An investigation on online reviews in sharing economy driven hospitality platforms: A viewpoint of trust

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ABSTRACT

Members on both sides of the sharing economy transaction must trust each other to act in good faith. This study empirically investigates the effect of online review contents on potential guests' trust perceptions in AirBnB.com. Six thematic characteristics of accommodation experiences were found as salient themes from online review contents, and corresponding relationships regarding trust perceptions were investigated: Through content analysis and theme extraction in python, our results show the salient cognitive themes are room aesthetics, host attributes, location, repurchase intention, overall evaluation and room description. Trust perceptions were both evaluated by individual coders and predicted by a convolutional neural network. Results suggest salient themes determine trust perception: Host attributes positively lead to benevolence, location and room aesthetics positively affect ability, room description positively affects integrity, and location and host attributes determine overall trust perception.

1. Introduction

Recently, a new type of online platform has emerged as the tourism industry has inevitably been influenced by diffusion of the sharing economy (Zervas, Proserpio, & Byers, 2017). New entrants offering innovative services are challenging incumbent service providers in the tourism industry. Due to the rapid development of information and communication technologies, innovative business models are dramatically transforming the lodging industry in particular (Cheng, Fu, & de Vreede, 2018; Dickinger, Lalicic, & Mazanec, 2017). This shift is changing consumer trends and behaviors, forcing traditional hotels to generate business through online travel agencies (OTAs) or run their business platforms exclusively online. Consequently, travelers are nowadays accustomed to reserving hotel rooms online. As an emerging business model, the sharing economy is puzzling the landscape of hospitality and tourism (Bilgihan & Nejad, 2015). As a result, many traditional hotels are concerned with the growing popularity of peer to peer (P2P) rentals.

Sharing economy platforms encourage participants to be receptive to encounters with strangers (Richardson, 2015), therefore trust is vital to the success of the sharing economy. Within the sharing economy-based platforms, guests' perceived trust is relatively low due to the lack of traditional brand marketing strategies (Bilgihan, 2016). However, research shows that, along with price and convenience, trust plays an essential role in sharing economy platforms as it creates a bond between unknown guests and hosts (Ert, Fleischer, & Magen, 2016). Without trust, P2P transactions are more vulnerable to risks (Ert et al., 2016). For example, prior to an AirBnB stay, the guest may worry about the quality of the host (e.g. clean towels in the bathroom), the host also may worry about the guest (e.g. the guest may be a criminal). A guest can stay in units without the permission of the landlord or neighboring condo owners or renters. Similarly, the host may fail to deliver its promises. The guest may damage the property or disturb neighbors. In other words, the P2P nature of the sharing economy poses many risks.

Trading with strangers in P2P marketplaces involves asymmetric information and economic risks, and consequently, these businesses have developed reputation mechanisms to encourage trust among traders (Resnick & Zeckhauser, 2002). The most common reputation mechanism is the presentation of online reviews by other users. Positive online reviews from other users significantly influence the online reputation of the host (Banerjee, Bhattacharyya, & Bose, 2017). Guests usually read feedback from past guests to help find the right fit for

them. Past guests rate their stay on several quality dimensions, like cleanliness and accuracy. Furthermore, they can write detailed reviews with feedback about their experiences. Such online reviews play an increasingly important role in customer's decision-making processes in choosing suitable hotels (Litvin, Goldsmith, & Pan, 2008; Leung, Xue, & Bai, 2015; Kim, Kim, & Heo, 2016; Kucukusta, Law, Besbes, & Legohérel, 2015; Kwok & Xie, 2016; Kwok, Xie, & Richards, 2017) and facilitates trust based on other guests' past experiences (Cheung & Lee, 2012; Fan & Lederman, 2018; Xie & Chen, 2014; Zhao, Wang, Guo, & Law, 2015).

Guests and potential guests of the sharing economy need to place a significant amount of trust in both the person and the platform with which they are dealing. The consequences of guests' or hosts' opportunism may be serious, for instance damage to goods or endangered personal safety. Therefore, trust is an important factor in overcoming uncertainty and mitigating risk in the sharing economy accommodations. However, there is no in-depth research that explains how trust is developed in this context (ter Huurne, Ronteltap, Corten, & Buskens, 2017). Against this backdrop, the current research examines the effect of online review contents on potential guests' trust perceptions.

Previous studies have examined several facets of online reviews on related platforms, such as the impact of ratings on sales (Awad & Ragowsky, 2008), the helpfulness of online reviews (Cezar & Ögüt, 2016; Lee, Law, & Murphy, 2011; Yin, Bond, & Zhang, 2014) and consumer perceptions of the length of online reviews (Chevalier & Mayzlin, 2006). These studies adopted common experiments, surveys and econometric analysis (Ayeh, Au, & Law, 2013; Banerjee et al., 2017; Ye, Law, Gu, & Chen, 2011; Zhao et al., 2015), even though empirical analyses were utilized, few studies concentrated on the content of the reviews in tourism-related analysis (Filieri & McLeay, 2014; Yacouel & Fleischer, 2012). Advanced deep learning approach and content analysis may contribute to a deeper understanding of online reviews through advanced analysis and qualitative in-depth investigations (Hu, Koh, & Reddy, 2014; Wu, Shen, Li, & Deng, 2017). The measurement of online review leads to a better understanding of the review contents and brings a number of benefits to the business operators in transaction management (Ludwig et al., 2013). Therefore, this study sets out to find the salient themes from online review contents:

> **RQ1**: What are the salient thematic characteristics of online review contents in sharing economy-based hospitality platforms?

The source and characteristics of information influence individuals trust perception (Banerjee et al., 2017). For example, reviewer characteristics have an effect on the perceived helpfulness of the online review, and thus influence readers' trust perception (Awad & Ragowsky, 2008; Baek, Ahn, & Choi, 2012; Fan & Lederman, 2018; Wu et al., 2017). Other studies focused on the effect of the framing of reviews and valence of reviews on trust perception, and found that early negative information has a high influence on trust variation, and potential consumers favor easy to read information from online reviews (Sparks & Browning, 2011; Weber, Bradley, & Sparks, 2017). However, very few studies have examined trust and online review in terms of online review contents from theme characteristic perspective. Understanding the relationships between salient review themes and trust perception is important in that it provides detailed cues on the perceived importance of the themes from online reviews (Awad & Ragowsky, 2008), and helps practitioners to better design online review customization to foster trust perception (Banerjee et al., 2017). Therefore, our study aims to address this research gap and explore the relationships between salient themes and perceived trust from online reviews. Thus, the second research question is:

> **RQ2**: Which salient thematic characteristics determine guests' perceived trust?

