

How Consumers Perceive Trustworthiness of Providers in Sharing Economy: Effects of Photos and Comments on Demand at Airbnb

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Abstract

There is limited systematic research that examines how the perceived trustworthiness of providers from photos and consumer comments influences consumer purchasing behavior in a sharing economy platform. In this paper, we develop a theoretical model that explores the mechanism through which consumers' visual-based trust and text-based trust in providers influence their purchasing behavior. We test our model using data from Airbnb.com—a leading sharing economy platform for short-term rental. Using computer vision, machine learning and natural language processing algorithms we extract and code the variables in our model from photos of and consumer comments about hosts in Airbnb.com.

Keywords

Trustworthiness, Sharing Economy, Computer Vision, Machine Learning, Natural Language Processing

Introduction

Sharing economy or “crowd-based capitalism” is a new way of organizing economic activities that may replace the traditional corporate-centered model (Sundararajan 2016). Driven by the Internet and mobile technology, it is a new market model that provides peer-to-peer sharing of access to goods and services (Zhang et al. 2016). For example, people can get access to apartments and rooms (e.g. Airbnb, 9flats), cars (e.g. Uber, Lyft) and freelance labor (e.g. TaskRabbit) in peer-to-peer sharing platforms. The most remarkable accomplishments of “sharing economy” have been in the hospitality industry with platforms such as Airbnb that has transformed the traditional hotel industry landscape (Abramova et al. 2015). Airbnb, founded in 2008, was recently reported to have 100 million users, 640,000 hosts, 2.3 million listings and a total value of \$30 billion (Smith 2016). Although these platforms have grown in popularity and achieved successes, they also encounter many challenges. For example, consumers are always hesitant to choose Airbnb due to concerns about personal safety, the quality of service provided by a host and the trustworthiness of a host. Thus, trust is a central tenet of the success of a transaction in sharing economy platforms. Compared to trust in traditional online platforms, trust in the sharing economy is characterized by a series of unique transaction characteristics: transactions include more personal characteristics of service exchange rather than pure product exchange and transactions involve no transfer of ownership (Möhlmann 2016; Hawlitschek et al. 2016). Transactions in the sharing economy platforms include online trading followed by face-to-face interaction with providers (Ert et al. 2016). Moreover, traditional online platforms only include monetary risk while sharing economy platforms involve additional risks such as safety and security risks (Ert et al. 2016).

Airbnb offers a number of features that help build trust between guests and hosts. For hosts, consumers provide online IDs (e.g. Facebook, Google, and LinkedIn), offline IDs (e.g. driving license), and verified photos to pass identity check. But for consumers, it is not easy to build trust in a host who provides a profile page that includes photos, a self-description and comments from consumers who have stayed with the host. The profile of a host is the only indicator of a host's reputation and trustworthiness which can be observed and perceived by consumers to make a purchase decision. How consumers perceive trustworthiness of a host from photos and consumer comments and how consumers' visual-based trust

and text-based trust in a host influences consumer purchasing behavior is not fully understood. Understanding these two questions carries significant importance for both academics and practitioners.

Past research on the sharing economy examines providers' trust in consumers (e.g. Mittendorf 2016) and trust in a "triad of relationship" (e.g. Hawlitschek et al. 2016). While recent studies start to explore consumers' trust in providers (e.g. Ert et al. 2016), there is limited research examining both consumers' visual-based and text-based trust in providers and how these aspects of trust influence the aggregate property demand. In contrast to previous studies that used survey or experiment to explore the effects of trust, we use computer vision and machine learning algorithms to detect visual-based trust cues from photos and use natural language processing algorithms to capture text-based trust cues from consumer comments about hosts.

Theoretical Background and Hypotheses Development

Signaling theory provides a framework to understand how two parties address information asymmetries in a contractual exchange (Spence 1973). There are information asymmetries between hosts and consumers at Airbnb. Consumers can get some information about hosts only through host profiles and consumer reviews in which hosts try to convey trust signals to consumers. Signals are most effective in influencing consumer perceptions and eventually consumer behavior in an exchange (Kirmani and Rao 2000). In this paper, we would like to examine how these trust signals are perceived by consumers and in turn influence consumer purchasing behavior. Trust is defined as consumers' set of beliefs about certain qualities the host has or lacks (Mayer et al. 1995). We refer to this belief-based conceptualization of trust as perceived trustworthiness (Büttner and Göritz 2008).

