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# Post-Purchase Trust in e-Commerce: A Theoretical Framework and a Text Mining-Based Assessment Method

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**ABSTRACT**

Post-purchase trust is formed after an online transaction is completed and the product or service is experienced. It influences consumers' repurchase intention and the reputation of vendors. The aim of the current study was to deepen our understanding of post-purchase trust in e-Commerce and to develop a text mining-based assessment method by mining consumers' online comments. By combining the expectancy-confirmation theory and product evaluation theory, this study proposes a comprehensive model of post-purchase trust encompassing consumers' evaluation of product, delivery, service, and website. The model was verified by a survey involving 249 consumers. The results indicate that both product evaluation factors and transaction supporting factors have positive impacts on post-purchase trust. Based on this theoretical model, we proposed a text mining-based method to measure these factors through text-mining of consumers' comments. To demonstrate the feasibility and benefits of the method, the method was applied to analyze 1,015,484 consumers' comments on personal computer products from jd.com, a major Chinese e-Commerce website. The results suggest that the proposed method can provide practitioners with diagnostic suggestions to promote post-purchase trust and understand consumers better.

**HIGHLIGHTS**

- Integration of the consumers' product evaluation model and expectation-confirmation theory is proposed to investigate post-purchase trust in e-commerce.
- The confirmation of delivery, service, website, and perceived value of products affect consumer satisfaction, thereby affect post-purchase trust.
- Perceived value is positively affected by perceived price and perceived quality, which can be increased by consumers' evaluation of the appearance, authenticity, and brand reputation of the product.
- The proposed model can be used to design text mining-based tools to monitor important factors of post-purchase trust via text mining.

## 1. Introduction

In the past decade, the increasing penetration of smartphones and mobile Internet laid the foundation for the tremendous development of e-commerce around the world. By 2019, over 710 million Chinese consumers were shopping online, and the trading volume of e-commerce 2019 was approximately US$4.97 trillion (China's Ministry of Commerce, 2017). In e-commerce, consumers' trust in the vendor is a critical issue because they need to make the purchase decision before they can physically examine and experience a product. Furthermore, they may never have any contact with the Internet vendors in the physical world, which may lead to worry about inauthentic products and illegal vendors. Trust in the vendor has been found to be one of the most frequently cited reasons for consumers refusing to shop online (Grabner-Kräuter & Kaluscha, 2003) and consumers with a higher level of trust are more likely to purchase from Internet vendors (Chen & Dhillon, 2003; Kim et al., 2009; Oliveira et al., 2017).

Consumers' trust in online vendors is not a static quality but varies along the interactive process between the consumer and the vendor (Kim, 2014; Kim et al., 2009; Zhang et al., 2011). In the pre-purchase phase, with limited experience with the vendor, consumers form their pre-purchase trust mainly based on peripheral cues, such as website reputation, brand recognition of the product, and third-party recognition, to make the purchase decision (Oliveira et al., 2017; Salam et al., 2005; Yoon & Occeña, 2015). After the transaction is completed and the product is delivered and experienced, consumers' post-purchase trust is influenced by their direct experience with the product (e.g., product quality, perceived competitiveness of the price, and perceived value) and transaction supporting factors (e.g., delivery and after-sale service) (Kim et al., 2005; Kim et al., 2001). Post-purchase trust affects consumers' repurchase intention and the long-term relationship between consumers and vendors,

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such as loyalty (Kim et al., 2009; Wang et al., 2016). In this sense, post-purchase trust is even more important for vendors than pre-purchase trust (Kim et al., 2009).

The literature on post-purchase trust, however, is limited, and much of it is built upon the expectancy-confirmation theory, which hypothesizes that consumers' confirmation of the vendor's performance results in satisfaction, and subsequently determines post-purchase trust (Kim, 2014; Kim et al., 2005, 2009). A limitation of these studies was that they measured consumers' confirmation levels based on their overall evaluation of vendor performance without distinguishing different aspects of transactions, such as product quality and services. However, consumer psychology research has found that consumers have more than one expectation (Novak et al., 2000; Wirtz, 1993) and not all confirmations are critical (Chiu et al., 2005). The overall confirmation concept did not address how consumers' evaluation of different aspects of the product and the transaction contributes to post-purchase trust and provides limited diagnostic information for practitioners to identify improvement directions for promoting post-purchase trust. Furthermore, the measurement of the overall confirmation construct relies on consumers' self-reporting using a specific instrument or questionnaire, which implies an extra cost for recruiting participants and increased difficulties in tracking post-purchase trust continually. Meanwhile, consumers' post-purchase comments and reviews provide a rich source to understand their post-purchase experience and evaluation of the transaction, and it is possible to infer and assess post-purchase trust by mining these reviews and comments. In most of these applications of the text-mining approach, however, antecedents of post-purchase trust are driven by data and are inconsistent across studies (Emayakumaari & Ananthi, 2015; Zhang et al., 2014), and a more elaborated and concrete framework depicting antecedents of post-purchase trust is required.

The current study aims to fill this gap by (1) proposing and validating an elaborated model of post-purchase trust that links the expectancy-confirmation theory with consumers' evaluation of product, delivery, service, and website factors, and (2) developing a text mining-based method to measure these factors through text-mining of consumer comments. Two studies were carried out. In Study 1, we proposed the model and validated it with a questionnaire survey involving 249 participants. The results showed that consumers' evaluation of identified factors related to product, delivery, service, and website predicts the level of post-purchase trust. In Study 2, we designed a text mining-based method to measure these factors identified in the model through text-mining of consumer comments. The text mining-based method can monitor post-purchase trust, help practitioners understand their consumers, and provide diagnostic suggestions for identifying improvement directions.

This study comprises four sections. Following this introduction, the next section is the theoretical background of the study. Section 3 is Study 1 and Section 4 is Study 2. The discussion and conclusion are presented in Section 5 and Section 6.

## 2. Literature review

### 2.1. Trust in e-commerce and the expectation-confirmation theory

In the literature on consumer psychology, expectation-confirmation theory (ECT) is one of the most widely used theoretic frameworks (Dabholkar et al., 2000; Kim et al., 2009; Oliver, 1993; Oliver & Burke, 1999). The theory was proposed by Oliver and Burke (1999) and further elaborated by Bhattacherjee (2001). It explains the causal relationship between transactions, consumer satisfaction, and repurchase intention. In the pre-purchase phase, a consumer forms his or her expectation for a transaction. After the consumer purchases and experiences the product, he or she evaluates the performance of the vendor and compares it with his/her prior expectation, and determines how well the expectation is confirmed. This confirmation and the prior expectation determine the consumer's satisfaction and repurchase intention, according to ECT.

Some researchers applied ECT in the field of trust in e-commerce (Chen et al., 2010; Kim, 2014; Kim et al., 2009, 2012), and identified that satisfaction driven by confirmation along with pre-purchase trust leads to post-purchase trust, and both satisfaction and post-purchase trust affect repurchase intention (Kim, 2014). In these studies, confirmation is measured by asking consumers how much their expectations are met in the purchase. However, the overall construct of confirmation may be insufficient to capture consumers' feelings in the post-purchase phase. First, in the post-purchase phase, consumers are likely to feel satisfied or dissatisfied with different aspects of one product. In this situation, the overall evaluation will prevent the mixed feelings of consumers from being conceptualized (Mittal et al., 1998). Second, different aspects contribute to satisfaction in different extents (Jiang & Rosenbloom, 2005; Mittal et al., 1998, 1999, 2017; Mittal & Kamakura, 2001; Tsiros et al., 2004). For example, Jiang and Rosenbloom (2005) found that after-delivery satisfaction is much more influential for overall satisfaction than at-checkout satisfaction. We summarized previous studies that investigated factors that influence trust in e-commerce in Table 1, which shows that few studies compared the different effects of these factors. More research about the contribution of different aspects is needed to better understand consumers and provide more specific and diagnostic suggestions to managers (Chitturi et al., 2008; Jiang & Rosenbloom, 2005; Mittal et al., 1998, 1999, 2017; Mittal & Kamakura, 2001; Tsiros et al., 2004).

### 2.2. Product evaluation factors influencing post-purchase trust

Because consumers are especially concerned about products and obtaining value is consumers' major motivation to trust and repurchase from a vendor (Eid, 2011; Harris & Goode, 2004; Kassim & Abdullah, 2010), the expected confirmation of a product can be represented by perceived value, which refers to the consumer's general assessment of the utility of the product based on the costs and benefits (Dodds et al.,

**Table 1.** Literature on factors influencing trust in e-commerce.

| | Data source | | Factors influencing trust in e-commerce | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Author | Traditional survey | User-generated content | Brand reputation | Price | Product quality | Product value | Delivery | Service | Website |
| Zhang et al. (2014) | | √ | | √ | √ | | √ | √ | |
| Porntrakoon and Moemeng (2017) | | √ | | √ | √ | | √ | | |
| Sullivan and Kim (2018) | √ | | | | √ | √ | | | √ |
| Suhaily (2017) | √ | | √ | √ | √ | | | | |
| Kim (2014) | √ | | | | | | √ | | |
| Jarvenpaa (1999) | √ | | √ | | | | | | |
| Kim (2005) | | √ | | √ | √ | | √ | | √ |
| Oliveira (2017) | √ | | √ | | | | | √ | √ |
| Yoon and Occeña (2015) | √ | | | | | | | | √ |
| Ribbink et al. (2004) | √ | | | | | | | √ | |
| Kassim and Abdullah (2010) | √ | | | | | | | √ | |
| Lee et al. (2004) | √ | | √ | | | | | √ | |
| Roy et al. (2001) | √ | | | | | | | | √ |
| Harris and Goode (2004) | | | | | | √ | | √ | |
| McKnight et al. (2002) | √ | | √ | | | | | | √ |
| Wu et al. (2010) | √ | | | | | | | √ | √ |
| Chang et al. (2013) | √ | | √ | | | | | √ | |
| Koufaris and Hampton-Sosa (2004) | √ | | √ | | | | | | √ |
| Bart et al. (2005) | √ | | √ | | | | | √ | √ |
| Wang (2016) | √ | | | | | √ | | √ | √ |

1991; Eid, 2011; Harris & Goode, 2004; Kassim & Abdullah, 2010). Perceived value has been found to increase satisfaction, trust, and repurchase intention (Fang et al., 2016; Gupta & Kim, 2007; Harris & Goode, 2004; Sullivan & Kim, 2018; Wang et al., 2016). It is a key variable for explaining how consumers' first-hand experiences with products influence their assessment of the transaction, such as satisfaction and loyalty in post-purchase situations (Anderson & Srinivasan, 2003; Carlson et al., 2015; Sullivan & Kim, 2018). Therefore, it is necessary to know how consumers evaluate the perceived value of products (Lin & Wang, 2006; Sullivan & Kim, 2018).