This paper builds upon previous online review literature in three main respects. First, this is one of the first papers to investigate the relationships between trust perception and online review contents from the salient theme perspective (Banerjee et al., 2017). Second, there has been a dearth of in-depth identification and validation of the review content themes. This stream of research helps build the framework on the overall understanding on online review contents from signaling mechanisms aspects of online reviews(Lee et al., 2011; Zhao et al., 2015). Third, the identified relationships of trust and salient themes depict causal cues, which also have a practical value that facilitates the improvement of online review exhibition for better trust perception.

2. Literature review

2.1. The sharing economy

The sharing economy refers to a socio-economic P2P sharing ecosystem that enables participants to access goods and services using technology (Matzler, Veider, & Kathan, 2014). It embraces the shared creation, production, distribution, trade and consumption of goods and services by different people and organizations. The foremost idea behind it is that sharing products is often more efficient than owning them individually (Benjaafar, Kong, Li, & Courcoubetis, 2018; Eckhardt & Bardhi, 2015). Participants of the sharing economy rely on collaborative consumption by sharing access to products or services, such as a bedroom, office space, or a car seat, rather than emphasizing individual ownership and coordinating those experiences entirely online.

Sharing economy companies such as AirBnB, Uber, RelayRides and SnapGoods do not maintain inventory, rather they match owners with renters or hosts with guests. Such P2P rental models offer extra income to owners/service providers and cheaper, more convenient options for borrowers. Occasional renting is generally more affordable than buying or renting from traditional providers like hotels or car rental firms. This phenomenon has disrupted mature service industries like lodging and transportation by providing consumers with convenient and cost-efficient access to resources without the financial, emotional, or social burdens of ownership (Eckhardt & Bardhi, 2015). Compared to traditional online hospitality websites, sharing economy-based platforms emphasize personalized experiences. Unique hosts that serve guests, rather than uniformed employees that follow a standardized process, is one example of such personalized experiences. Overall, the unique features of a sharing economy provide chances for parties to get in touch, make new friends and build social interactions (Zervas, Proserpio, & Byers, 2015).

The Internet makes it cheaper and easier than ever to aggregate supply and demand. While estimates for the current size of the nascent market vary, PricewaterhouseCoopers estimates that five main sectors of the sharing economy could represent $335 billion in revenue worldwide by 2025, but social and economic implications of the sharing economy still need to be investigated. One important social construct that needs to be addressed in sharing economy is trust.

2.2. Trust

The continued growth of the sharing economy, as well as decreasing barriers among peers, greatly depends on trust (Ert et al., 2016). Results from an online survey suggest that trust indicators enable online P2P transactions (Pick, 2012). The broader objective of trust is to generate positive impressions, ensuring peace of mind in a provider's reliability, and a sense of security during use of services or transactions (Wirtz & Lwin, 2009). Trust is considered a principle determinant in choosing collaborative consumption options (Möhlmann, 2015). Oftentimes, people will not purchase travel products and services if they do not trust the service provider (Bilgihan, 2016; Kandampully, Zhang, & Bilgihan, 2015; Li & Chang, 2016).

In the presence of uncertainty, trust is a social concept that refers to

the willingness of a party to be vulnerable to the actions of another party based on predictable expectations and behaviors (Mayer, Davis, & Schoorman, 1995), and in the context of this study the interactions among various parties through online electronic media (Shankar, Urban & Sultan, 2002). In electronic transactions, trust refers to a consumer's willingness to engage in a transaction with the seller (Kim, Ferrin, & Rao, 2008). The difference between conventional offline and online trust is the technological assurances and human interactions of online transactions plus new business models triggered by information technology (Cheng et al., 2018).

In sharing economy platforms, facilitating trust among parties is even more critical to business operations than it was in earlier types of P2P platforms (Ert et al., 2016). The ability to build trust between strangers has become an essential part of determining the success of a sharing economy-based platform. In sharing economy platforms both parties show some kind of vulnerability to the other party. Reviews posted for both parties help to reduce uncertainty and risks. Online reviews posted by the past consumers are critical sources of online trust that signal information cues to the potential consumers (Sparks & Browning, 2011; Xu, 2018). Online trust is widely investigated in various disciplines, including psychology, consumer research, and marketing literature (Awad & Ragowsky, 2008; Fan & Lederman, 2018; Kim & Peterson, 2017; Liu et al., 2015). Due to information asymmetry, online trust has been identified as a crucial signal to enable online transactions (Bilgihan, 2016; Chiu, Hsu, Lai, & Chang, 2012). Trust in online communities is a precondition for mutual interactions (Cheng, Fu, & Druckenmiller, 2016; Fan & Lederman, 2018; Jarvenpaa, Knoll, & Leidner, 1998). A plethora of studies argued that lack of trust hinders individuals' engagement in P2P interactions (Kim, Ferrin, & Rao, 2009; Midha, 2012). Research shows that trust leads to active participation (Khansa, Ma, Liginlal, & Kim, 2015), increased purchase intention (Chiu et al., 2012; Hajli, Sims, Zadeh, & Richard, 2017), transformational relationships (Zhu, Newman, Miao, & Hooke, 2013), and customer retention (Han & Hyun, 2015) in customer to customer online communities. In electronic hospitality sectors, consumer trust was considered as a component of service processes (http://www.sciencedirect.com/science/article/pii/S1447677014000023, Lovell, 2009; Wang, Law, Hung, & Guillet, 2014).

Researchers have identified three dimensions of trust in the initial trust-building period: cognition-based trust, personality-based trust and institutional-based trust (Gefen, Karahanna, & Straub, 2003; Kim, Xu, & Koh, 2004). Personality-based trust is independent of the context and is a general tendency to trust or distrust. This form of trust becomes less important as the interaction proceeds (McKnight, Cummings, & Chervany, 1998). Institutional-based trust refers to situational normality and structural assurances, which are also related to system quality and privacy concerns (Pavlou & Gefen, 2004). For instance, in sharing economy driven hospitality management, institution-based trust is guaranteed through website regulations, such as certification verification. Because this study focuses only on online reviews found on a hospitality website, institution-based trust is not within the scope of our research. Likewise, personality-based trust involves people's inherent propensity to trust and will not be investigated. Cognition-based trust refers to the second-hand experience that facilitates reputation mechanism; inherent stereotypes are also related to cognition-based trust (Gefen et al., 2003). With cognition-based trust, cognitive cues such as the first impression determine the degree of belief in the future behavior of another party. Individuals develop a sense of trust by observing and responding to cues of the trustees. In this sense, the investigation on online review is within the scope of cognition-based trust. In the words of AirBnB, 'trust is what makes it work.' AirBnB creates multiple levels of online trust for consumers by having them construct an online profile with a 'verified ID,' which includes confirmation of social networks and providing official identification

(AirBnB, 2018). Additionally, an accumulation of a guest's reviews are visible to other guests and hosts (Richardson, 2015). Direct face-to-face interactions with consumers entail more risks than traditional e-commerce (e.g., asset abuse, physical violence) so a necessary condition for all AirBnB transactions is trust (Ert et al., 2016). Essentially, community sharing of reviews establishes trust (Sparks & Browning, 2011).

