%), experience(3.42%), social(4.59%), final(14.06%), video(3.48%), event(6.01%), special(8.63%), stall(2.77%), miles(2.25%), west(4.01%), standing(2.24%)
4	Coffee time	All things related to coffee and/or coffee house	Starbucks(17.26%), cafe(24.68%), morning(6.08%), coffee(5.29%), week(10.02%), days(6.26%), drink(6.27%), internet(2.23%), holiday(2.21%), cold(1.78%), drinking(1.65%), beer(1.95%), Monday(1.61%), cup(2.36%), wine(1.48%)
5	People	Related to people or interpersonal relationship	Love(19.15%), man(28.57%), waitress(4.50%), guy(6.66%), girl(6.19%), girls(2.63%), waiter(2.60%), guys(3.12%), dear(2.16%), date(4.61%), lady(1.63%), boy(4.54%), together(1.61%), couple(1.65%), woman(1.43%)

| Food | Happy time | Dining experience | Coffee time | People |

Figure 2. *Word clouds of five topics*

The topic of *food* described cuisine (e.g., "pizza", "taco"), dining types (e.g., "buffet", "breakfast") and restaurant names (e.g., "McDonald's", "KFC"). The top words included "eat", "ate", "menu", "food", "McDonald's", and "buffet". Particularly, "McDonald's" was the most discussed restaurant brand and "buffet" was the most widely mentioned dining type on Facebook messages. The theme of *happy time* described enjoyable nightlife (e.g., "pub", "bar"). The top words were

composed of "night", "pub", "great", "fun", "happy", "bar", and "tonight". Consumers were likely to share with others about their positive experiences in pubs and bars at night on Facebook. *Dining experience* covered the happenings at restaurants (e.g., "bill", "spending"). The top words were "final", "special", "service", "event", and "private". Besides service as one of the cores in the restaurant industry, the special and engaging dining context was addressed on Facebook messages. *Coffee time* referred to consumers' experience at coffee stores (e.g., "Starbucks", "coffee"). The top words were "Starbucks", "café", "week", "drink", and "coffee". Particularly, Starbucks was a star brand in coffee stores, which was mostly mentioned on Facebook. *People* depicted the types of both service employees and consumers at the restaurant context (e.g., "waitress", "waiter"). The top words were composed of "guy", "man", "love", "date", "girl", "boy", and "waitress". Specifically, by checking individual consumer reviews, it was found that "guy", "man", "girl", and "boy" referred to both companions and strangers met at the business. Some examples of reviews included "*just watched a drunk guy get arrested in the Waffle House*" and "*the boys I met at the restaurant were pretty cool*". The result was consistent with Pollack (2009), Brady and Cronin (2011), and Tang et al. (2020) which included both service people and other consumers as a social environment factor of restaurants. "Love" and "date" described the settings for the dining-out experience. Some examples of reviews were composed of "*well, I must say what a fabulous night out for 16th Marry Ceremony at Cy restaurant! Love you Adam you are just my fabulous guy*", and "*have a romantic dating at Kokk Estia restaurant. Wonderful memories!*".

Relationship between Facebook Status Update Themes and Gender

Gender showed a significant difference on the topic of *people* (Table 4). Females discussed more about *people* at the restaurant setting than males. The finding is consistent with Alzahrani (2016) that females share more about social relationships than males on social media.

Table 4. *t-test on gender difference in eating-out topics*

	Food	Happy time	Dining experience	Coffee time	People
t Stat	1.07	0.28	-0.99	1.3	2.37
p(T<=t) two ways	0.3	0.78	0.35	0.22	0.04*

Note: n=7, df=12, *p<0.05

Relationship between Facebook Status Update Themes and Age

Figure 3 demonstrates the relationship between the topics of Facebook status updates and age groups. First, people at 20 or younger showed the

least coffee consumption among all the age groups. Coffee consumption smoothly increases in the age groups of 21-60. The coffee consumption of the older people at the age of 61 or later decreases compared to those at 21-60, which may be explained by their more concerns about health (Butt & Sultan, 2011). Second, Facebook users mentioned the topic of people most at the age of 20 and younger. Social contacts with other people play a crucial role in brain development for adolescence's transformation to the mature (Cauce et al., 1994). It explained why social gatherings at restaurants were highly frequently shown on the teenagers' Facebook status updates.