A widely-used approach to depict how consumers evaluate products is the product evaluation model (Dodds & Monroe, 1985; Dodds et al., 1991; Monroe & Krishnan, 1985; Parasuraman & Grewal, 2000; Zeithaml, 1988). It suggests that consumers evaluate the quality and perceived value of a product according to its attributes of the product. Factors in the product evaluation model are named product evaluation factors, including perceived value, perceived quality, perceived price, brand reputation, authenticity, and appearance.

In trust-related research, perceived quality, perceived price, and brand reputation have been found to contribute to perceived value (Chiang & Jang, 2007; Sullivan & Kim, 2018). Perceived quality is defined as the consumer's judgment about the product's overall excellence or superiority (Zeithaml, 1988). Perceived price is the subjective evaluation of price at a specific vendor compared with other vendors. A higher perceived price means the price at the vendor is higher than the price at other vendors (i.e., higher monetary cost) (Kim et al., 2012). According to the definition of perceived value. i.e., a tradeoff between benefits and costs, perceived quality increases perceived value, and perceived competitive price decreases perceived value (Zeithaml, 1988). Sullivan and Kim (2018) have identified that perceived quality and perceived price influence perceived value and these product evaluation factors are important in influencing post-purchase trust and repurchase intention. Brand reputation is an important attribute of a product for consumers to evaluate perceived quality. Products with a favorable brand reputation are more likely to be evaluated as having a higher level of perceived quality and perceived value (Dodds et al., 1991). Chiang and Jang (2007) have found that brand reputation significantly affects perceived quality and trust.

However, the product evaluation factors listed in the studies above missed two factors that potentially affect the perceived value and post-purchase trust, i.e., authenticity and appearance. Appearance has been supposed an important cue for perceived quality (Zeithaml, 1988). Better appearance implies to consumers that the quality is excellent. Besides, the authenticity of the product is another important benefit that consumers expect from the purchase (Eggers et al., 2013) and it has been shown important for product image evaluation (Beverland & Farrelly, 2010; Park et al., 2016). If they are introduced, we can better understand how consumers generate their evaluations of the product based on product attributes.

### 2.3. Text mining for evaluating trust in e-commerce

In the e-commerce context, consumers generate plenty of comments on shopping websites. These comments include consumers' evaluations of the product and shopping experience and provide important information for managers. To obtain the information, practitioners and researchers often use text-mining techniques to extract product features and conduct sentiment analysis to acquire consumers' opinion orientation from comments (Liang et al., 2015; Shia & Qiu-Shib, 2011; Xu et al., 2019). Sentiment analysis is an effective and efficient way of monitoring consumers' opinions of business marketing (Zhang et al., 2011).

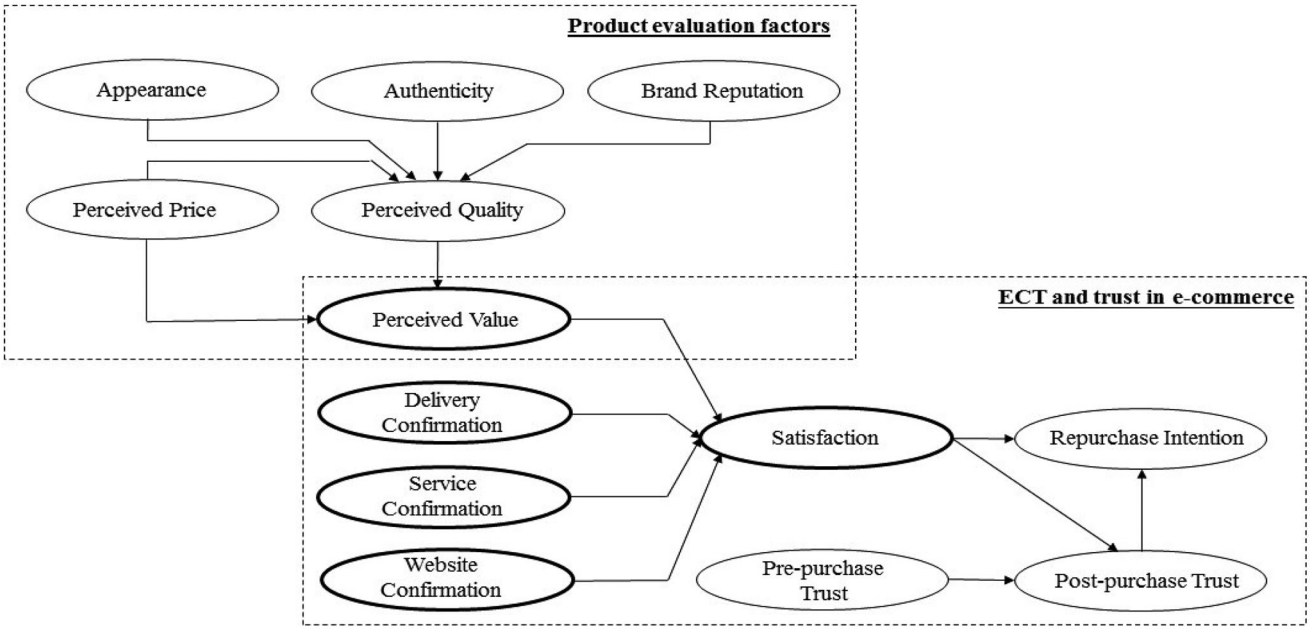


**Figure 1.** Proposed model. *Note*. The constructs in bold are driven from ECT.

Recent studies have utilized a text mining approach to evaluate trust (Bhargava et al., 2016; Emayakumaari & Ananthi, 2015; Mol & John, 2017; Zhang et al., 2014), and several studies further take a multi-dimensional approach to uncover consumers' evaluations of different dimensions of trust (Emayakumaari & Ananthi, 2015; Zhang et al., 2014). Zhang et al. (2014) proposed an algorithm to uncover dimensions embedded in consumer comments, which is shown effective for shopping websites to distinguish vendors and understand consumers' opinions. Emayakumaari and Ananthi (2015) extracted aspect opinion expressions from consumer comments to evaluate aspect trust and their experiments extracted four dimensions (i.e., product, delivery, communication, cost) from consumer comments. These studies manifest vendors' performance in different dimensions and help vendors know where the problem is.

However, because the above studies utilized learning-based approaches, the correspondence between identified clusters and the actual dimension is not explicit and noisy comments are easily assigned a neural score (Collomb et al., 2014). For example, in the study of Zhang et al. (2014), "service," "price," and "quality" are clustered into one dimension, making it difficult to know what the dimension means. Thus a lexicon-based approach, which uses lexicons and predefined rules, can provide meaningful clusters and is often easier to use. Porntrakoon and Moemeng (2017) used a lexicon-based method to measure trust. They use product quality, price, and delivery as evaluation dimensions. The method is shown to reveal trust in various dimensions and find good accuracy. However, the three dimensions in their study are proposed without verifying the relationship between the three dimensions and trust.

## 3. Study 1

Study 1 aims to investigate the impact of consumers' confirmation of different aspects of the transaction on post-purchase trust and repurchase intention. The results will provide a comprehensive understanding of post-purchase trust and a basis for the assessment of post-purchase trust in Study 2.

### 3.1. The research model and hypothesis

Integrating the product evaluation model and ECT, we proposed a research model in Figure 1. The model is constructed based on the two theoretical lenses of the study: (1) product evaluations and (2) trust in e-commerce and ECT. Based on the product evaluation model, we use appearance, authenticity, brand, and perceived price as indicators of perceived quality and assume that perceived quality and perceived price affect consumers' assessments of perceived value. Based on ECT and studies about trust in e-commerce, consumers' degree of post-purchase trust is adjusted based on pre-purchase trust and the satisfaction driven by confirmation in the post-purchase phase, and post-purchase trust and satisfaction both affect relationship retention (e.g., repurchase intention and willingness to reuse). We further want to differentiate consumers' confirmation of different aspects to have a more comprehensive understanding of post-purchase trust.

Urban et al. (1998, 1999, 2000) posit that the vendor implements three generic stages to complete an online transaction and during the process consumers' trust is built. These stages are the website stage, product stage, and transaction stage in which consumers are concerned about the delivery and the after-sale service. The framework is used by plenty of studies to investigate consumers' trust in the vendor (Kim et al., 2001, 2005; McCole et al., 2010; McKnight et al., 2002; Papadopoulou et al., 2003). Based on the framework, we consider that website, product, delivery, and service are the four major expectations of consumers to the vendor. The five CTE constructs are bolded in Figure 1, including four aspects of confirmation and satisfaction.