2.3. Online reviews in hospitality platforms

With the development of information technology, the hospitality industry is undergoing transformation, such as gamification funware in trip planning (Sigala, 2015), smartphone usage in travel reservations (Verma, Stock, & McCarthy, 2012), and knowledge management (Okumus, 2013). However, one of the heavily investigated areas still lies in online review issues (Viglia et al., 2016). A lack of trust is believed to be a major barrier for people in engaging with online communities (Midha, 2012). Information acquisition is one of the first steps in the travel decision-making process to reduce perceived risk and promote trust formation (Nusair, Bilgihan, Okumus, & Cobanoglu, 2013). The key enabler of sharing economy transactions is the development of a strong online reputation and signaling mechanisms. Online reviews enable potential consumers to decide whether an establishment can be trusted, and also serve to reduce risk and uncertainty (Sparks, So, & Bradley, 2016; Weber et al., 2017). Online reviews tend to reduce uncertainty, so consumers often rely on the experiences of others to form purchase decisions (Fang, Ye, Kucukusta, & Law, 2016; Nusair et al., 2013).

Consumers place a greater importance on peer reviews rather than official descriptions of products or services (Bilgihan, Barreda, Okumus, & Nusair, 2016; Cezar & Ögüt, 2016; Xu, 2018). Positive reviews develop a better perception toward sellers, while negative reviews lead to distrust from the perspective of consumers (Lee, Park, & Han, 2008). Positive reviews lead to positive expectations of the product or service. This confidence and trust often leads to intended purchases (Kim et al., 2009) and contribute to the improvement of sales revenues (Hua, 2016; Yin et al., 2014).

Some studies argue that online reviews have a beneficial role in product marketing (Awad & Ragowsky, 2008; Baek et al., 2012; Sahoo, Dellarocas, & Srinivasan, 2018; Sparks et al., 2016) and that intangible experienced-based goods especially depend on online reviews (Furner & Zinko, 2017). Other studies focused on the usefulness and helpfulness of online reviews (Baek et al., 2012; Yin et al., 2014) and whether the valuable reviews helped to ensure reservations (Sparks & Browning, 2011). Lastly, customers' perception of online reviews was also studied (Sparks et al., 2016) and customer preferences prediction was conducted from the customers' perception perspectives (Fan, Che, & Chen, 2017; Geetha, Singha, & Sinha, 2017; Geetha et al., 2017, 2017; Xu, 2018).

Existing studies have adopted various techniques in terms of the measurement of online review contents to understand potential customers' cognitive perceptions from online reviews. For example, a large number of studies focused on linguistic style of the reviews (Geetha et al., 2017; Guo, Barnes, & Jia, 2017; Ludwig et al., 2013) using data mining techniques, such as latent dirichlet analysis (Guo et al., 2017) for topic modeling to extract meaning from online reviews. Other studies used deep learning techniques, such as neural network analysis to understand the relationship between tourism performance and online reviews (Phillips, Zigan, Silva, & Schegg, 2015), and the prediction of tourism demand (Bloom, 2005). Collectively, these studies outline the critical role of online reviews in the hospitality industry and highlight the importance of advanced technologies on the analysis of online reviews. However, very few studies investigated the cognitive perspective of trust issues from online reviews, which is important for the understanding of sharing economy driven digital businesses.

3. Hypothesis development

Experience goods, such as hospitality services, require word of mouth information to get to know product characteristics prior to consumption (Gavilan, Avello, & Martinez-Navarro, 2018). An online review is a form of information sharing that affords the dissemination of travel experiences (Guo et al., 2017; Munar & Jacobsen, 2014). In short rental platforms, specifically, accommodation experience constitutes the major content of online reviews for subjective evaluation after the stay (Munar & Jacobsen, 2014).

The quality of accommodation experience involves product and service quality (Han & Hyun, 2015; Kahn, Strong, & Wang, 2002; Ye, Li, Wang, & Law, 2014). Service quality refers to the measure of how well the service delivered by the service providers in the context of hospitality management (Saleh & Ryan, 1991; Ye et al., 2014). Amateur hosts provide services through the sharing of idle accommodations in sharing economy driven living experiences. The hosts allow access to their own vacant rooms temporarily in exchange for compensation, and there are no uniformed rules to regulate service in sharing economy-based platforms (Tanford, Raab, & Kim, 2012). Instead, hosts' personal characteristics and openness motivate users to experience their unique accommodations. The person(s) providing the service (e.g. host of the overnight stay) is a key part of the sharing economy experience. Although the nature of a guest's experiences with services and living environments may not be easily quantified in the hospitality industry (Filieri & McLeay, 2014), living experiences are often vividly characterized through online feedback. The social interactions between the host and the guest help define the experience, therefore hosts' attributes and the social interactions among hosts and guests are important in ensuring the delivery of high-quality services worth remembering (Ert et al., 2016).

Product quality refers to the performance of the core tangible product relative to its value, including location attributes, furniture styles, and room aesthetics (Ghose, Ipeirotis, & Li, 2012; Han & Hyun, 2015). When designing ranking system for hotels, location-based characteristics, for example, include the number of external amenities, presence near a beach, presence near public transportation, presence near a highway, and presence near a downtown area are important characteristics that influence the desirability of a hotel (Ghose et al., 2012). While room aesthetics refer to the quality of the room itself, it is also an overall evaluation of comfort, such as smell, room size, scenery and cleanliness (Alfakhri, Harness, Nicholson, & Harness, 2018; Callan & Kyndt, 2001). Additionally, the evaluation of a room in an online review also includes the accuracy of room descriptions on the website (Millar & Baloglu, 2011). Potential guests prefer objective information and seek confirmation from the third party, such as user-generated online reviews, to check the authenticity of the descriptions by the hosts (Ghose et al., 2012; Yang, Hlee, Lee, & Koo, 2017). Therefore, the accuracy of room description is also an important part of accommodation experiences shared by prior guests.

Online reviews help strengthen or weaken the level of trust towards a host (Chan & Ngai, 2011; Herrero, San Martín, & Hernández, 2015; Hua, 2016). It is usually more reliable than standard information, such as photos, identification certifications, and security assurances provided by the platform itself. Online review leads to an increased level of trust perception through the sharing of prior experiences on which potential guests could base their belief of accommodation quality (Sparks & Browning, 2011). One of the basic trust building tenets is the positive information disclosure from online review to reduce the risks involved in an unfamiliar product or service (Kim et al., 2008). Therefore, we propose that:

Hypothesis 1. Accommodation experiences shared through online reviews positively determine the overall trust perception from potential guests.