Figure 3. *Relationship between Facebook status update themes and age*[*]
([*]The numbers of Facebook status updates in the five themes were standardized, which is shown on Y-axis.)

Third, *dining experience* was discussed most during 61-70. The age of 61-70 is the full retirement age for most countries. Senior people at this age range start to have freely disposable time and money after retirement, and they have fewer obstacles to eating well compared to even older people (Hellmich, 2014). Therefore, eating out makes seniors at 61-70 feel like an enjoyable mini-vacation (Menchin, 2000), which is worthy to share on Facebook. Fourth, *happy time* was portrayed on Facebook status updates most among senior people at 61-70. People at 61-70 mentally and psychologically cannot accept the lifestyle of aging people and are inclined to show off their energy and vigor on Facebook through engagement in

happy hours (Holladay, 2002). Last but not least, *food* was shown on Facebook status updates most in the age group of 51-60.

Facebook Status Updates Themes by both Gender and Age

Figure 4 illustrates the gender difference in each topic of Facebook status updates among seven age groups. As indicated in Table 4 aforementioned, except for *people*, no significant difference was found between the male and female groups among *food*, *happy time*, *dining experience*, and *coffee time*. For the theme of *people*, the two gender groups showed distinctions at four age stages. Examples of messages for males and females are "*took the girls to the park and had lunch at Applebee's. It's such a beautiful day!*" and "*It's my daddy's birthday!!! Olive Garden with my family and my handsome boyfriend soon!:) yay*". For the age groups of 41-50, 61-70, and 71 and above, females communicated more about *people* than males. However, males of 20 and below mentioned *people* more at the restaurant setting than females. A potential reason is that adolescent girls generally use Facebook to communicate preexisting social relationships, while boys more often address new social relationships (e.g., people date at restaurants) (Barker 2009).
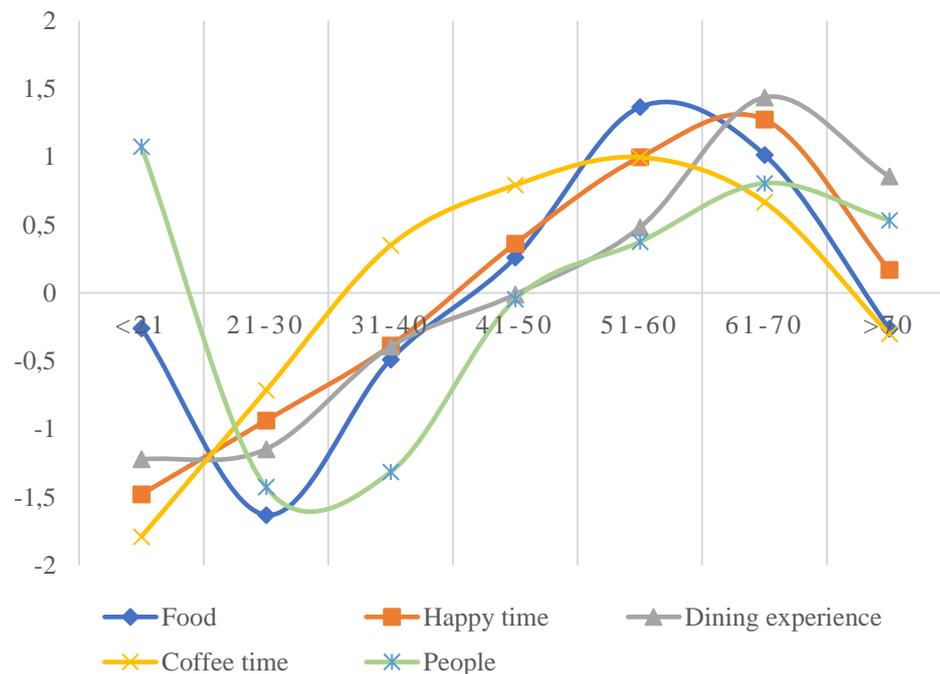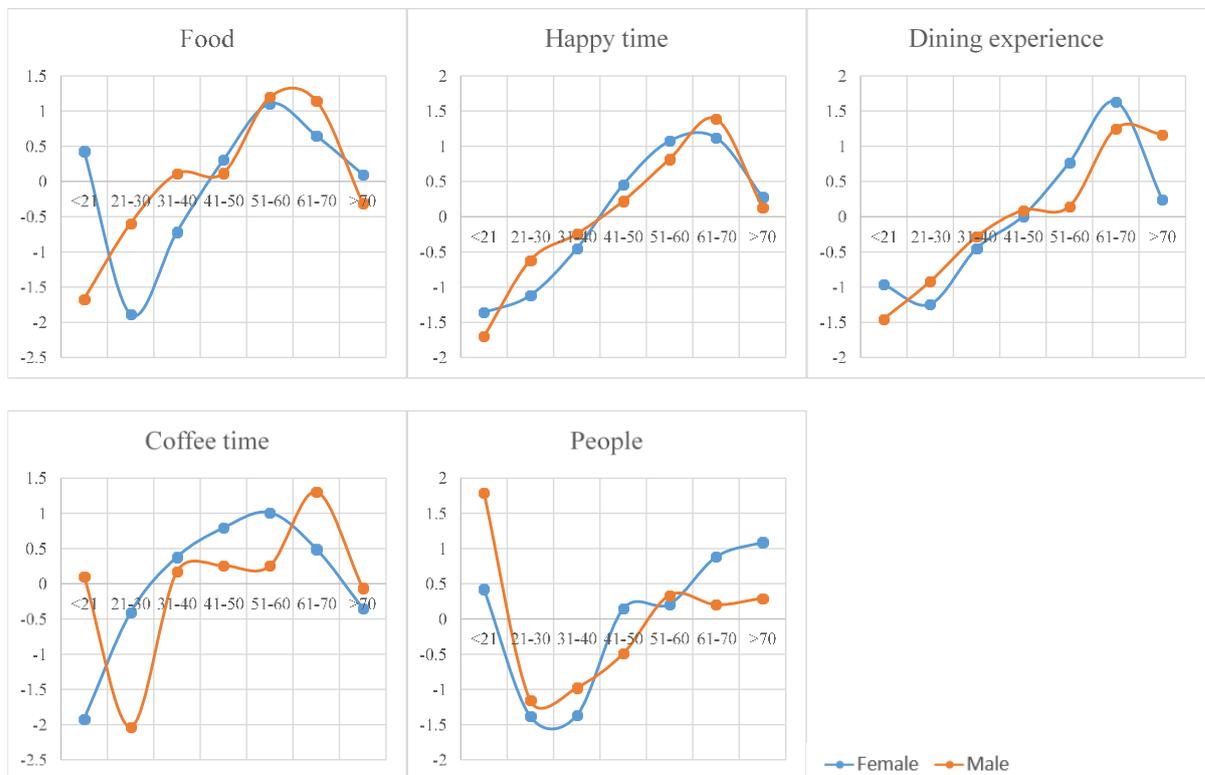

Figure 4. *Facebook status update themes by both gender and age**
(*The numbers of Facebook status updates in the five themes were standardized, which is shown on Y-axis.)