According to the product evaluation model, consumers assess the quality of a product based on the cues of the product, including appearance, authenticity, and brand reputation. First, a better appearance indicates more investment from manufacturers, brings positive feelings to consumers, and further leads to higher perceived quality (Creusen & Schoormans, 2005; Stone-Romero et al., 1997; Zeithaml, 1988). Second, consumers' confirmation of the expectation that the products are authentic increases their positive attitudes to the product after purchase (Beverland & Farrelly, 2010). Consumers usually prefer authentic products even if the non-authentic products are superior in other features (Nijssen & Douglas, 2011). Because the authenticity of a product is associated with consumers' positive attitude and a better product image (Park et al., 2016), it may positively affect perceived quality. Third, brand reputation is an important cue of perceived quality (Zeithaml, 1988). Consumers believe that a favorable brand reputation indicates a significant investment of the manufacturer, who is less likely to produce poor quality products that may jeopardize the brand reputation (Chen & Dhillon, 2003; Doney & Cannon, 1997). In this way, brand reputation conveys positive information about quality to consumers and enhances the perceived quality (Zeithaml, 1988). Therefore,

**Hypothesis 1:** Appearance positively affects perceived quality.

**Hypothesis 2:** Authenticity positively affects perceived quality.

**Hypothesis 3:** Brand reputation positively affects perceived quality.

An increase in perceived price means more monetary cost. Because consumers assume that a better quality product needs a higher monetary cost in the market (Chen & Dubinsky, 2003; Devaraj et al., 2009; Rao & Monroe, 1989), a higher perceived price provides a cue for consumers that the product has a better-perceived quality. According to the definition of perceived value, perceived price is negatively associated with perceived value, and perceived quality is positively associated with a perceived value (Brucks et al., 2000; Dodds et al., 1991; Sullivan & Kim, 2018; Teas & Agarwal, 2000; Zeithaml, 1988). Therefore,

**Hypothesis 4:** Perceived price positively affects perceived quality.

**Hypothesis 5:** Perceived price negatively affects perceived value.

**Hypothesis 6:** Perceived quality positively affects perceived value.

According to the ECT, consumer satisfaction is determined by how well their expectations are confirmed (Bhattacherjee, 2001; Oliver & Burke, 1999). Consumers mainly expect a higher perceived value of the product (Dodds et al., 1991), thus, a higher level of perceived value is more likely to satisfy consumers. Studies showed that consumers also expect the vendor's good performance on delivery, service, and website (Al Karim, 2013; Kassim & Abdullah, 2010; Ribbink et al., 2004). A higher level of confirmation of these factors is more likely to satisfy consumers (Al Karim, 2013; Kassim & Abdullah, 2010; Lee & Joshi, 2007). Therefore,

**Hypothesis 7:** Perceived value positively affects satisfaction.

**Hypothesis 8:** Service confirmation positively affects satisfaction.

**Hypothesis 9:** Delivery confirmation positively affects satisfaction.

**Hypothesis 10:** Website confirmation positively affects satisfaction.

In the e-commerce context, consumers could not feel the product and see the vendor, thus they feel more uncertain about the transaction than offline shopping context (Chen & Dhillon, 2003; Kim et al., 2003). In the post-purchase phase, if consumers are satisfied with the vendor's performance, their feelings about uncertainty will decrease and their trust in the vendor will be enhanced (Kim, 2014; Kim et al., 2009; Wang et al., 2016). If consumers have a higher level of pre-purchase trust, they are more likely to trust the vendor (Kim, 2014). Therefore, we hypothesize that both pre-purchase and satisfaction are positively associated with post-purchase trust.

**Hypothesis 11:** Satisfaction positively affects post-purchase trust.

**Hypothesis 12:** Pre-purchase trust positively affects post-purchase trust.

In the repurchase process, consumers form trust and make a repurchase decision based on their experience. Satisfaction leads to consumers' understanding and trust in the vendor (Kim, 2014; Kim et al., 2009; Wang et al., 2016) and consequently, consumers are more likely to maintain a long-term relationship with the vendor. Post-purchase trust enables consumers to make a repurchase decision and its critical role in repurchase intention have been identified by some studies (Kassim & Abdullah, 2010; Kim, 2014; Sullivan & Kim, 2018; Wang et al., 2016). Therefore,

**Hypothesis 13:** Satisfaction positively affects repurchase intention.

**Hypothesis 14:** Post-purchase trust positively affects repurchase intention.

### 3.2. Research method

#### 3.2.1. Measurement development

The model is verified via questionnaires. Appendix A shows the measurement items with the sources they were drawn. The majority of the items were borrowed from previous

Table 2. Descriptive statistics and reliability coefficients for constructs.

| Constructs | Mean | Standard deviation | Cronbach's alpha | Composite reliability | AVE |
|---|---|---|---|---|---|
| Appearance | 5.73 | 1.12 | 0.925 | 0.952 | 0.870 |
| Authenticity | 6.46 | 1.08 | 0.922 | 0.951 | 0.865 |
| Brand reputation | 5.60 | 1.36 | 0.933 | 0.957 | 0.882 |
| Perceived price | 3.52 | 1.58 | 0.927 | 0.954 | 0.873 |
| Perceived quality | 5.96 | 1.00 | 0.947 | 0.966 | 0.905 |
| Perceived value | 5.57 | 1.26 | 0.943 | 0.964 | 0.898 |
| Delivery confirmation | 6.73 | 1.22 | 0.899 | 0.937 | 0.832 |
| Service confirmation | 5.51 | 1.25 | 0.940 | 0.962 | 0.893 |
| Website confirmation | 5.70 | 1.05 | 0.907 | 0.941 | 0.843 |
| Satisfaction | 5.79 | 0.96 | 0.964 | 0.973 | 0.902 |
| Pre-purchase trust | 6.03 | 0.93 | 0.966 | 0.972 | 0.855 |
| Post-purchase trust | 5.96 | 0.98 | 0.962 | 0.972 | 0.897 |
| Repurchase intention | 5.69 | 1.31 | 0.961 | 0.971 | 0.894 |

studies and adapted to reflect the context of the current study. Three constructs were developed by ourselves: delivery confirmation, service confirmation, and website confirmation ($\alpha = 0.899$, 0.940, and 0.907, respectively). The three constructs were measured by modifying the "confirmation" scale in ECT (Bhattacherjee, 2001; Oliver & Burke, 1999). ECT measures confirmation by four items, asking how much consumers' expectations of the vendor are confirmed. In the current study, the four items were modified to specify the three different aspects by replacing "expectations" with "expectations of delivery/service/website." All items were translated into Chinese and carefully examined by the authors. All constructs except satisfaction were measured using seven-point Likert scales ranging from "strongly disagree" (1) to "strongly agree" (7).

#### 3.2.2. Survey administration

Data were collected among e-commerce users in Chinese. The questionnaire was distributed on WeChat. To ensure that the participants could recall their online shopping experience better, we only recruited consumers who had purchased and received products in the previous two weeks. We collected 329 responses of which 249 were valid. The recruited participants were at an average age of 26.7, with a range from 18 to 60. Among the participants, 63.9% were females; 58.2% have a college degree and 20.9% have a graduate degree; 88.75% earned more than 1000 yuan a month. All the participants were familiar with online shopping and 92.4% of them shopped online more than once a month.

The participants were asked to fill out the questionnaires based on their most recent online transactions. In over half of the selected transactions (54.6%), the participants purchased from the vendors for the first time. Among the participants, 21.3% purchased clothes and 18.5% purchased personal care products. Nearly half of the transactions (46.6%) were <100 yuan.

### 3.3. Data analysis and results

The hypotheses were tested by factor analyses and structural equation modeling on SmartPLS 3.0 (Ringle et al., 2015). All latent variables are reflective constructs.

#### 3.3.1. Testing the measurement model

To validate the construct of the measurement model, the internal consistency, construct validity and discriminant validity were assessed (Bollen, 1989; Chin & Gopal, 1995). The internal consistency was measured by Cronbach's alpha and composite reliability (Fornell & Larcker, 1981). As shown in Table 2 and Appendix B, the Cronbach's alpha and composite reliability of all constructs are higher than the recommended boundary of 0.7, indicating adequate internal consistency (Fornell & Larcker, 1981; Nunnally, 1978; Nunnally & Bernstein, 1994). Construct validity was examined by average variance extracted (AVE) and item loadings (Chin, 1998; Chin et al., 1997; Fornell & Larcker, 1981). Each construct has an AVE larger than 0.6 and all term loadings are >0.5 (Fornell & Larcker, 1981; Wixom & Watson, 2001), indicating acceptable validity. The discriminant validity is verified by the satisfaction of the following two criteria: (1) the items load more strongly on the corresponding construct than other constructs, as shown in Appendix C, and (2) the square root of the AVE is larger than inter-construct correlations, as shown in Table 3 and Appendix B. The results show that all measures have adequate convergent and discriminant validity.

We utilized Harman's one-factor test to avoid common method bias. As recommended by Podsakoff et al. (2003), we conducted an exploratory factor analysis on the variables. If only one factor is found to account for a majority of the covariance in variables, the model will probably have a common method bias. In this study, we found the most covariance explained by one factor is 14%, which is not a major proportion. Therefore, we can infer the absence of common method bias in the study.

#### 3.3.2. Structural model

In the first round of the questionnaire, the PLS path coefficients are shown in Figure 2. As hypothesized, appearance, authenticity and brand positively affect perceived quality ($\beta = 0.464$, $p < .001$, $\beta = 0.203$, $p < .001$, $\beta = 0.288$, $p < .001$, respectively). The effect of perceived price on perceived quality is not significant. Together, appearance, authenticity, brand reputation, and perceived price account for 58.9% of the variance in perceived quality. Perceived quality and perceived price are significant predictors of perceived value ($\beta = 0.555$, $p < .001$, and $\beta = -0.237$, $p < .001$, respectively),

**Table 3.** Correlations of latent variables.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Appearance | 0.933 | | | | | | | | | | | | |
| 2. Authenticity | 0.331 | 0.93 | | | | | | | | | | | |
| 3. Brand reputation | 0.465 | 0.443 | 0.939 | | | | | | | | | | |
| 4. Perceived price | −0.101 | −0.116 | −0.05 | 0.934 | | | | | | | | | |
| 5. Perceived quality | 0.67 | 0.49 | 0.597 | −0.135 | 0.951 | | | | | | | | |
| 6. Perceived value | 0.494 | 0.397 | 0.52 | −0.312 | 0.587 | 0.948 | | | | | | | |
| 7. Delivery confirmation | 0.368 | 0.194 | 0.318 | −0.042 | 0.418 | 0.313 | 0.912 | | | | | | |
| 8. Service confirmation | 0.532 | 0.383 | 0.484 | −0.11 | 0.528 | 0.547 | 0.509 | 0.945 | | | | | |
| 9. Website confirmation | 0.451 | 0.288 | 0.4 | −0.12 | 0.475 | 0.444 | 0.644 | 0.607 | 0.918 | | | | |
| 10. Satisfaction | 0.548 | 0.374 | 0.47 | −0.168 | 0.631 | 0.592 | 0.58 | 0.637 | 0.639 | 0.95 | | | |
| 11. Pre-purchase trust | 0.576 | 0.497 | 0.55 | −0.04 | 0.703 | 0.511 | 0.433 | 0.535 | 0.479 | 0.513 | 0.925 | | |
| 12. Post-purchase trust | 0.587 | 0.47 | 0.514 | −0.118 | 0.674 | 0.604 | 0.59 | 0.724 | 0.649 | 0.771 | 0.672 | 0.947 | |
| 13. Repurchase intention | 0.523 | 0.378 | 0.462 | −0.103 | 0.641 | 0.533 | 0.456 | 0.589 | 0.527 | 0.726 | 0.491 | 0.737 | 0.946 |