Trust is one party's willingness to be vulnerable to another party based on the belief that the latter party is competent, open, concerned, and reliable (Mishra, 1996). Prior research has identified various trust dimensions. The most frequently addressed dimension is comprised of benevolence, integrity and ability (Mayer et al., 1995).

Benevolence connotes the altruistic attachment that one party wants to do good to the other party (Jarvenpaa et al., 1998), especially when a party feels caring from the other party (Mayer et al., 1995). The level of benevolence perceived by the potential guests reflects the quality of service providers (Vázquez-Casielles et al., 2010). Since service quality is a dimension of accommodation experience, we propose:

Hypothesis 2. Accommodation experiences shared through online reviews positively determine the benevolence perception from potential guests.

Integrity refers to the adherence and acceptability of ethical principles and moral among two parties (Mayer et al., 1995). In other words, integrity relates to honesty and promise keeping (McKnight, Choudhury, & Kacmar, 2002). Online reviews provide information on individuals' objective comparison between the described contents and the actual service and product quality. Inconsistency reveals a low level of honesty and promise keeping. Therefore, we propose:

Hypothesis 3. Accommodation experiences shared through online reviews positively determine the integrity perception from potential guests.

Ability is one's perceived competence and skills on the other party. One party has the capability to do what the other party needs (Mayer et al., 1995; McKnight et al., 2002). The attributes of accommodation experiences, including location, room aesthetics, and host attributes, reflect the ability of the house listings and the hosts to serve future guests in the context of sharing economy driven hospitality platforms. Therefore, we propose:

Hypothesis 4. Accommodation experiences shared through online reviews positively determine the ability perception from potential guests.

4. Methodology

4.1. Overview of AirBnB.com

AirBnB.com is a leading reservation platform where travelers experience unique accommodations from local hosts. AirBnB started with three air mattresses in a San Francisco apartment offered by two recent university graduates using a simple website to advertise their apartment as an 'AirBed & Breakfast' (Guttentag, 2015). Since then, AirBnB has grown rapidly. Without owning a single room for rent, it has served over 30 million guests and has been valued at about $24 billion, placing it ahead of Marriott hotels and rivals such as Expedia and Priceline (Winkler & MacMillan, 2015). AirBnB.com connects people to unique travel experiences, at any price point, in more than 65,000 cities and 190 countries, with 2 million guests on any given night (AirBnB, 2018). The concept of a sharing economy has been remarkable for online hospitality services. The industry landscape was once dominated by traditional hotels but is rapidly transforming due to platforms like AirBnB.com (Zervas et al., 2015).

We browsed AirBnB.com and found that nearly 96% of user-generated ratings are either 4.5 or 5 stars (5-star being the maximum, 1-star being the lowest), forming a J-shaped distribution (Hu, Zhang, & Pavlou, 2009) consistent with a previous study by Zervas et al. (2015). Moreover, a large number of hosts regularly conducted identity authentication, from ID verification to social media accounts as well as email address and phone number validations. These findings suggest that the platform itself has proposed several solutions and regulations to improve institutional trust. Therefore, the user-generated online reviews are reliable metrics of guests' trust, and the institutional trust of
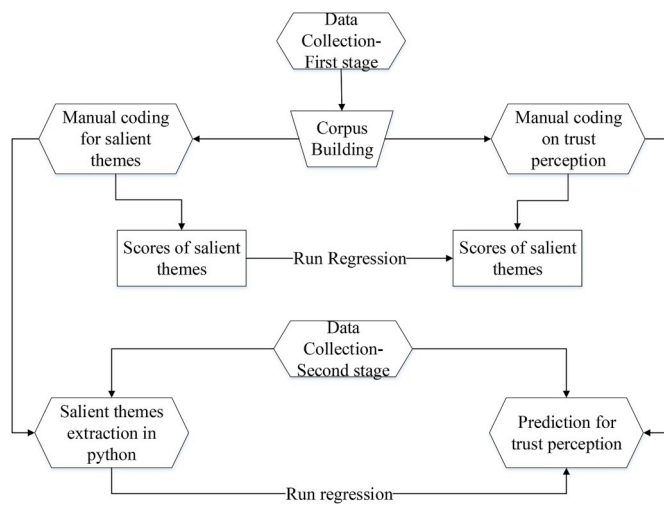
Fig. 1. Research framework.

the platforms is well guaranteed.

In order to better understand trust perception through online reviews on AirBnB.com, our research framework, as portrayed in Fig. 1 below, is comprised of two parts. The first is data collection and the initial coding for corpus-building to get the manual coding results for salient themes and trust perception. The second involves the extraction of salient themes and prediction of trust perception on big data. We then further investigate the relationships among salient themes and trust perception based on the corresponding scores.

4.2. Data collection-first stage

There are over 2 million listings posted on the AirBnB website (AirBnB, 2018). A thorough investigation of all listings required computer-assisted analysis, but the accuracy of the results may still be influenced by the algorithms. We focused on listings within New York City, which serves over 50 million foreign and domestic tourists each year, to increase the generalizability due to the cosmopolitan nature of both its hosts and guests. As one of the largest cities in the world, the hospitality industry in this city has developed quickly. With a large amount of available short-term rentals in AirBnB.com, the housing resources in New York City are highly diversified. We also focused on the positive reviews rated over 4.5 and hosts who have been named "superhosts." Superhosts provide listings that inspire enthusiastic reviews, complete at least 10 trips in their listings in a year, and have high response rates. In order to be a superhost, at least 80% of their reviews must be 5 stars. Since we aim to investigate trust perception through online reviews, the reviews of superhosts are worth investigating.

In total, 1485 valid reviews composed of 342 lodge listings were screened in New York City in the first stage. A sample of reviews was selected through a search of lodging lists in New York City posted on AirBnB.com from February 14, 2016 to February 23, 2016. By visiting a number of postings, the reviews and corresponding room descriptions were identified through a randomization procedure. The selected reviews for corresponding listings comprised of 735 entire homes, 731 private rooms and 19 shared rooms. The comments were classified into files for further analysis.

4.3. Data processing-first stage

The review comments were first content analyzed using manual coding techniques. Manual coding has also been used for exploring trust factors previously (Cheng & Macaulay, 2014). The exploratory nature of the present study and the moderate size of the dataset made an initial analysis appropriate for our study. Content analysis serves as a

systematic analysis of textual data that recognizes the importance of language in human cognition. As a form of contingency analysis, word frequencies and content categories were extracted through content analysis. Our adoption of manual coding entailed the analytical flexibility of both manifest content and latent content and identifies cognitive centrality and importance (Gottschalk, Winget, & Gleser, 1979).