Emotional Dimensions among the Five Themes of Facebook Status Updates

Plutchik's (1994) framework is composed of four opposite emotional dimensions. The examples of messages for the pair of anger and fear are *"ridiculous service and no feedback not even a call from the store manager after so many phone calls. Domino's Pizza."* and *"There's a McDonald's two blocks away from ground zero that has killed more than two terrorists"*, respectively. The instances of messages for the pair of joy and sadness are *"Had a fun time at Starbucks! And today was the last Ask-Out-Friday"* and *"It's pretty sad when I feel too ill to go to the pub - and this is the third week in a row that I've missed out"*, respectively. The examples of Facebook status updates that conveying trust and distrust are *"Two weeks in a row... we have found simply AMAZING restaurants!!! Both places we clean, elegant, uniquely Choice! They even agreed to let us see the kitchens! wow! all hail the small business ppl!"* and *"I crave Taco Bell but after I eat it I realize it's so disgusting!"*, respectively. The instances of the messages for anticipation and surprise are composed of *"Having dinner at a well-reviewed Italian restaurant tonight. Hope it's as good as we anticipate! Panna cotta for dessert"* and *"What a surprise! The Café has such a rude waitress"*.

Figure 5. *Comparison of eight emotions in Facebook status updates themes*

Figure 5 demonstrates the strengths of the emotional dimensions among five themes of Facebook status updates. On each axle, the point close to the inner with a smaller number shows a wea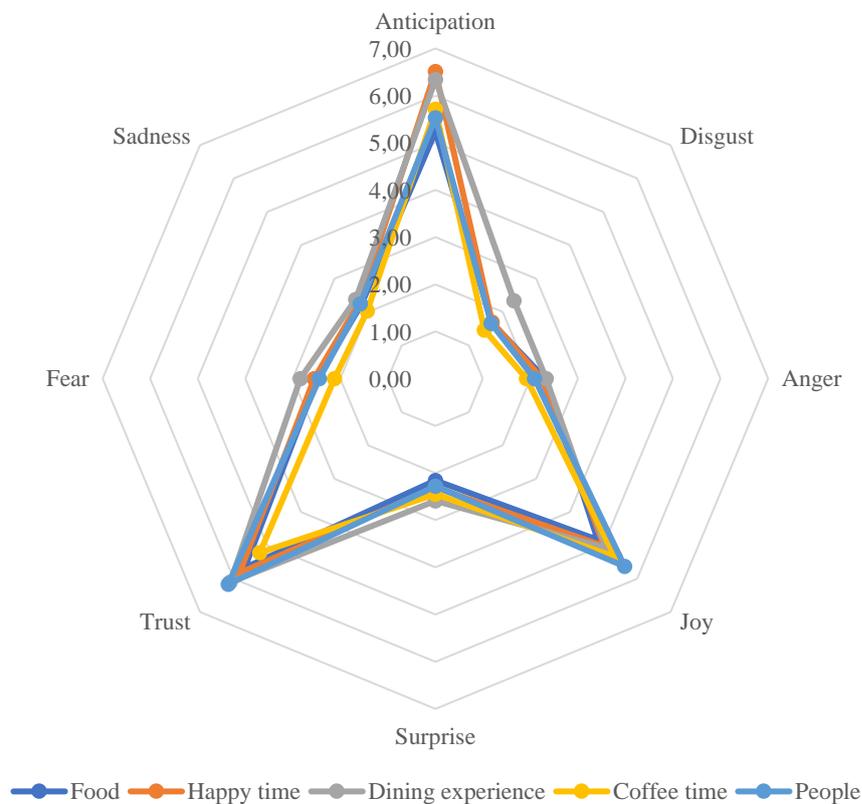ker extent of emotion; in contrast, the point far away from the inner with a larger number means a stronger extent of emotion. Except the pair of anger (range of 1.92-2.33 for the five themes of Facebook status updates) – fear (range of 2.12-2.84), the positive emotional dimension showed a much stronger extent than its negative counterpart, including joy (range of 4.83-5.63) – sadness (range of 2.03-2.37), trust (range of 5.22-6.16) – disgust (range of 1.46-2.34), and anticipation (range of 5.24-6.51) – surprise (range of 2.16-2.59). It is consistent with the findings in previous studies focusing on consumer review websites (e.g., Felbermayr & Nanopoulos, 2016; Wang et al., 2019).