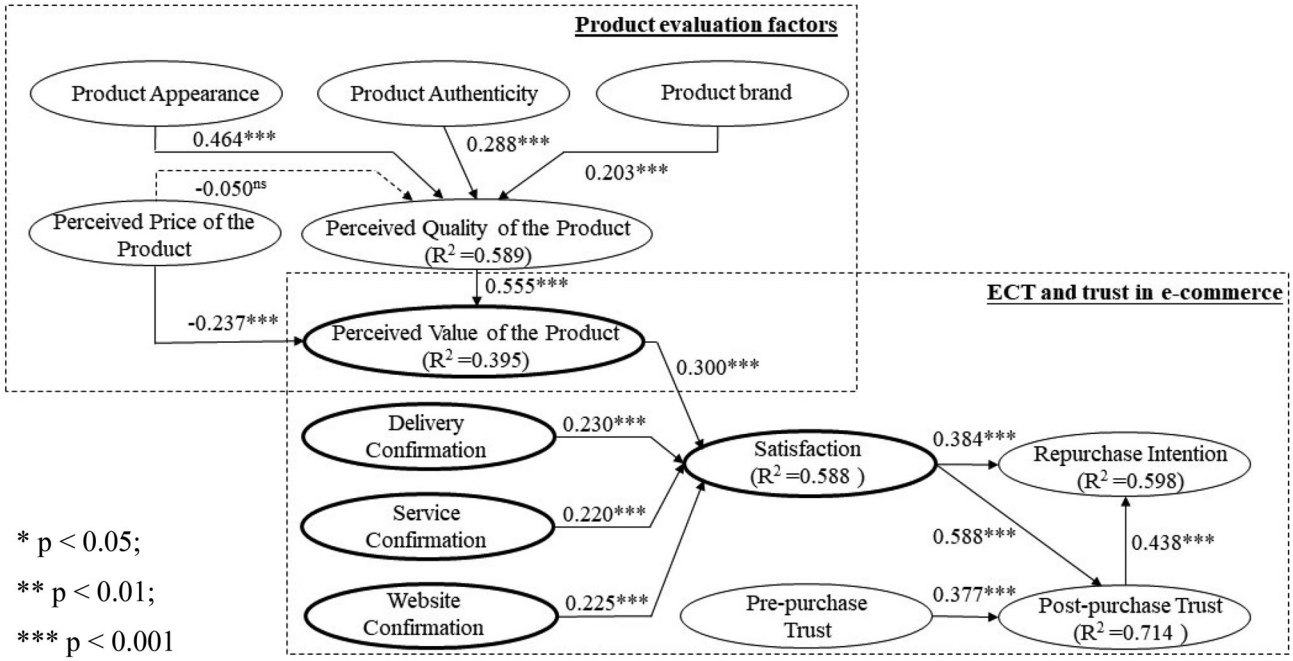


**Figure 2.** Structural model results.

and they together account for 39.5% of the variance in perceived value. Perceived value, delivery confirmation, service confirmation, and website confirmation are all positively related to consumer satisfaction ($\beta = 0.300$, $p < .001$, $\beta = 0.230$, $p < .001$, $\beta = 0.220$, $p < .001$, $\beta = 0.225$, $p < .001$, respectively), and explain 58.8% of the variance in satisfaction. Satisfaction positively affects post-purchase trust ($\beta = 0.588$, $p < .001$) and pre-purchase trust also has a positive effect on post-purchase trust. The two constructs together account for 71.4% of the variance of post-purchase trust. As hypothesized, both post-purchase trust and satisfaction are positively related to repurchase intention ($\beta = 0.438$, $p < .001$ and $\beta = 0.384$, $p < .001$, respectively). They account for 59.8% of the variance of repurchase intention. The results of the hypothesis are summarized in Table 4.

**Table 4.** Summary of hypotheses results.

| Hypothesis | Support? |
|---|---|
| H1: Appearance positively affects perceived quality. | √ |
| H2: Authenticity positively affects perceived quality. | √ |
| H3: Brand reputation positively affects perceived quality. | √ |
| H4: Perceived price positively affects perceived quality. | × |
| H5: Perceived price negatively affects perceived value. | √ |
| H6: Perceived quality positively affects perceived value. | √ |
| H7: Perceived value positively affects satisfaction | √ |
| H8: Service confirmation positively affects satisfaction. | √ |
| H9: Delivery confirmation positively affects satisfaction. | √ |
| H10: Website confirmation positively affects satisfaction. | √ |
| H11: Satisfaction positively affects post-purchase trust. | √ |
| H12: Pre-purchase trust positively affects post-purchase trust. | √ |
| H13: Satisfaction positively affects repurchase intention. | √ |
| H14: Post-purchase trust positively affects repurchase intention. | √ |

### 3.4. Summary of study 1

Research has established that consumers' overall confirmation of their expectations results in satisfaction and then leads to post-purchase trust (Kim et al., 2005, 2009). The results of Study 1 further differentiated the overall confirmation into the confirmation of the delivery, the service, and the website, and their perceived value of the products, and found that the perceived value of the product is determined by consumers' evaluations of product attributes. To summarize, Study 1 identified key determinants of post-purchase trust based on ECT, product evaluation models, and

**Table 5.** Dictionary for factors.

| Factors | Words |
|---|---|
| Authenticity | quality goods (正品、正版), official website (官网), original (原装), the third party (第三方), serial number (序列号) |
| Brand | brand (品牌, 牌子), Apple*, MacBook* (苹果), ThinkPad* (联想), HP (惠普), Asus (华硕), Samsung (三星), Dell (戴尔), Hasee (神舟), domestic products (国货, 国产), Lenovo (联想), Xiaomi (小米), IBM |
| Website | Jingdong (京东, 京豆), self-run (自营) |
| Quality | screen (屏幕), startup (开机), dual system (双系统), performance (性能), configuration (配置), running (运行), system (系统), hard disk (硬盘), quality (质量), machine (机器), keyboard (键盘), fluency (流畅), heat dissipation (散热), play game (玩游戏), mouse (鼠标), software (软件), workmanship (工艺), RAM, hand feel (手感), fan (风扇), runs fast (运行快), battery (电池), graphics card (显卡), effect (效果), resolution ratio (分辨率), clarity (清晰), portability (方便携带), interface (界面), touch tablet (触摸板), utility (性能), bare machine (裸机), driver (驱动), border (边框), hardware (硬件), noise (噪音), operation (运行), test (测试), update (更新), voice quality (音质), charge (充电), SSD, CPU, accessory (配件), standby time (待机时间), compatibility (兼容), sound (声音), CD-ROM, definition (清晰度), version (版本), desktop (桌面), material (材质), luminance (亮度), dexterity (灵敏), power line (电线), color saturation (颜色饱和度), bolt (螺丝), adapter (适配器), mainboard (主板), audio card (声卡), pixel (像素), stability (稳定性), power consumption (耗电量), loudspeaker (扩音器), weight (重量), video (音响), activate (激活) |
| Delivery | delivery (快递), shipment (收货), arrival (收到货), courier (快递员, 快递小哥), Shunfeng, sign for (签收) |
| Price | price/performance ratio (性价比), price (价格), economical (经济, 物美价廉), price spike (秒杀), sale (打折), interest-free(免息), installment (分期), cheap (便宜), worth (值得, 物有所值), reasonable price (价格合理), rush to purchase (抢购), price difference (差价), coupon (优惠券), present (赠品) |
| Appearance | appearance (外观), beautiful (漂亮), design (设计), lightness (轻巧), color (颜色), delicate (精致), fashion (时尚), concise (简洁), packaging (包装盒), cool (酷), exterior (外壳) |
| Service | consumer service (客服), service (服务), attitude (服务态度), sales return (退货), exchange goods (换货), invoice (发票), contact (联系店家), shopkeeper (店家), warranty (保修), reply (店家回复), return and exchange goods (退换货), repair (维修), complaint (抱怨), reimburse (赔偿) |

empirical evidence from surveys. The proposed model offers in-depth and multi-dimensional approaches for the assessment of post-purchase trust. Based on this model, Study 2 will propose an approach that extracts these dimensions and the sentiment of consumers' reviews.

## 4. Study 2

Study 2 was to build on the results of Study 1 to develop a text mining-based tool to assess post-purchase trust via consumer comments. The results of Study 1 demonstrated that consumers' evaluation of the product, their confirmation of delivery, service, and website, and their pre-purchase trust affect their satisfaction and further contribute to post-purchase trust. However, it may not be convenient for practitioners to obtain consumers' evaluations through questionnaires. First, consumers lack the motivation to answer questionnaires, which makes it difficult for practitioners to collect enough samples and leads to bias (Curtin et al., 2000). Second, it is difficult to know whether the participants understand questions in the context of online questionnaires. Misunderstanding or skipping questions affects the reliability of the questionnaire data (Schober et al., 2018). Third, consumers' perceptions may change over time, and because of the long time required to collect questionnaires, it is difficult to capture such changes via questionnaires. Analyzing consumer comments, whereas, is another approach to obtain consumers' evaluations. Consumers express their assessments in textual comments (O'Donovan et al., 2007), often toward specific aspects of the transaction, making it possible to uncover consumers' opinions toward different aspects from comments (Zhang et al., 2014) Compared with questionnaires, consumer comments are more available, low-cost, and can be continuously collected. Text mining of consumer comments has been used for evaluating satisfaction (Hong et al., 2019; Xu & Li, 2016), word of mouth (Liang et al., 2015; Liu, 2006), and trust (Chavan & Kulkarni, 2015; Porntrakoon & Moemeng, 2017; Zhang et al., 2014).

Because pre-purchase trust and perceived value could not be obtained via comments, the two factors are excluded in Study 2. Eight factors of post-purchase trust were identified to be assessed through consumers' comments, including appearance, authenticity, brand, service, quality, delivery, website, and price.

### 4.1. Proposed method

The critical component of the approach is conducting a sentiment analysis of the different factors. The first step is to differentiate factors and a dictionary is needed. To build the dictionary for factor differentiation, we first conducted a frequency analysis of 300,000 comments on laptops on jd.com. Words that occurred more than 100 times were recorded. These words constitute 87.5% of all the words collected, which we think is enough to represent all comments. Among these words, those found related to the eight factors are assigned to factors and were called factor words. The obtained dictionary is in Table 5. In the table, a word following "*" represents words with the same meaning. Apple* contains both Apple and apple.