Through pilot manual coding, we identified a corpus based on the online reviews. Then, according to the classification and manual coding principles, the frequencies (i.e. scores) for each cognitive themes were identified. Furthermore, we coded the perception of trust corresponding to each online review.

4.3.1. Corpus for content analysis

In order to ensure validity and reliability, four research assistants participated in the coding process. They were divided into two groups and worked in pairs to analyze the same review comments separately. The results for inter-rater and intra-rater reliability were acceptable (Erdener & Dunn, 1990). Cohen's kappa (0.723) was used as a function to account for chance agreements. Next, a research scheme was formed to instruct the analysis. Initially, 100 online comments were reviewed by the first two authors, which served as a pilot study to pinpoint important factors that were related to trust. The corpus was formed in this stage. Theoretical sampling was used in this stage to select the comments following Eisenhardt and Graebner (2007). It was believed that 100 comments were sufficient to build a thorough corpus for the online reviews. The salient thematic characteristics were derived from the large number of keywords within the online reviews. After discussion and modification of the keywords by the first two authors, we found seven cognitive themes: location, room aesthetics, host attributes, room description, social interaction, overall evaluation, and repurchase intention. The keywords are explained in Table 1. We listed some examples of corpus corresponding to each cognitive theme.

4.3.2. Manual coding process

We began data analysis based on the corpus created in the pilot study, which served as the reference to assist in manual coding. We counted the frequency of keywords corresponding to the corpus of each cognitive theme. The detailed scoring criteria are shown in the following example: The first cognitive theme, location, encompasses three general aspects. The first factor is the external amenities, such as the café shops and convenience stores that facilitate convenience living outside the guest room. The second factor is the distance of lodging to the nearest form of public transportation, which makes traveling easy. The third is the general location and proximity to destinations that consumers travel to most.

We carefully searched the keywords related to these three aspects in each online review. We counted 1 for the emergence of a specific aspect. Fig. 2 shows an example of our manual coding process. For this online review, we found five trust factors from the manual coding. Each modal particle (i.e., sincerely, strongly, extremely, definitely) contributes to scores apart from the involving aspects. The example shown in the figure displays repurchase intention and sincerity. That is to say, sincerity is a modal particle that enhanced the recommendation level. In such cases, we counted 2 instead of 1 for repurchase intention in this review. The sentimental coding was based on the existing dictionary.[1]

According to the results of manual coding and call for future research directions on mixed quantitative and qualitative research into the investigation of trust and online reviews (e.g. See-To & Ho, 2014), we conducted further investigations on the interactions of salient factors found in the manual content analysis.

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[1] http://dreference.blogspot.com/2010/05/negative-ve-words-adjectives-list-for.html.

Table 1
Examples of corpus of each cognitive theme.

Cognitive theme	Explanation	Examples of corresponding corpus
Location	Includes the external amenities, presence near public transportation or a highway, presence near a downtown area.	"Close to the subway; have amazing restaurants and cafes; super location; very walkable; cafes within walking distance; the area is safe and great; very easily accessible from the L train; near shopping; a few minutes from the subway to Manhattan," etc.
Room aesthetics	Refers to the amenities within the room and the room quality, including cleanliness, smell, room area, scenery, decoration.	"Room is optimized spacious, very clean, well kept; room is the right size, bed is very comfortable, cozy; everything was very clean, the place is nicely decorated; full of light, comfy, clean; tasteful; without a window; clean and neat smell; love the way decorated; nice bathroom," etc.
Host attributes	Refers to the host's personal characteristics; includes all the benevolence the guest perceived, such as quick response online, enthusiasm to the guests, etc.	"She made me feel at ease; always willing to answer any questions; cheerful host; really welcoming and helpful, gracious, kind; accommodate my late arrival; she had good knowledge of the city; patiently explained how to get the shuttle; awesome and opened minded, makes you feel very welcome; lend me the washing machine; cook dinner for me," etc.
Room description	The room description on the website fits the description of the actual room.	"Room was as described; The room is just as shown on the pictures; exactly as pictured; The apartment was clean, spacious and completely as pictured in the ad," etc.
Overall evaluation	Refers to the guest's overall feelings towards his/her living experience.	"Perfect for the price; excellent stay; one of my best experiences; feels safe; enjoyed my stay; could not imagine a better place; my choice was successful; well worth it," etc.
Repurchase intention	Refers to the guest's intention to repurchase the room and recommend to others.	"I will definitely be back; Highly recommend; look forward to staying with her again; book your stay without hesitation," etc.

Fig. 2. Example of the manual coding.

Table 2
Examples of corpus on each cognitive theme.

Indicators	Description
Benevolence	The apartment seems to meet my needs and desires.
Integrity	This apartment seems reliable and has a strong sense of integrity.
Ability	This apartment seems to be suitable to live in.
Overall trust perception	Please score your overall perception of trust based on the given website.

4.3.3. Measurement of trust perception

We recruited 30 undergraduate students to rate their perceptions of trust of each website from the 1485 chosen postings on AirBnB.com. The students were asked to rate no more than 200 posts per day to ensure consistent rating quality. Trust is traditionally comprised of three components, benevolence, ability and integrity, which serve as our references in our trust ratings (McKnight et al., 1998). Our trust rating questionnaires comprised of the three traditional components plus the overall perception of trust (see Table 2 for detailed descriptions of our measurement of trust).

Once the students finished their ratings, we compiled the data and held several meetings to discuss the details about coding. We designed an iterative approach for the undergraduate students to score each post when extreme disagreement exists. The final independent coding results

reached a *kappa* value greater than 0.70(0.792).

4.4. Data collection-second stage

Data for the second stage analysis was sourced from insideairbnb.com, a publicly available tool for extracting data from AirBnB listing all around the world. Specifically, we extracted review data from March 1, 2016 to March 25, 2016 that include 10000 reviews of listings in New York City. The reviews we selected in this stage are also positive reviews with ratings over 4.5. The time frame of data in this stage is close to the data collected in the first stage during manual coding. The listings corresponding to the selected reviews also cover all lodging types, including entire homes, private rooms and shared rooms.

4.5. Data processing-second stage

4.5.1. Salient themes extraction

The above Fig. 3 illustrates the steps we take to analyze the review contents.