Among the four negative emotional dimensions, the words relevant to the disgust dimension showed a bit stronger tone compared to those in the dimensions of sadness, fear, and surprise. The Facebook status updates on the disgust aspect are most relevant to food health (e.g., bugs in noodles), which is the "bottom line" of eating out experience (Yiannas, 2008). Thus, breaking through the "bottom line" makes consumers intolerable and triggers strong offensive feelings. Among the four positive dimensions, Facebook users were inclined to express their trustworthy and anticipative feelings at greater levels and communicated joyful sentiments at a gentle level but demonstrated anger at a weaker extent. Although "angry" is categorized as a positive dimension of Plutchik (1994)'s framework, it conveys the depressed and dissatisfied mood (Bougie et al., 2003) which is close to the negative dimension. Therefore, similar to the four negative dimensions, the "angry" tone was at a weak extent.

As a summary, a comparison of the findings generated from the current big data analysis with previous research has been demonstrated in Table 5. It can be discovered that the majority of past research was inclined to utilize business comment websites (like Yelp.com) to obtain information instead of individualized social media such as Facebook. Almost all previous studies did not focus on age diversity in the dinning-out settings in the hospitality and tourism industry, particularly among those studies with big data techniques. Only sporadic research efforts existed in other disciplines like nutrition (Butt & Sultan, 2011), communication (Holladay, 2002), and others. Although gender diversities were discovered in previous studies on restaurant consumer behavior, the majority of them employed regression for data analyses and research methods (e.g., Ma et al., 2011, 2014; Yildirim & Akalin-Baskaya, 2007). Consumer sentiment has been broadly explored via diverse text excavation approaches. Nevertheless, the

majority of past studies either utilized one-dimension sentiment scale or failed to deconstruct text information into topics (e.g., Luo et al., 2020; Wang et al., 2019).

Table 5. *The comparison of findings between current research and previous studies*

Research themes	The current research's findings	Previous studies' findings
Eating-out topics	coffee time	Kwon et al. (2022) excavated consumer-produced comments from Yelp.com. and obtained 14 topics (e.g., excellence in every way, love with food, mediocre taste, rude attitude, etc.).
	dining experience	Wen et al. (2020) explored consumer remarks on AllergyEats.com and acquired 40 topics (e.g., knowledgeable staff, customized orders, efforts of staff, menu options, fried foods, oil, communication, etc.).
	food	Huang (2017) discovered three primary topics, such as taste, restaurant (brand and aura) and opportunity of out-eating, and employee service via the excavation of hospitality review websites in Chinese and English.
	people	Luo et al. (2020) obtained five topics (atmosphere, foods & drinks, location, service, and value) via the analyzing comments from Yelp.
Eating-out topics & Age	coffee time	Butt and Sultan (2011) argued that the purchase of coffee among the senior citizens decreases in contrast to that among younger people.
	dining experience	Hellmich (2014) discovered that the elder generation has spare time and wealth. And it's more probable for these people to eat well in contrast to individuals of higher ages.
	happy time	Holladay (2002) argued that individuals at 61-70 are reluctant to embrace senior citizen lifestyle, but wishing to exhibit vitality via social media by enjoying lives.
Eating-out topics & Gender	dining experience	Yildirim and Akalin-Baskaya (2007) discovered that female consumers highlighted numerous aspects of restaurants' reputation, such as exquisite planning, roomy space, tidiness, tranquility, and peacefulness via MANOVA.
	food	Ma et al. (2011) argued that female consumers, in general, exhibited greater demands for flavor, appearance, and menu diversity, whereas male consumers highlighted the actual quantity of the food via SEM.
	people	Alzahrani (2016) stated that women communicate more on their social interaction in contrast to men on social media.
		Ma et al. (2014) revealed that when assessing service experiences, men are more target-driven whereas women are more social interaction-driven via SEM.
Eating-out topics & Emotion	dining experience	Luo and Tang (2019) utilized Plutchik's emotional wheel and revealed that consumers display emotions via the mining of Airbnb consumer comments.
		Wang et al. (2019) employed eight sentiments from Plutchik's emotional wheel via excavating Yelp comments, nevertheless, they failed to offer topics of comments.
		Luo et al. (2020) indicated that consumers expressed positive sentiment on food and drink by mining consumer reviews on Yelp.
	food	Calheiros et al. (2017) revealed that consumers exhibited favorable sentiment in the accommodation services.
	people	Luo et al. (2020) revealed that consumers generally displayed favorable sentiment towards staff service via the excavation of Yelp data.