The second step is to get consumers' opinions of each factor *via* conducting a sentiment analysis of the content between each factor's words. The dictionary of sentiment and degree assessment is derived from CKNI. Sentiment words that express positive or negative opinions were collected. In addition, we added some words that express opinions and occurred frequently in the comments (i.e., the frequency of mention >100 in the 300,000 comments) to the dictionary. Some words appear mainly in the e-commerce context, such as "five star" (五星) and some words express opinions on certain factors. For example, "laggy" (卡顿) expresses a negative opinion of the quality factor. In addition, if any negation word (e.g., "not" (不, 不是) is

extracted before the sentiment word, the sentiment changes to its opposite. Because adverbs influence the effect of sentiment (Lee et al., 2009; Yao & Lou, 2007), we also assess the degree of influence by collecting adverbs from CKNI. These degree words were divided into five categories, representing decreasing degrees from high to low: extreme/most (极, 最), very (很), more (较), -ish (稍), and insufficiently (欠). We designed the weights of the five categories as 2, 1.6, 1.2, 0.8, and 0.4, respectively. Referring to Demers and Vega (2011), for each factor word, we considered the effect of the degree word before the sentiment words as follows:

$$\text{Score} = \sum sentiment * degree$$

Where sentiment is the positive or negative opinion of each sentiment word of the factor word; degree is the weight of the degree word before the sentiment word. If no degree word before the sentiment word, degree = 1. The sum of the scores of all factor words occurring in the comment is the score of the factor.

The score is obtained for all factors. For example, there is a comment "The system is very good, the screen is beautiful and the delivery is quick." From the dictionary of factor differentiation, we identified that two factors, i.e., quality and delivery, are mentioned. For "Quality" factor, the factor words are "system" and "screen," the sentiment words of the factor words are "good" and "beautiful" with "good" is strengthened by "very," which has a strength of 2. For "Delivery" factor, the factor word is "delivery" and the sentiment word is "quick," with no degree word. Therefore, in the example, for "Quality" factor, the score = 1*2 + 1*1 = 3; for "Delivery" factor, the score = 1*1 = 1.

For each comment, the method provides three outputs for each factor: the frequency of occurrence of the factor, the hit density of the factor, and the sentiment score of the factor. The occurrence of a specific factor is how many factor words of the factor appear in the comment, the hit density is defined as the occurrence of the factor divided by the total number of meaningful words in the comment, and the score is calculated as above. The three indicators reflect how often consumers comment on the factor, how densely the factor populates in the comment, and the opinion consumers have of the factor, respectively.

## 4.2. Case study

### 4.2.1. The aim of the case study

To show the feasibility and applicability of the proposed method, we report a case study in which two brands were compared. As mentioned above, the method assesses the eight factors influencing post-purchase trust *via* conducting a sentiment analysis of consumer comments. In practice, the sellers can be different entities, such as brands, manufacturers, or distributors. Any particular entity needs to collect its' consumers' comments and apply the proposed method to the data, following which assessments are provided. We selected two major brands of laptops, the Apple MacBook and the Lenovo ThinkPad, to compare consumers' assessments of the two brands. These assessments provide understanding of the two brands' consumers and diagnostic suggestions for the brands, showing the practical value of the proposed method.

To achieve our aim, 1,015,484 comments on the laptops of the two brands (401,377 for MacBook and 614,107 for ThinkPad) were crawled from jd.com from October 10, 2014, to March 12, 2017. First, the three outputs of the proposed method were discussed in Sections 4.2, 4.3, and 4.4, respectively. A comparison of the three indicators may indicate the emphases of the two groups of consumers and a word-frequency analysis was undertaken to find which factors are crucial in the "Quality" factor. Based on the analysis, we know what consumers of the two brands are talking about in relation to the factor, help the brands to understand their consumers, and provide comprehensive and diagnostic suggestions for promoting post-purchase trust.

### 4.2.2. Occurrence

Table 6 shows the total number, the mean, and the standard deviation of occurrence of each factor. Some differences can be found between the two brands. First, the results show that, from the perspective of occurrence, "Authenticity" occurs much more often in MacBook consumers' comments than in ThinkPad consumers' comments. Second, although "Quality" is the factor that occurs most frequently for both brands, the mean frequency of occurrence of "Quality" with ThinkPad consumers is particularly high. Despite these differences, there are also some similarities between the brands. First, except for "Authenticity," "Brand," and "Quality," the average frequency of occurrence of the other five factors are similar. Second, as shown in Figure 3, the mean frequencies of occurrence of the two brands present a similar pattern along the eight factors. For both brands, the average occurrence of "Quality" is the most, and "Service" and "Authenticity" are the two least mentioned factors for either brand.

### 4.2.3. Hit density

The hit density of a factor is the ratio of the hits that the factor received divided by the number of meaningful words in a comment, indicating how densely a factor is populated in a comment. Analysis of hit density can provide insights to understand consumers of the two brands.

The mean hit intensity is shown in Table 7 and Figure 4. First, consumers of the two brands show a similar pattern

**Table 6.** Mean occurrences of the factors.

| | MacBook ($N = 401,377$) | | | ThinkPad ($N = 614,107$) | | |
|---|---|---|---|---|---|---|
| | Sum | Mean | *SD* | Sum | Mean | *SD* |
| Appearance | 71,414 | 0.18 | 0.52 | 111,641 | 0.18 | 0.55 |
| Authenticity | 34,765 | 0.09 | 0.32 | 13,502 | 0.02 | 0.17 |
| Brand | 62,873 | 0.16 | 0.44 | 82,411 | 0.13 | 0.49 |
| Delivery | 75,527 | 0.19 | 0.49 | 106,140 | 0.17 | 0.50 |
| Price | 86,180 | 0.21 | 0.61 | 151,202 | 0.25 | 0.61 |
| Quality | 255,406 | 0.64 | 1.26 | 629,917 | 1.03 | 2.05 |
| Service | 37,224 | 0.09 | 0.46 | 55,419 | 0.09 | 0.45 |
| Website | 55,322 | 0.14 | 0.45 | 62,605 | 0.10 | 0.41 |

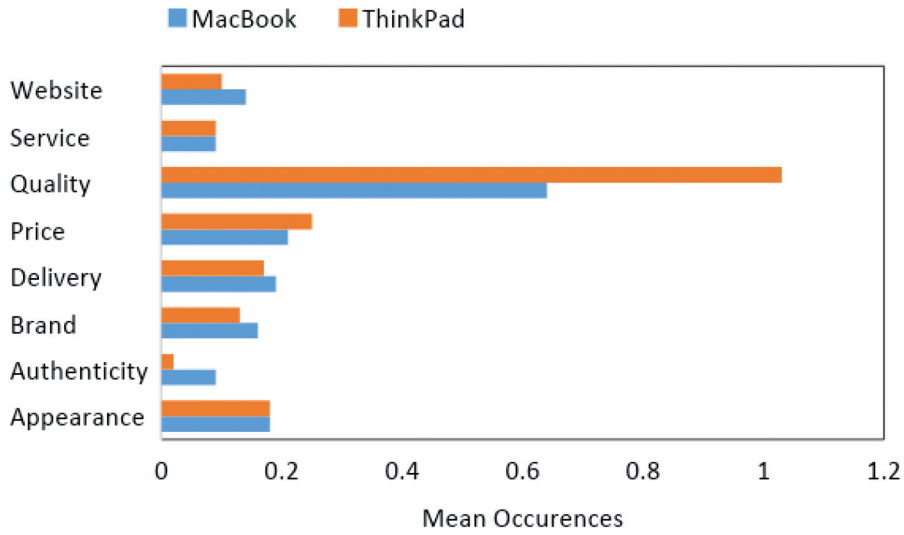


**Figure 3.** Mean occurrences of eight factors for two brands.

**Table 7.** Mean hit intensity for the factors.

| | MacBook | | ThinkPad | |
|---|---|---|---|---|
| Factor | Mean | *SD* | Mean | *SD* |
| Appearance | 0.16 | 0.1326 | 0.130 | 0.1186 |
| Authenticity | 0.174 | 0.1675 | 0.139 | 0.1572 |
| Brand | 0.129 | 0.0929 | 0.116 | 0.0976 |
| Delivery | 0.141 | 0.0899 | 0.132 | 0.1000 |
| Price | 0.125 | 0.1338 | 0.170 | 0.1471 |
| Quality | 0.183 | 0.1285 | 0.193 | 0.1333 |
| Service | 0.128 | 0.1054 | 0.106 | 0.1059 |
| Website | 0.125 | 0.0851 | 0.109 | 0.0870 |

among the factors from the perspective of hit density, with "Quality" is the most dense factor. Second, "Price" is populated more densely in ThinkPad consumers' comments than in MacBook consumers' comments. Third, "Authenticity" and "Appearance" populated more densely in MacBook consumers' comments than in ThinkPad consumers' comments.

### 4.2.4. Sentiment score

The mean sentiment score for each factor of post-purchase trust indicates the average assessments of consumers. However, as few consumers mentioned all the factors in a comment, the sentiment score data are quite sparse, which means many factors obtained a score of 0 in most comments. The mean opinion score excluding the not-mentioned comments is presented in Table 8 and Figure 5.

The results indicate the evaluations of consumers who mentioned the factors. First, for all the factors, the average sentiment scores for the two brands are similar, showing consumers' average opinions of the factors are approximately equal. Second, the sentiment score for "Quality" and "Brand" for ThinkPad is larger than it is for MacBook, showing that for consumers who mention the two factors, ThinkPad consumers have more positive assessments than MacBook consumers.