First, we divided online reviews into different sentences with punctuations (such as ".", "!", "?", etc.). Second, with the corresponding corpus corresponding to each cognitive theme in Table 2, we use the program to automatically match the number of words in the corresponding topic from 10,000 review comments. For each sentence in the online review, if a word or phrase expression under the relevant
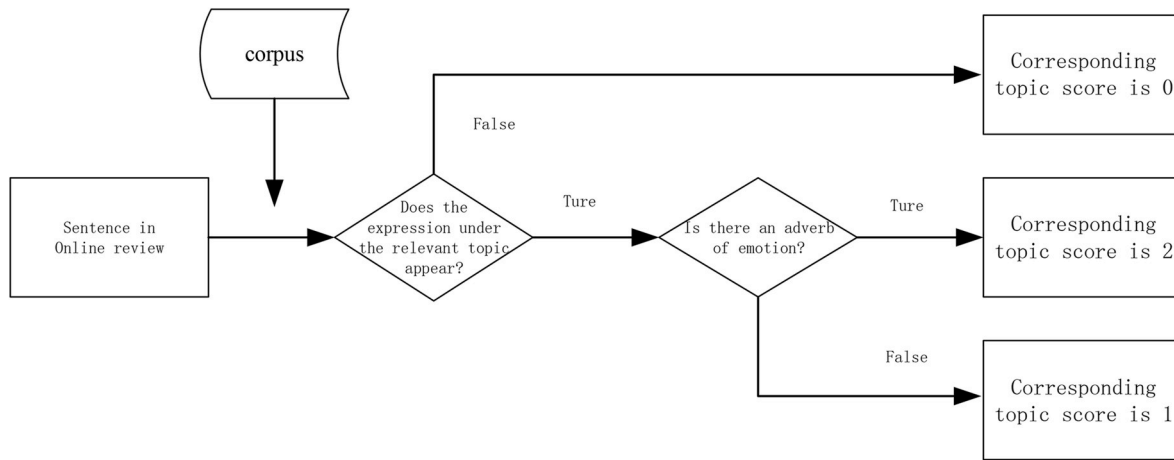
Fig. 3. Steps of salient themes.

cognitive theme (i.e., Location, Room aesthetics, Host attributes, Room description, Social interaction, Overall evaluation, Repurchase intention) appears in the sentence, we scored 1 under the corresponding cognitive theme. Then, we checked whether the sentence contained emotional adverbs. If it is, the score is doubled. Finally, we add the number of each sentence in the online review to each cognitive theme to get the total score for each cognitive theme in each online review. The above steps are automatically executed by the python program.

4.5.2. Trust prediction

We manually marked 500 reviews as the training data. Student volunteers scored four aspects (i.e., Benevolence,Integrity, Ability,Overall trust perception) for each review text to get trust prediction of 10,000 online reviews, We trained the convolutional neural network(CNN) with 500 labeled data and then used the learned model to predict unlabeled comment text. Fig. 4below shows the CNN model we used.

In this work, we used a CNN model for text classification in the literature (Kim, 2014). Here we set the output layer to a neural unit to adapt to our prediction tasks. A review of length n (n words or padded if necessary) is:

$$x_{1:n} = x_1 \oplus x_2 \oplus ... \oplus x_n$$

Where $\oplus$ concatenates all word vectors. Each word x is a k-dimensional vector, here we set k to 256. In the embedding layer, word embedding vector is randomly initialized and then modified during training. In order to learn the effect of different word sequence lengths on the final result, we set up three different region sizes of convolution kernels in the convolutional layer: 3, 4 and 5. The output of convolution operator is:

$$c_i = f(w \bullet x_{i:i+h-1} + b)$$

Where $w \in {}^{hk}$, h is one of the values[3,4,5]; k is the dimensional of word vector, $b \in$ is the bias term and f is the activation function. In the experiment, we use ReLu as the activation function. Then we apply max-pooling operation. Finally, all the obtained vectors are concatenated and fed into the fully connected network to make a prediction. To prevent overfitting, we used dropout on the fully connected layer (dropout rate sets 0.5).

During the training phase model, we used the Adaptive Moment Estimation (Adam) algorithm to learn. For different forecasting tasks, to prevent experimental errors, we used a 5-fold cross-validation over repeated runs. In the model training, the results tend to be stable when training to 500 epochs. The Mean Squared Error (MSE) results for different prediction tasks is shown in Table 3.

5. Results

5.1. Descriptive results-first stage

We conducted descriptive analysis on the themes from online review coding data the results yielded minimum and maximum values of the counted themes. Skewness and kurtosis of each attribute are presented in Table 4.

Descriptive analysis of the online review coding data showed a maximum value of 3 for social interaction, which is lower compared to other attributes. The mean value and standard deviation of social interaction were also the lowest, with values of 0.07 and 0.28 respectively. However, the skewness and kurtosis were higher than other attributes. The values of location and room aesthetics were relatively high, which means that a large number of guests often placed greater importance on these two attributes, and suggests that these two constructs appear to serve as cognitive themes to potential guests.

Finding 1: Based on mean values, the salient cognitive themes are room aesthetics, host attributes, location, repurchase intention, overall evaluation and room description.

5.2. Online review contents and trust perception

Based on the aforementioned salient themes for accommodation experiences, we linked the coding data together (at first coding on salient themes of online reviews and then coding on trust perception) and investigated the influence between the selected themes and trust. We incorporated the data into SPSS 21 and ran the regression, each based on four dimensions of trust as dependent variables; the salient cognitive themes in online reviews serve as the independent variables. Since the data are not completely normally distributed, we conducted the min-max normalization method to map the current dataset into [0, 1] intervals before the regression analysis.

In the function below, i ranges from 1 to 4, which represents 4 indicators of trust perception. The letters R, H, L, E, G, D represent room aesthetics, host attributes, location, repurchase intention, overall evaluation and room description respectively.

$$T_i = \beta_0 + \beta_1 R + \beta_2 H + \beta_3 L + \beta_4 E + \beta_5 G + \beta_6 D$$
$$+ \varepsilon, (i = 1, 2, 3, 4) \hspace{2cm} \text{(Function 1)}$$