When potential consumers view a host's profile photo, they form an immediate impression of the trustworthiness of this host and we label this form of trust as visual-based trust (Ert et al. 2016). Social presence theory explains why the absence or presence of facial image of a host can influence trust. Social presence is defined as "the extent to which a medium allows a user to experience others as being psychologically present" (Gefen and Straub 2003, p11). Cyr et al. (2009) argue that perceived social presence will be highest in the high-human condition compared to the medium-human and no-human conditions. High level of social presence through human figures positively influenced perceived trustworthiness (Cyr et al. 2009). From the theory of planned behavior, perceived trustworthiness of a host will influence consumers to actually conduct business with this host (Mcknight and Chervany 2001). Some hosts' profile photos present human faces while others display a landscape or a pet. We argue that the facial image of a host creates higher levels of social presence than other images and thereby will increase consumers' visual-based trust in this host. This increased trust in turn can encourage consumer purchasing behavior thereby reflecting in the demand for the property that this host lists. Thus, we hypothesize that,

H1: Presence of facial image of a host will have a positive influence on property demand.

Social presence proposed by Short et al. (1976, p65) is "the capacity to transmit information about facial expression, direction of looking, posture...all contributing to the social presence of the communication medium". If a host's profile photo presents a human face, facial expression is also an enabler of trust building cues. Facial expressions elicit vicarious emotion in observers, which is described as "emotional contagion" (Small and Verrochi 2009). Positive facial expression such as a smile increases the observers' feeling of familiarity with unknown faces and is perceived as favorable and trustworthy. A neutral facial expression signifies control of emotions (Schneider et al. 2013) and is perceived as less favorable and trustworthy (Krumhuber et al. 2007). For a host's profile photo that presents a human face, we argue that positive facial expression will trigger more visual-based trust than neutral facial expression. The increased trust in turn encourages consumer purchasing behavior thereby reflecting in the property demand. A negative facial expression has a negative impact on the likelihood to rent a room at Airbnb (Fagerstrøm et al. 2017) and thus decreases the property demand. Thus, we hypothesize that,

H2: Facial expression valence of a host will have a positive influence on property demand.

When potential consumers read consumer comments about a host, they perceive the trustworthiness of a host from others' experience and we label this form of trust as text-based trust. Perceived trustworthiness encompasses four dimensions: ability, benevolence, integrity and predictability (Mayer et al., 1995;

Büttner and Göritz 2008) which are reflected in consumer comments about a host. Ability refers to the host's competence to fulfil promises given; benevolence means that the host is interested in consumers' well-being; integrity denotes that the host follows a set of desirable principles (Büttner and Göritz 2008). Predictability implies that consumers believe the host's actions are consistent enough so that consumers can predict them in a given situation (Mcknight and Chervany 2001). When consumers read comments about a host, the perceived text-based trust will influence behavior such as purchasing (Mcknight and Chervany 2001), thus increasing the aggregate property demand. Therefore, we hypothesize that,

H3: Perceived trustworthiness of a host from consumer comments will have a positive influence on property demand.

Property managers are less likely to interact with consumers because property managers often manage listings remotely and their transactions are less associated with social norms (Fradkin et al. 2015). Consumer comments for the property manager will contain less information about the quality of the host and could not reflect perceived trustworthiness of the host. However, for private hosts who typically reside in the properties they list, consumer comments will contain rich information about the quality of a host due to increased social interaction. Thus, consumers will depend more on text-based trust than visual-based trust to make a purchase decision. Therefore, the effects of visual-based and text-based trust on the property demand are varied by the type of hosts.

H4: Compared to property managers, text-based trust (e.g. perceived trustworthiness of a host) will have a more positive influence on property demand than visual-based trust (e.g. facial expression valence) for private hosts.

Data and Methodology

Data

To test our hypotheses, we plan to collect information about US listings and their hosts from Airbnb.com. For each listing, we will collect information about the property type, number of accommodates, number of bathrooms, number of beds, number of photos, geographic information, number of comments and the overall review rating, the text portion of all reviews on a weekly basis. For each host, we will collect information about the profile photo, the number of listings a host has, whether a host is a super host and whether a host is verified on a weekly basis. And we will also check the property's availability from the online calendar and the property price on a daily basis during our observed window.

Methodology

Human image detection from a host's photo

Detecting humans in images is a challenging task due to their changeable appearance and a wide range of poses that they can adopt (Dalal and Triggs 2005). In order to detect whether a host's profile photo presents a human face, we will apply Dalal and Triggs' (2005) method which uses linear Support Vector Machine (SVM) as a baseline classifier and grids of Histograms of Oriented Gradient (HOG) descriptors which outperform existing feature sets for human detection (Dalal and Triggs 2005).