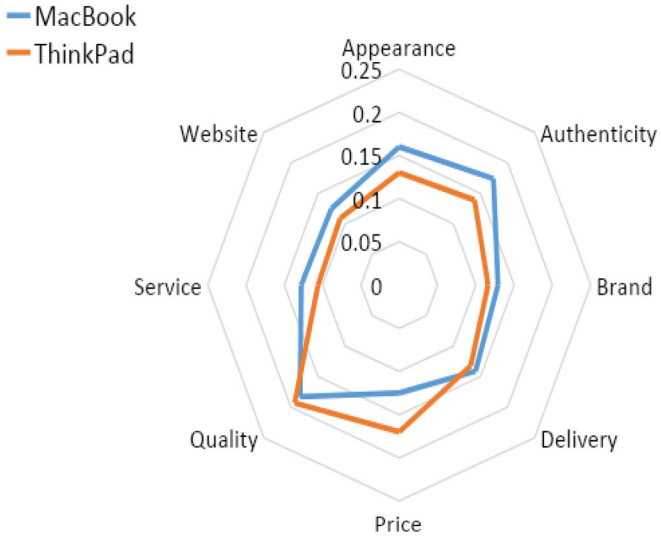


**Figure 4.** Mean hit intensity of eight factors for two brands.

**Table 8.** Mean opinion scores for the factors.

| | MacBook | | ThinkPad | |
|---|---|---|---|---|
| | Mean | *SD* | Mean | *SD* |
| Appearance | 1.34 | 0.81 | 1.36 | 0.93 |
| Authenticity | 1.14 | 0.49 | 1.11 | 0.53 |
| Brand | 1.14 | 0.59 | 1.34 | 0.91 |
| Delivery | 1.22 | 0.68 | 1.28 | 0.74 |
| Price | 1.36 | 0.97 | 1.35 | 0.82 |
| Quality | 1.74 | 1.60 | 2.17 | 2.54 |
| Service | 1.43 | 1.17 | 1.47 | 1.20 |
| Website | 1.24 | 0.73 | 1.28 | 0.82 |

### 4.2.5. Word frequency analysis

The above analysis pinpoints critical factors, and word frequency analysis can be used to provide detailed information about particular factors. "Quality" was found to be the most frequently mentioned factor. It is related to many things, such as the "Hardware" or "System;" however, what is critical in the consumers' comments? Using word frequency analysis, elements that occur frequently can be identified and provide references for sellers to promote the factor.

The result for "Quality" is shown in Table 9. First, for the factor of "Quality," "System" is the most important aspect with which consumers are concerned for both brands, especially in MacBook consumers' comments. This may be due to MacBook's unique system. Considering the comments again, it was found that consumers were talking about their adaption to the system, the usability of the system and that some of them preferred to use a dual system. Second, "Screen" and "Performance" occur frequently in MacBook consumers' comments and ThinkPad consumers are talking about the speed of starting up the laptop and the hard disk.

### 4.3. Summary of study 2

Based on the model identified by Study 1, Study 2 proposed a text mining-based approach to extract and evaluate the critical factors of post-purchase trust via conducting text mining to consumer comments and conducted a case study to show the feasibility of the approach. The comparative case study showed that consumers of MacBook and ThinkPad rank the factors in a similar order of importance, with "Quality" is the most critical factor and "Website" and "Authenticity" received the least attention, and ThinkPad consumers have more positive assessments than MacBook consumers in "Quality" and "Brand" and they care "Price" more. The results suggested that the two manufacturers pay particular attention to the product quality and ThinkPad adopted a competitive pricing policy. Study 2 demonstrated that the proposed method is helpful for practitioners to monitor the factors influencing post-purchase trust, understand their consumers, and take targeted measures to improve trust.

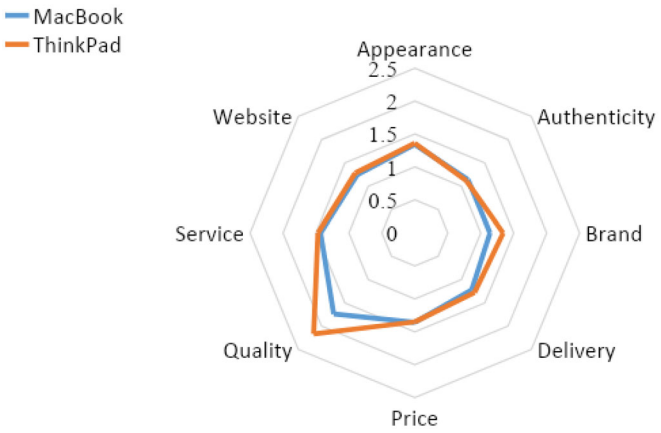


Figure 5. Mean opinion scores of the factors for two brands.

## 5. Discussion

### 5.1. Findings

This study proposes a comprehensive model of post-purchase trust in e-commerce and based on the model, develops a method to assess trust by analyzing the sentiment of consumers' reviews. The model reveals the relationships between consumers' post-purchase trust and its determinants (i.e., consumers' evaluation of product, delivery, service, and website). Study 1 verifies the model by surveying 249 e-commerce consumers and structural equation modeling. Based on the model, Study 2 proposes a sentiment-analysis approach to text mining-based ally extract and evaluates these factors via mining consumer comments, and conducted a case study to show the feasibility of the approach.

The model of Study 1 indicates three key contributions. The first major contribution is to consider consumers' evaluations of four aspects of the transaction to investigate post-purchase trust. While some research used confirmation to study how much the vendor meets consumers' expectations, most of them focused on the overall perception and confirmation (Kim, 2014; Kim et al., 2003, 2009). Our model explains 59.5% of the variance of satisfaction, which is higher than those studies that use the overall confirmation of the transaction (Kim, 2014; Kim et al., 2003, 2009) (i.e., 55.4, 49.5, 49%, respectively). The results indicate that considering different aspects is helpful for understanding consumers. In the post-purchase phase, consumers may feel the vendor's performance in different aspects and evaluate these aspects to form their satisfaction and post-purchase trust. By considering different aspects, researchers can know the relative importance of different aspects and provide diagnostic suggestions to practitioners. This suggests future research to take consumers' evaluation of different aspects to investigate their attitude and behavior.

Second, the study reveals that the confirmation of delivery, service, website, and perceived value of the product is

Table 9. The 14 most frequently mentioned words for the "Quality" factor in the comments on the two brands

| MacBook | | | ThinkPad | | |
|---|---|---|---|---|---|
| Words | Frequency | Percentage | Words | Frequency | Percentage |
| System | 36,287 | 19.98% | System | 42,608 | 7.96% |
| Screen | 9,217 | 5.08% | Starting up | 40,594 | 7.59% |
| Performance | 8,825 | 4.86% | Hard disk | 32,125 | 6.00% |
| Software | 6,961 | 3.83% | Performance | 23,412 | 4.38% |
| Starting up | 6,416 | 3.53% | Operation | 22,131 | 4.14% |
| Workmanship | 6,176 | 3.40% | Computer requirements | 20,371 | 3.81% |
| Battery | 5,485 | 3.02% | Screen | 18,219 | 3.41% |
| Dual system | 5,198 | 2.86% | Keyboard | 15,643 | 2.92% |
| Heat dissipation | 4,708 | 2.59% | Mouse | 14,632 | 2.73% |
| Operation | 4,574 | 2.52% | Memory | 13,687 | 2.56% |
| Computer requirements | 4,044 | 2.23% | Heat dissipation | 13,678 | 2.56% |
| Feeling | 3,688 | 2.03% | Sound | 13,049 | 2.44% |
| Keyboard | 3,465 | 1.91% | Software | 12,825 | 2.40% |

important for post-purchase trust. In the post-purchase phase, a higher level of confirmation reduces a consumer's uncertainty associated with online vendors and helps the vendor establish a good reputation and relationship with the consumer. When another transaction happens, the positive prior experience decreases the consumers' desire to look for alternative vendors since searching requires much effort (Hellier et al., 2003), so consumers are more likely to repurchase the vendor. Therefore, there is a need for vendors to fulfill consumers' expectations throughout the shopping process, especially the product, which is found more influential than the other three aspects.

Third, by adding consumers' evaluation of product appearance and authenticity, our model explains 58.9% of perceived quality, which is higher than the explanation of 24.6% of perceived quality in Sullivan and Kim (2018), indicating the necessity of including the two attributes. Although previous research suggests positive associations between perceived price and quality (Sullivan & Kim, 2018; Zeithaml, 1988), our model suggests no significant association. A possible explanation is that the previous studies investigate the pre-purchase situation whereas this study focuses on the post-purchase phase, in which consumers evaluate the product quality according to their substantial experience rather than price. In this phase, the assessment of perceived quality and the perceived price is more independent than in the pre-purchase phase.

The trust assessment method in Study 2 performs better than previous text mining-based studies (Porntrakoon & Moemeng, 2017; Zhang et al., 2014) in two aspects. First, the method in Study 2 analyzes texts based on a lexicon, and thus the clusters of the current study are more meaningful and easy to understand. In previous studies, some terms may be assigned to unrelated factors, making some clusters difficult to interpret (Emayakumaari & Ananthi, 2015; Zhang et al., 2014). For example, in the study of Zhang et al. (2014), "payment" is assigned to the dimension of delivery, and "service," "product," and "buy" are clustered into one dimension. These arcane clusters make practitioners difficult to make improvements. Second, factors like authenticity and brand are included in the current study. Emayakunaari and Ananthi (2015) extracted four factors (i.e., product, delivery, communication, and cost), Porntrakoon and Moemeng (2017) extracted three factors (i.e., product quality, price, and delivery service). Different from these studies which take the product as one factor, the study considers attributes of products to offer a more comprehensive view highlighting the effect of consumers' evaluation of the product. The study also suggests research using texting–mining to evaluate trust pay more attention to the lexical approach.

### 5.2. Implications

From a practical perspective, the study has three implications. First, the finding reveals consumers' trust in vendors can be enhanced by satisfying consumers' four aspects expectations, including product, service, delivery, and website. Previous studies have shown that consumers' overall confirmation of their expectations to the vendor increases satisfaction and then leads to trust (Chen et al., 2010; Kim, 2014; Kim et al., 2003, 2009, 2012), but the overall confirmation does not provide vendors suggestions about where to improve. We advise vendors to pay attention to all four aspects to assure consumers' trust.

Second, given the four aspects can be used to assure trust, the study suggests vendors monitor consumers' evaluations of the four aspects. To do this, vendors can collect questionnaires or text mining consumer comments. For example, we suggest vendors send questionnaires that ask consumers to evaluate the four aspects after a transaction or segment online reviews into several parts (e.g., product, service, delivery, and website) and ask consumers to comment on each part independently. With these evaluations on different aspects, vendors will know which aspect is lagging and improve the aspect.