When benevolence is the dependent variable, the results of the model are acceptable ($R^2 = 0.214$, $p < 0.05$). Among the independent variables, only *host attributes* has a significant influence on benevolence ($t = 2.917$, $p < 0.05$). Benevolence refers to the extent that people aim to take actions that are good to others in this context. Such actions include the behaviors reflecting guests' well-being rather than the host's
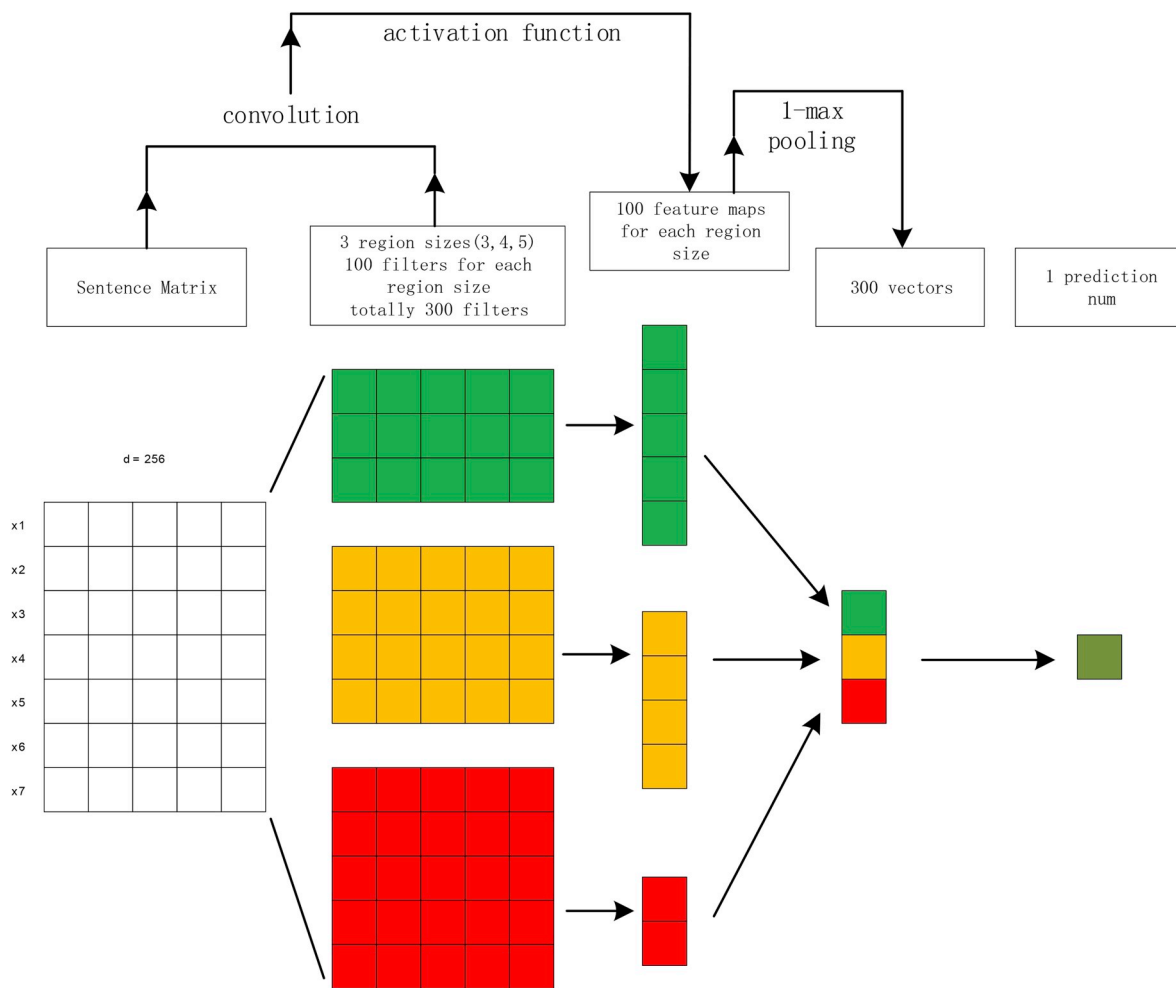
Fig. 4. CNN architecture for prediction.

Table 3
MSE results of trust prediction.

Task	Benevolence	Integrity	Ability	Overall trust perception
MSE	0.69	0.74	0.65	0.67

opportunistic behaviors that pursue their own benefits (Mayer et al., 1995). In AirBnB, guests tend to easily perceive benevolence from the hosts who are welcoming and helpful to the guests.

When ability is the dependent variable, the results of the model are also acceptable ($R^2 = 0.243$, p < 0.05). Among the independent variables, *location* and *room aesthetics* have significant influence on ability (t = 1.216, p < 0.05; t = 0.937, p < 0.05). Ability pertains to a collection of competencies, expertise and skills that convince guests that the host is worthy of trust (Mayer et al., 1995). Therefore,

satisfying *location* and nice *room aesthetics* make the listed rooms more likely to be rented. These corresponding descriptions of online reviews increase perceived trust of the potential guests through competency.

When integrity is the dependent variable, the results of the model are also acceptable ($R^2 = 0.154$, p < 0.05). Among the independent variables, *room description* has a significant influence on benevolence (t = 0.836, p < 0.05). Integrity refers to the degree of which the hosts' actions are congruent with his or her words; other similar constructs include consistency, honesty and fairness (Mayer et al., 1995). The room description appears to adequately convey information about whether the hosts can be trusted. Adequate *room description* ensures the reliability of the hosts and the corresponding lodging.

When overall trust perception is the dependent variable, the results of the model are also acceptable ($R^2 = 0.273$, p < 0.05). Among the independent variables, *location* and *host attributes* have a significant

Table 4
Descriptive analysis results.

	N	Minimum value	Maximum value	Mean value	Standard deviation	Skewness	Kurtosis
Location	1485	0	5	1.090	0.9442	0.542	−0.169
Room aesthetics	1485	0	5	1.325	1.3009	0.644	−0.463
Room description	1485	0	3	0.576	0.7382	1.009	0.667
Host attributes	1485	0	5	1. 1832	0.885	0.643	−0.0842
Social interaction	1485	0	3	0.070	0.2852	4.541	23.648
Overall evaluation	1485	0	4	0.593	0.7588	1.028	0.247
Repurchase intention	1485	0	4	0.683	0.8450	0.775	−0.786
Price	1485	258	4669	934.433	499.9972	1.523	4.973

influence on benevolence (t = 1.257, p < 0.05; t = 0.571, p < 0.05). Overall trust perception serves as the general feelings of trust from the potential guests. The result shows that *location* and *host attributes*, which also influence ability and benevolence, also have an influence on the overall trust perception.

We conducted the regression analysis again using the data from the second stage. Specifically, the theme value from salient theme extraction analysis was input as independent variables, while the trust prediction results from the CNN were coded as dependent variables. The regression results verified the results using the first stage data. First, the influence of host attributes on benevolence is significant (t = 34.881, p < 0.001). Second, good location and room aesthetics produce higher level of ability (t = 21.533, p < 0.001; t = 30.156, p < 0.001). Third, room description significantly influences integrity (t = 17.195, p < 0.001). And finally, the effect of location and host attributes on overall trust perception are significant (t = 21.062, p < 0.001; t = 28.752, p < 0.001).

Finding 2: Cognitive themes regarding to accommodation experience influence trust perception: benevolence is influenced by host attributes, location and room aesthetics impact ability, integrity is influenced by room description, and overall trust perception is influenced by location and host attributes.