CONCLUSION AND IMPLICATIONS

Conclusion

By taking advantage of big data analytics on Facebook status updates, the present study demonstrated the eating-out patterns and trends in the general population. We identified five primary themes relevant to eating out: *food*, *happy time*, *dining experience*, *coffee time*, and *people*. Males and females show a significant difference in the theme of *people*, specifically among four age groups (20 and below, 41-50, 61-70, 71 and above). The two most discussed topics of Facebook users, between the ages of 61-70, are *happy time* and *dining experience*. The two most discussed topics for the Facebook users at 51-60 are *coffee time* and *food*. However, *people* is the most discussed among the consumers at 20 and below. Except for the pair of anger – fear, the positive emotional dimension (joy, trust, and anticipation) showed a much stronger extent than its negative counterpart (sadness, disgust, and surprise).

Theoretical Implications

The present research has three primary theoretical contributions. First, as discussed in the Section 2.1., among the previous studies relevant to Facebook in the hospitality and tourism field, very limited ones from the perspective of receivers (i.e., only one in Table 1) focused on the restaurant setting. Facebook may cover even more wide-ranging and distinct topics than those included in traditional restaurant data sources such as interviews and surveys at service encounters. For example, Facebook messages cover many details, such as motivations for eating out, subtle emotional changes, and post-event memory. Thus, the literature stream about consumers' communications at the restaurant setting on Facebook needs more attention from scholars. The present study which investigates the large-scale Facebook messages significantly contributes to this literature stream. Furthermore, due to the nature of rich content on Facebook, the specific type of content (i.e., as discussed in section 3.1. about the literature streams on distinct purposes, engagement formats, usage status, message delivery media) should be put under microscope to examine the details (Moya & Jain, 2013; White, 2010). The present study particularly focused on textual (as a type of message delivery media) conversational (as a type of distinct purposes) comments (as a type of engagement formats).

The current study also contributes to the studies of emotions in the hospitality and tourism field. Previous studies have primarily focused on

intrapsychic emotion (such as a person's inner emotional feelings) within an individual consumer, which could be viewed as the application of emotion-as-feedback system theory discussed in Section 2.3. For instance, numerous attempts have assessed how a consumer's affection during the service affects the mentality on certain commodity and re-patronage motivation (e.g., Kim & Tang, 2016; Lam & Chen, 2012). Nevertheless, limited attention from previous research has been given to interpersonal role of a consumer's emotion (i.e., affective interactions between peoples) as explained in the emotional contagion theory (see Section 2.3.). With the emergence of social media, the emotional function in people's interactions has been enhanced. The emotional hints within a group on the Internet are able to arouse sentiment-related responses, which eventually affects people's mentality towards the information supplier. In this research stream, previous studies have primarily given attention to review websites rather than Facebook. The present study fills the gap.