Third, the study suggests vendors consider the appearance and authenticity of products to improve consumers' evaluations of product quality, and hence consumer satisfaction and post-purchase trust. In our study, the perceived value of products is found the most effective determinant of consumer satisfaction, which further affects post-purchase trust. The result is consistent with previous studies (Eid, 2011; Harris & Goode, 2004; Kassim & Abdullah, 2010), indicating that product is the major expectation of consumers. Thus, product quality should always take the central position for vendors to manage the transaction and consumer relationship (Kim, 2014). In the pre-purchase phase, consumers expect authentic products (Eggers et al., 2013) and they take the authenticity of products as important cue to evaluate the product (Park et al., 2016). Our study shows that in the post-purchase phase, authenticity is also important for consumers to evaluate the perceived quality of products. That reminds vendors that they should provide consumers with credible and convenient access, such as anti-counterfeit QR codes or special labels, to check the authenticity to make sure the product is authentic. In the study, appearance is found more effective than authenticity in affecting consumers' evaluations of product quality. Good appearance gives consumers a positive impression of the product quality before the purchase (Zeithaml, 1988) and our study further indicates that even in the post-purchase phase, where consumers feel and use the product, appearance still has a large impact on their evaluations of the product. Therefore, we suggest vendors invest in improving the appearance of their products to improve product evaluation, which in turn enhances consumer satisfaction and post-purchase trust. However, the importance of appearance may be different for different types of products, thereby we expect more research tailor to different types of products.

Fourth, we provide a framework of post-purchase trust and attempt to build Chinese lexicons for laptops based on the framework. We advise vendors to apply our framework to other areas and build lexicons accordingly. With the lexicons, vendors can obtain more meaningful and

comprehensive results about their performances in the factors of the framework.

## 6. Conclusion and limitation

The study proposes a theoretical model of post-purchase trust, which augments the existing literature on post-purchase trust by considering the different aspects of the vendor's performance, including product, service, delivery, and website. The study further utilizes appearance, authenticity, perceived price, and brand reputation to evaluate products more comprehensively. The model argues that all four aspects are important for post-purchase trust and repurchase intention. Based on the model, we identify eight factors that are important for post-purchase trust and can be extracted from consumer comments. The proposed sentiment analysis-based method is employed in consumer comments to obtain consumers' attitudes toward these factors. The results of the case study show consumers' emphasis in the post-purchase phase and offer diagnostic suggestions to vendors, indicating the method is meant for practitioners to promote post-purchase trust and understand consumers.

There are several limitations of the study to be noted. First, the results of the model should be used with caution when dealing with different types of products. Consumers are influenced differently when they are buying different types of products (Chiang & Jang, 2007; Girard et al., 2002, 2003). For example, the effect of word-of-mouth of positive online comments is larger for products whose main features can be objectively evaluated from readily available information than products that need to be examined (Hao et al., 2010). Therefore, the effect of trust may be not significant on some types of products, and future studies are needed to explore whether the effect is significant all the time.

Second, the proposed method in Study 2 is lexicon-based. It needs the manual labor of experts to build the dictionary. Experts need to classify which factor the words belong to and define appropriate rules based on their knowledge. Furthermore, the proposed method is less flexible than the learning-based methods. The lexicons developed for one product type may not be used for another, making it hard for practitioners to apply the method. We expect more accurate and convenient text mining-based methods to come.

In addition, it should be noted the current research was motivated to investigate post-purchase trust of physical goods that can rarely be experienced before online purchase. Further research and modifications are needed when the framework and the tool are to be applied to gauge post-purchase trust in virtual goods. The intangible nature of virtual goods entails different determinants of consumer satisfaction (e.g., the delivery may not be a peculiar issue as most virtual goods are delivered instantly) and factors influencing perceived product quality. Furthermore, caution needs to be exercised to apply the comment-mining method to credence goods and services (Darby & Karni, 1973), whose qualities can hardly be verified or accurately evaluated by an average consumer even after the actual experience (e.g., complex medical services). Our method draws on aggregating evaluations from a crowd of individual consumers, and the majority of them may not be able to evaluate the quality of credence goods and services properly due to reasons, such as insufficient expertise and knowledge. Insights obtained through mining such comments, though still reflecting consumers' perceptions and attitudes, may be insufficient to reveal avenues of further improvement for such goods and services.

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**Appendix A.** Measurement items for constructs.

| Constructs (reference) | Measurement items |
|---|---|
| Pre-purchase trust (Gefen, 2000; Jarvenpaa et al., 1999) | Before I purchase from the vendor, I believe that |
| | The vendor is trustworthy. |
| | The vendor is trustful in its dealings with me. |
| | The vendor is honest. |
| | The vendor is sincere and genuine. |
| | The vendor keeps promises and commitments. |
| | The vendor is competent and effective in providing its service. |
| Perceived quality (Dodds et al., 1991) | After I received the product, I think |
| | The quality of the product of the vendor was excellent. |
| | The performance of the product of the vendor was excellent. |
| | Generally, I'm satisfied with the quality of the product of the vendor. |
| Appearance (Stone-Romero et al., 1997) | After I received the product, I think |
| | The product looks very attractive. |
| | The product is very elegant. |
| | I am satisfied with the appearance of the product. |
| Authenticity* (Beverland & Farrelly, 2010) | After I received the product, I think |
| | The product is (1) genuine to (7) fake |
| | The product is (1) original to (7) counterfeit |
| | The product is (1) authentic to (7) non-authentic |
| Brand reputation (Jarvenpaa et al., 1999; Teo & Liu, 2007) | The brand of the product has a good reputation in the market |
| | In general, I believe the brand always fulfill its promise to its consumers. |
| | In my opinion, the brand has a food image. |
| Perceived competitive price* (Gupta & Kim, 2007) | It may be cheaper to buy the product in another vendor. |
| | It may be possible to get a better discount from another vendor. |
| | I may need to pay more money buying the product in this vendor than in another vendor. |
| Perceived quality (Dodds et al., 1991) | The quality of the product was excellent. |
| | The performance of the product was excellent. |
| | Generally, I'm satisfied with the quality of the product. |
| Perceived value (Dodds et al., 1991) | The product I bought was a very good value for the money. |
| | The product I bought was considered to be a good buy. |
| | The price of the product was very acceptable. |
| Delivery confirmation (Bhattacherjee, 2001; Oliver & Burke, 1999) | Overall, most of my expectations of the delivery of the vendor were confirmed. |
| | My experience with the delivery of the vendor was better than what I had expected. |
| | The expectations that I have regarding the delivery of the vendor were correct. |
| Service confirmation (Bhattacherjee, 2001; Oliver & Burke, 1999) | Overall, most of my expectations of the service of the vendor were confirmed. |
| | My experience with the service of the vendor was better than what I had expected. |
| | The expectations that I have regarding the service of the vendor were correct. |
| Website confirmation (Bhattacherjee, 2001; Oliver & Burke, 1999) | Overall, most of my expectations of the website were confirmed. |
| | My experience with the website was better than what I had expected. |
| | The expectations that I have regarding the website were correct. |
| Satisfaction (Spreng et al., 1996) | How do you feel about your overall experience of the purchase from this e-vendor? |
| | Satisfaction (1 = very dissatisfied, 7 = very satisfied) |
| | Pleasure (1 = very displeased, 7 = very pleased) |
| | Contentedness (1 = very frustrated, 7 = very contented) |
| | Delightedness (1 = absolutely terrible, 7 = absolutely delighted) |
| Post-purchase trust (Gefen, 2000; Jarvenpaa et al., 1999) | Before I purchase from the vendor, I believe that |
| | The vendor is trustworthy. |
| | The vendor is trustful in its dealings with me. |
| | The vendor is honest. |
| | The vendor is sincere and genuine. |
| | The vendor keeps promises and commitments. |
| | The vendor is competent and effective in providing its service. |
| Repurchase intention (Dodds et al., 1991; Teo & Liu, 2007) | If I were to buy the product again, I would consider buying it in this vendor. |
| | The likelihood of my purchasing a product again in this vendor is high. |
| | I would like to revisit the vendor to purchase products. |
| | If I could, I would like to make a purchase in this vendor. |

*Note.* Scales of measurement items not mentioned in the table were anchored with end points of strongly disagree (1) and strongly agree (7).
*Reverse coded.