6. Discussion and conclusions

6.1. Discussion

This study aimed to explore the influence of online reviews on perceived trust. We specifically investigated the salient thematic characteristics of accommodation experiences from online reviews in sharing economy-based hospitality platforms and how online reviews in AirBnB.com affect guests' perceived trust. The current study offers a new perspective in understanding trust through online review contents. Through the combination of qualitative coding and deep learning analysis, the current study offers insights on sharing economy driven online reviews in the hospitality industry. More specifically in the first research question, we found six salient themes from our data analysis: aesthetics, host attributes, location, repurchase intention, overall evaluation, and room description. Considering that we chose data with high rating scores, the attributes found in the online reviews can help us better understand the trust-building process through analyzing the content of reviews.

The second research question addresses the influence of salient themes on trust perceptions from online reviews. In order to investigate trust perceptions in online reviews, we focused on the regression among trust perceptions and the salient cognitive themes. According to the definition of trust, benevolence, ability, integrity and overall trust perception were coded and predicted through CNN. The correspondent relationships between trust factors and cognitive themes are also identified (see Fig. 5 for a visualized description of the second research question).

The present study shows that the six salient attributes in online reviews influence potential guests' perception of trust in the context of sharing economy driven hospitality platforms. However, the differences in services offered by employees of hotels versus independent hosts make the online sharing transactions more attractive. The host attributes play an important role in the guests' trust perception and tends to encourage potential users to increase their online bookings. A unique feature of the sharing economy is that it makes resource allocations more efficient (Hamari, Sjöklint, & Ukkonen, 2016). In online reviews, the key concentration is not necessarily the same with traditional online platforms. For example, host attributes are typically noticed by guests, unlike interactions with staff in a hotel, and a unique feature of the host may serve as an attraction for potential guests. Although room aesthetics are mentioned by both traditional and sharing economy driven hospitality platforms, reviews about the latter focused on the "second

home" experience, rather than customized service in a regular hotel.

6.2. Implications

This study extends the body of knowledge of online reviews by enriching content on the sharing economy-facilitated hospitality industry. The core contribution of this research is its investigations of online reviews that link with trust perception. Previous studies mainly focus on online ratings (Awad & Ragowsky, 2008), website regulations (Ye et al., 2011) and other external factors in investigating trust. Potential consumers tend to scan online reviews before making a purchase decision, but very few studies have investigated trust in the context of sharing economy driven hospitality platforms. Traditional trust-building mechanisms may not be the same between traditional platforms and sharing economy driven platforms. This study contributes to trust studies in electronic commerce (Kim et al., 2009) and traditional virtual teams (Jarvenpaa et al., 1998) by concentrating on hospitality platforms in the sharing economy era. According to the analysis of online review data from AirBnB, this paper contributes to the ongoing research regarding trust factors (Cheng et al., 2016; Cheng & Macaulay, 2014; Gibson & Birkinshaw, 2004).

This study is also one of the first investigations of online reviews on AirBnB.com and enriches content analysis and deep learning techniques on online reviews. Although online reviews have been frequently studied by scholars (e.g. Ghose et al., 2012; Yin et al., 2014), most studies focused on the review ratings and helpfulness. Our study extends the research scope of these research methods in the online hospitality industry, specifically for sharing economy driven smart tourism platforms. Additionally, our findings provide a theoretically grounded explanation about the nature of review contents, which are far less understood than quantitative indicators in the existing literature of sharing economy enabled hospitality areas (Ye et al., 2011).

Additionally, the causal relationship between trust perceptions and cognitive themes extend prior models of trust (Gefen et al., 2003; Mayer et al., 1995). This study extends the current work of trust antecedents in the context of sharing economy-based hospitality platforms through content analysis and deep learning on review contents. For instance, location and host attributes both have an influence on overall trust perception. These two dimensions of trust antecedents may be applied to other trust studies with appropriate adaptations. Since previous studies on trust are mostly from investigations of online communities, such as virtual collaboration (Cheng et al., 2016; Cheng & Macaulay, 2014) and electronic commerce transactions (Pavlou & Gefen, 2004), our research findings contribute to the existing knowledge of trust in online sharing economy-based platforms, and provide new perspectives to understanding trust models.

Overall, this study provides new perspectives on tourists' behavior and host service improvement. The six proposed cognitive themes provide several factors with which we can better understand trust through online reviews. The convergence of hospitality platforms and the sharing economy also offers a new perspective of the industry transformation. Our results have implications on host attributes and can serve as references for hosts to improve their service quality, increase demand for rooms, and help with social interactions through sharing economy platforms. This study provides a broad insight into sharing economy-based hospitality management and offers preliminary outlines on how to facilitate trust-building with potential guests.

6.3. Limitations and future research

This study has several limitations. The first limitation is whether the sampled population is representative enough to be generalizable. Future research is suggested to collect data from a wider range of cities all over the world to compare the differences and similarities among cultures, price levels and historical background of a city. The second limitation is the inherent differences of the listings in Airbnb. com.
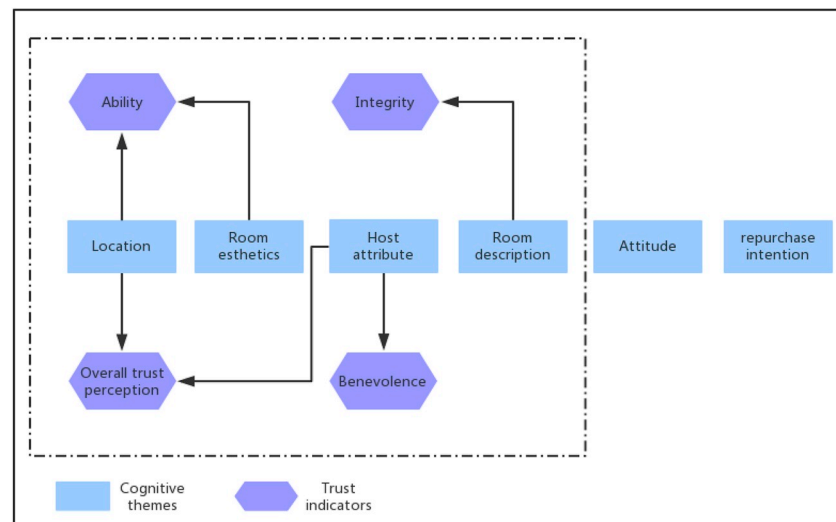
Fig. 5. Visual influence of salient themes on trust perception.

Topics for future research include comparisons of room types, whether online reviews of sharing economy-based hospitality platforms involve the same trust attributes as traditional lodging establishments, and distinguishing between business travelers and leisure travelers. Finally, the current research investigated the trust from the guests' perspective. Future research may investigate the trust from sellers' point of view.

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