Last but more importantly, the present study is the first adoption of a multi-dimensional scale of emotions instead of dichotomy (i.e., positive vs. negative) on Facebook in hospitality and tourism field. In Plutchik's (1994) emotional framework, positive sentiment is composed of joy, anticipation, trust, and anger, while negative sentiment covers fear, surprise, disgust, and sadness. The results of the present research indicate that the four perspectives belonging to either positive or negative sentiment are present at different extents on Facebook status updates. It supports that the single-dimensional scale of emotion widely adopted in previous hospitality and tourism research overlooked emotion complication, and thus provided an ambiguous argument about consumers' perceptions and attitudes.

Furthermore, although the current research only evaluated eight affective aspects, the fundamental mechanism can be used to comprehend the influence of an even broader assembly of emotional features (e.g., Arnold (1960)'s 11-aspect emotion framework and Cowen and Keltner (2017)'s emotion framework with 27 dimensions) conveyed on Facebook regarding eating out. Moreover, although the present research evaluated Facebook status updates, the fundamental logic is applicable to other social media venues (e.g., twitter, google+), which could be a promising direction for future studies. From an even more far-reaching viewpoint, our efforts are expected to supplement the hospitality and tourism literature on consumer emotions.

Practical Implications

The present study suggests an alternative tool for government offices to conduct a statewide or even countrywide investigation of consumers' eating-out behaviors. To the knowledge of the present authors, even the leading government offices and foodservice organizations (e.g., United States Department of Agriculture (USDA)) have not tracked the general public's experience and attitude in millions of restaurants. A good example of a countrywide project related to dining is food swamps map (US Department of Agriculture, 2019) conducted by USDA, which marked the areas with high or low density of establishments selling high-calorie fast food or healthier food options. The adoption of large-scale Facebook messages could further enrich the data of food swamps map alike. For example, with the same approach used in the present study, USDA could partner with Facebook to timely collect large-scale messages which convey the general public's perceptions of restaurants and demonstrate the summarized results (i.e., topics and emotions) by geographic locations and even by restaurant brands. It could provide richer information for the government offices to understand the general public's perceptions and experiences of eating-out, and accordingly provide guidance for healthy eating and formulate policies and regulations for the restaurant industry. Facebook effectively decreases costs and generates real-time statistics about the general public's eating-out experience, suggesting a completely innovative area of large-scale restaurant research.

The findings provide industry practitioners opportunities for "taking the pulse" of specific dining out topics of interest among the general public. For example, in the theme of *food*, the top words are composed of "McDonald's", "KFC", "Wendy", "buffet", "taco", "pizza", "burger", and "chicken." It shows that fast-food restaurants are popular. And high-calorie food items, more detailly, popular food categories (e.g., burger, pizza) and main ingredients (e.g., chicken) on menus, are still widely consumed among the general public. Although the government offices (e.g., USDA) and restaurateurs have been committed to promote healthy dining-out, it seems a long way to go before significantly changing the general public's eating-out habits and trends.

The keywords identified on Facebook status updates in the present study expand industry practitioners' understanding of the dining-out themes. For example, although the human factor was included into restaurant attributes identified on review websites or consumer surveys in previous studies (e.g., Huang, 2017), staff interaction was the focus.

However, according to our results, the presence of others as a social environment factor has a significant impact on a consumer's perception of dining-out experience, including both his/her accompaniers and strangers at a restaurant. The *people* factor plays a different role for the two genders in distinct age ranges. Thus, in the promotional materials (e.g., commercials) targeting a specific consumer group, the human variable, including both interactions with employees and presence of other consumers in the social environment, should be weighted at different extents. For instance, males care people more than females in the age group of 20 and below. Thus, for promoting an event targeting male teenagers (e.g., high school boys' dinner party) at a restaurant, the energetic and joyful crowd of the youth could be included in the advertisements. Females at 61 and above discussed people more than male peers. Thus, for promoting an occasion targeting the females at 61 and above (e.g., dinner at a senior women conference) at a restaurant, the sociable environment should be addressed in advertising and other marketing venues, including meeting new friends, getting social support, interacting with employees, and others.