Facial expression recognition from a host's photo

Different machine learning techniques have been proposed to classify facial expression such as neural network, Support Vector Machine (SVM), Bayesian Network (BN) and rule-based classifiers (Shan, Gong and McOwan 2009). We plan to choose Boosted- Local Binary Patterns (LBP) based SVM approach to classify hosts' photos for two reasons. First, this method can apply to both 6-class prototypic expression recognition (i.e. disgust, fear, joy, surprise, sadness and anger) and 7-class expression recognition including neutral expression (Shan et al. 2009). The facial expression of a host on Airbnb should include neutral facial expression. Second, this method can be applied to low resolution images. At Airbnb, the hosts' profile photos are small and sometimes are in low resolution. By using this automatic facial expression algorithm, the facial expression of a host can be classified into anger, disgust, fear, joy, sadness, surprise and neutral. We further group them into positive expression (e.g. joy, surprise), negative expression (e.g. anger, disgust, fear or sadness) and neutral expression (e.g. neutral).

Text mining reviews to obtain the perceived trustworthiness of a host

Two steps are used to measure the perceived trustworthiness of a host from consumer comments. First, we use Amazon Mechanical Turk (AMT) to tag some of consumer comments as the training dataset. To content-code our consumer comments about a host, we design a survey in which AMT workers are asked to answer a series of binary yes/no questions (1/0) concerning a fine-grained characterization of perceived trustworthiness of a host reflected in the comments (Lee et al. 2014). Table 1 outlines the coding schema and the precise definitions of the various dimensions used to describe the perceived trustworthiness of a host. After obtaining the training dataset, we will build natural language processing algorithms to extend the content-coding to the full set of consumer comments (Lee et al. 2014).

Table 1. Coding Scheme for Describing the Perceived Trustworthiness of a Host

Categorization	Attribute	Description	Source
Ability	Competent	The host is very competent.	Büttner and Göritz, 2008
	Fulfilling	The host is able to fully satisfy its consumers.	Büttner and Göritz, 2008
	Resourceful	One can expect good advice from the host.	Büttner and Göritz, 2008
Benevolence	Caring	The host is genuinely interested in consumers' welfare.	Büttner and Göritz, 2008
	Altruistic	The host puts consumers' interests first.	Büttner and Göritz, 2008
	Fair	If problems arise, one can expect to be treated fairly by the host.	Büttner and Göritz, 2008
Integrity	Honest	The host is honest with his/ her consumers.	Moorman et al. 1993
	Conscientious	The host operates scrupulously.	Büttner and Göritz, 2008
	Credible	One can believe the statements of the host.	Büttner and Göritz, 2008
Predictability	Coherent	The host's methods of operation are clear.	Büttner and Göritz, 2008
	Consistent	The host keeps its promises.	Büttner and Göritz, 2008
	Reliable	One would rely on advice from the host.	Büttner and Göritz, 2008

Key Variables

Property demand: for each property, we check whether a property is occupied on each day within one week. Then the property demand is defined as portion of days being occupied during the period. This variable is just a proxy of property demand since we can only observe the property availability not actual property occupancy (Zhang et al. 2016). **Presence of a human image** is a binary variable. It is coded as 1 if a human face is detected in a photo and 0 otherwise. **Facial expression valence** is an ordinal variable which includes positive facial expression, negative facial expression and natural facial expression detected by automatic facial expression recognition algorithms. **Perceived trustworthiness** is created as a composite variable by adding values of all attributes (i.e. *Competent, Fulfilling, Resourceful, Caring, Altruistic, Fair, Honest, Conscientious, Credible, Coherent, Consistent, Reliable*) across four dimensions ranging from 0 to 12. **Property manager** is defined as the host who has more than 3 listings. **Controls:** we control for the property and host variables that may influence the property demand. The property controls include the property type, number of accommodates, number of bathrooms, number of beds, number of photos, number of comments, geographic information (e.g. neighborhood name or zip code) the overall review rating and the property price. The host controls include whether a host is a super host, whether a host is verified, a host's gender, race and age. Using Kumar et al. (2009)'s novel methods for face verification we recognize a host's gender, race and age. Our future work will focus on collecting the data and coding the data we have collected. We will use a panel data model to test our hypotheses. We do expect to complete this and present the results at the conference in August.

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