Furthermore, the assessment of individual emotional aspects on Facebook status updates indicate that people are more likely to convey positive opinions, ideas, and experience relevant to eating out rather than negative ones. Just because many former consumers are reluctant to express negative emotions toward a business no matter within a friend network or not, a restaurant with inferior quality could keep attracting other first-time consumers. Foodservice relevant organizations (e.g., National Restaurant Association) and social media should encourage the general public to express any of their emotions toward restaurant experience, no matter positive or negative, which contributes to the monitor of industry performance. To take the idea further, future studies could do the emotion assessment on Facebook status updates for individual restaurants (i.e., use the restaurant name as keyword for data collection), which enables industry practitioners to instantly recognize "whether the consumers are happy with, dissatisfied with, losing trust in, or angry with their product or a particular feature of the product" (Mohammad & Turney, 2013, p. 4). The evaluation of emotion-related data from Facebook communications could provide restaurants with a kind of "sentiment-awareness" to distinguish emotional aspects, explore the causes, and develop service remedy plans.

LIMITATIONS AND FUTURE RESEARCH

This study has several limitations. First, the current study only considers Facebook as the investigation site and implications of the study may be

limited due to the validity of the data. Although Facebook is one of the world's most trafficked sites, users on other social media such as Twitter or Instagram may post different content on the sites. Therefore, future studies could modify and validate the model for other social media sites and provide more applicable strategies. Second, data bias may exist considering that users who post Facebook status updates may not be representative of the entire population. Specifically, a subgroup of users (e.g., outgoing people) may be more or less inclined to post information relevant to eating out. Controlling bias is a hallmark of traditional methods like surveys and experiments, yet biases on social media are little comprehended, which should be considered in future hospitality and tourism studies. Third, the data collected from Facebook status updates are composed of either description of an actual dining-out experience or just a mention of the perception toward a restaurant. Such a crowd-sourced effort makes us only detect attitudes and behaviors of the public regarding eating out. For more precise research tasks (e.g., consumption experience toward fast-food restaurants), the exact nature of the restaurant-relevant words should be determined in future work.

Fourth, the keywords used to screen Facebook status updates covered diverse restaurant settings (e.g., fast food restaurants, coffee shops). The scope of restaurants may be disputed. A more specific context is preferred in future research upon particular study purposes. Fifth, we used the textual data cleaning procedure suggested by Miner et al. (2012), which excluded punctuations, apostrophes, slangs lookup, intentional misspellings (e.g., goooood day). However, considering the multimodality feature of social media communication, it would be an interesting venue to further and deeper investigate consumers' emotions through "decoding" the emoji and emoticons on Facebook. While, on the other hand, if there would be any chance of analyzing emoji's motions taking advantage of technology development in future, it also could be a promising research subject for social media and netnographic studies. Sixth, a challenge that remains in large-scale textual analysis is semantic ambiguity. For example, a message of "McDonald" is ambiguous, but more information in the message like "*I enjoyed the hamburger at McDonald's near my house*" shows a common cause. Furthermore, the multilingual and informal nature of text make such a task even tricky, we removed the non-English messages and cross-checked individual Facebook status updates to eliminate vagueness. However, for an even larger-scale dataset and multilingual text analysis in future research, it is imperative to develop more precise information

extracting techniques with computational algorithms or robustness check procedures.

Seventh, we did not differentiate Facebook status updates by geographic information of participants. Future studies could further precisely examine the eating-out patterns in a specific nation or region. Eighth, we did not disaggregate the Facebook status updates by years. Future studies are advised to compare the changes of topics and emotions across multiple years. Last but not least, monitoring the prevalence of a phenomenon on Facebook allows researchers to correlate and compare that phenomenon with other data compiled via distinct approaches, which is beyond the scope of the present study. For example, the content and sentiment of eating-out habits and patterns shown on an aggregation of Facebook messages could be linked to the census tracts of obesity (Centers for Disease Control and Prevention, 2016) or food deserts (US Department of Agriculture, 2016).

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