**Appendix B.** Exploratory factors analysis results.

| | Mean | SD | Pre-purchase trust | Repurchase intention | Delivery confirmation | Satisfaction | Authenticity | Brand reputation | Appearance | Perceived price | Service confirmation | Perceived value | Website confirmation | Perceived quality |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pre-purchase trust1 | 6.01 | 0.96 | 0.75 | 0.23 | 0.17 | 0.18 | 0.09 | 0.17 | 0.16 | −0.03 | 0.09 | 0.11 | 0.03 | 0.16 |
| Pre-purchase trust2 | 6.11 | 0.88 | 0.84 | 0.1 | 0.12 | 0.13 | 0.16 | 0.12 | 0.19 | −0.02 | 0.11 | 0.13 | 0.13 | 0.07 |
| Pre-purchase trust3 | 5.95 | 0.97 | 0.83 | 0.11 | 0.13 | 0.09 | 0.12 | 0.12 | 0.22 | 0.03 | 0.11 | 0.16 | 0.13 | 0.05 |
| Pre-purchase trust4 | 5.94 | 1.00 | 0.78 | 0.14 | 0.13 | 0.04 | 0.24 | 0.22 | 0.15 | 0.06 | 0.1 | 0.13 | 0.04 | 0.06 |
| Pre-purchase trust5 | 6.10 | 0.89 | 0.82 | 0.13 | 0.11 | 0.07 | 0.22 | 0.16 | 0.1 | −0.01 | 0.14 | 0.1 | 0.16 | 0.08 |
| Pre-purchase trust6 | 6.08 | 0.89 | 0.82 | 0.16 | 0.12 | 0.11 | 0.2 | 0.16 | 0.14 | −0.04 | 0.16 | 0.09 | 0.11 | 0.1 |
| Perceived quality1 | 5.93 | 1.01 | 0.41 | 0.27 | 0.08 | 0.18 | 0.17 | 0.24 | 0.3 | 0.05 | 0.09 | 0.2 | 0.09 | 0.62 |
| Perceived quality2 | 5.92 | 1.03 | 0.42 | 0.29 | 0.13 | 0.15 | 0.21 | 0.23 | 0.3 | 0.06 | 0.09 | 0.16 | 0.05 | 0.59 |
| Perceived quality3 | 6.03 | 0.97 | 0.4 | 0.34 | 0.14 | 0.19 | 0.18 | 0.22 | 0.29 | 0.08 | 0.09 | 0.17 | 0.12 | 0.51 |
| Appearance1 | 5.79 | 1.10 | 0.3 | 0.2 | 0.12 | 0.09 | 0.07 | 0.11 | 0.73 | 0.08 | 0.2 | 0.16 | 0.09 | 0.13 |
| Appearance2 | 5.61 | 1.17 | 0.28 | 0.18 | 0.1 | 0.16 | 0.06 | 0.18 | 0.78 | 0 | 0.12 | 0.08 | 0.12 | 0.07 |
| Appearance3 | 5.80 | 1.06 | 0.27 | 0.2 | 0.08 | 0.15 | 0.12 | 0.13 | 0.76 | 0.02 | 0.12 | 0.15 | 0.1 | 0.14 |
| Authenticity1 | 6.37 | 1.22 | 0.21 | 0.1 | −0.04 | 0.08 | 0.79 | 0.11 | 0.05 | 0.07 | 0.09 | 0.05 | 0.04 | 0.08 |
| Authenticity2 | 6.48 | 1.00 | 0.21 | 0.16 | 0.05 | 0.14 | 0.86 | 0.2 | 0.1 | 0.03 | 0.07 | 0.11 | 0.04 | 0.09 |
| Authenticity4 | 6.53 | 0.99 | 0.27 | 0.1 | 0.06 | 0.01 | 0.82 | 0.12 | 0.06 | 0.06 | 0.08 | 0.13 | 0.07 | 0.02 |
| Brand reputation1 | 5.41 | 1.45 | 0.21 | 0.13 | 0.07 | 0.09 | 0.14 | 0.77 | 0.15 | −0.05 | 0.08 | 0.16 | 0.09 | 0.08 |
| Brand reputation2 | 5.69 | 1.31 | 0.28 | 0.18 | 0.08 | 0.08 | 0.18 | 0.83 | 0.11 | 0.02 | 0.13 | 0.12 | 0.06 | 0.09 |
| Brand reputation3 | 5.69 | 1.30 | 0.28 | 0.16 | 0.07 | 0.14 | 0.17 | 0.76 | 0.14 | 0.03 | 0.15 | 0.18 | 0.11 | 0.09 |
| Perceived price1 | 4.37 | 1.58 | 0.02 | 0.03 | −0.02 | 0.05 | 0.01 | 0 | 0.05 | 0.92 | −0.02 | 0.1 | 0.02 | 0 |
| Perceived price2 | 4.48 | 1.58 | 0 | 0.03 | 0.02 | 0.06 | 0.05 | 0.03 | 0.06 | 0.95 | −0.01 | 0.06 | 0.02 | 0.05 |
| Perceived price3 | 4.57 | 1.58 | −0.03 | 0.02 | 0.01 | 0.01 | 0.07 | −0.04 | −0.03 | 0.81 | 0.09 | 0.15 | 0.04 | 0 |
| Perceived value1 | 5.61 | 1.21 | 0.25 | 0.21 | 0.04 | 0.2 | 0.13 | 0.24 | 0.19 | 0.14 | 0.17 | 0.71 | 0.13 | 0.1 |
| Perceived value2 | 5.56 | 1.26 | 0.25 | 0.17 | 0.1 | 0.16 | 0.14 | 0.19 | 0.13 | 0.2 | 0.16 | 0.78 | 0.08 | 0.06 |
| Perceived value3 | 5.54 | 1.33 | 0.19 | 0.24 | 0.07 | 0.15 | 0.12 | 0.15 | 0.12 | 0.23 | 0.14 | 0.76 | 0.09 | 0.1 |
| Service confirmation1 | 5.33 | 1.34 | 0.2 | 0.26 | 0.19 | 0.14 | 0.09 | 0.13 | 0.14 | 0.07 | 0.71 | 0.16 | 0.18 | 0.01 |
| Service confirmation2 | 5.59 | 1.22 | 0.23 | 0.25 | 0.18 | 0.17 | 0.15 | 0.18 | 0.18 | 0.01 | 0.78 | 0.17 | 0.16 | 0.1 |
| Service confirmation3 | 5.51 | 1.21 | 0.24 | 0.21 | 0.22 | 0.2 | 0.14 | 0.14 | 0.18 | 0.03 | 0.69 | 0.17 | 0.21 | 0.04 |
| Delivery confirmation1 | 5.90 | 1.14 | 0.22 | 0.19 | 0.79 | 0.19 | 0.04 | 0.09 | 0.07 | 0.01 | 0.18 | 0.05 | 0.17 | 0.13 |
| Delivery confirmation2 | 5.61 | 1.30 | 0.12 | 0.16 | 0.72 | 0.1 | 0 | −0.04 | 0.08 | −0.02 | 0.13 | 0.08 | 0.22 | 0.01 |
| Delivery confirmation3 | 5.67 | 1.21 | 0.18 | 0.12 | 0.82 | 0.18 | 0.02 | 0.16 | 0.1 | 0.02 | 0.09 | 0.01 | 0.19 | 0.01 |
| Website confirmation1 | 5.55 | 1.13 | 0.1 | 0.21 | 0.3 | 0.22 | −0.04 | 0.1 | 0.13 | 0.06 | 0.19 | 0.18 | 0.64 | 0.04 |
| Website confirmation2 | 5.82 | 1.00 | 0.25 | 0.16 | 0.37 | 0.18 | 0.11 | 0.14 | 0.08 | 0.06 | 0.21 | 0.05 | 0.71 | 0.06 |
| Website confirmation3 | 5.74 | 1.02 | 0.22 | 0.2 | 0.31 | 0.14 | 0.15 | 0.09 | 0.16 | 0.03 | 0.16 | 0.09 | 0.7 | 0.05 |
| Satisfaction1 | 5.82 | 0.95 | 0.21 | 0.38 | 0.25 | 0.63 | 0.11 | 0.12 | 0.17 | 0.07 | 0.19 | 0.18 | 0.21 | 0.09 |
| Satisfaction2 | 5.81 | 0.96 | 0.17 | 0.38 | 0.27 | 0.65 | 0.11 | 0.11 | 0.18 | 0.09 | 0.2 | 0.18 | 0.25 | 0.12 |
| Satisfaction3 | 5.76 | 0.96 | 0.2 | 0.35 | 0.22 | 0.7 | 0.12 | 0.16 | 0.21 | 0.09 | 0.18 | 0.18 | 0.13 | 0.07 |
| Satisfaction4 | 5.78 | 0.97 | 0.17 | 0.34 | 0.25 | 0.72 | 0.11 | 0.13 | 0.12 | 0.06 | 0.15 | 0.2 | 0.17 | 0.11 |
| Post-purchase trust1 | 5.94 | 0.98 | 0.35 | 0.37 | 0.22 | 0.26 | 0.12 | 0.14 | 0.21 | 0.02 | 0.28 | 0.24 | 0.2 | 0.09 |
| Post-purchase trust2 | 5.95 | 0.99 | 0.33 | 0.34 | 0.23 | 0.25 | 0.27 | 0.15 | 0.16 | 0.08 | 0.27 | 0.18 | 0.18 | 0.11 |
| Post-purchase trust3 | 5.97 | 0.96 | 0.37 | 0.39 | 0.3 | 0.26 | 0.14 | 0.1 | 0.16 | 0.03 | 0.27 | 0.15 | 0.22 | 0.07 |
| Post-purchase trust4 | 5.97 | 0.99 | 0.35 | 0.42 | 0.26 | 0.29 | 0.17 | 0.12 | 0.17 | 0.02 | 0.25 | 0.16 | 0.16 | 0.08 |
| Repurchase intention1 | 5.76 | 1.22 | 0.17 | 0.77 | 0.15 | 0.26 | 0.1 | 0.12 | 0.15 | 0.05 | 0.15 | 0.16 | 0.12 | 0.13 |
| Repurchase intention2 | 5.66 | 1.32 | 0.11 | 0.81 | 0.15 | 0.17 | 0.11 | 0.14 | 0.13 | 0 | 0.13 | 0.13 | 0.11 | 0.12 |
| Repurchase intention3 | 5.73 | 1.31 | 0.23 | 0.81 | 0.1 | 0.19 | 0.12 | 0.15 | 0.15 | 0.02 | 0.17 | 0.13 | 0.16 | 0.08 |

**Appendix C.** PLS item factor loadings and cross loadings.

| | Appearance | Authenticity | Brand reputation | Delivery confirmation | Post-purchase trust | Pre-purchase trust | Perceived price | Perceived Quality | Repurchase intention | Satisfaction | Service confirmation | Perceived Value | Website confirmation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appearance1 | 0.929 | 0.299 | 0.419 | 0.359 | 0.558 | 0.546 | 0.137 | 0.631 | 0.497 | 0.497 | 0.532 | 0.490 | 0.423 |
| Appearance2 | 0.933 | 0.290 | 0.450 | 0.344 | 0.530 | 0.535 | 0.057 | 0.600 | 0.472 | 0.513 | 0.475 | 0.417 | 0.429 |
| Appearance3 | 0.936 | 0.336 | 0.434 | 0.328 | 0.555 | 0.530 | 0.087 | 0.643 | 0.494 | 0.522 | 0.480 | 0.473 | 0.412 |
| Authenticity1 | 0.253 | 0.908 | 0.347 | 0.105 | 0.363 | 0.409 | 0.120 | 0.407 | 0.293 | 0.289 | 0.313 | 0.299 | 0.216 |
| Authenticity2 | 0.360 | 0.954 | 0.481 | 0.225 | 0.507 | 0.488 | 0.094 | 0.517 | 0.419 | 0.428 | 0.392 | 0.416 | 0.300 |
| Authenticity3 | 0.299 | 0.928 | 0.393 | 0.200 | 0.425 | 0.483 | 0.114 | 0.429 | 0.329 | 0.309 | 0.355 | 0.383 | 0.279 |
| Brand reputation1 | 0.412 | 0.370 | 0.918 | 0.270 | 0.419 | 0.456 | −0.007 | 0.512 | 0.381 | 0.392 | 0.393 | 0.446 | 0.343 |
| Brand reputation2 | 0.430 | 0.441 | 0.953 | 0.307 | 0.503 | 0.541 | 0.064 | 0.574 | 0.451 | 0.436 | 0.468 | 0.482 | 0.370 |
| Brand reputation3 | 0.467 | 0.433 | 0.946 | 0.316 | 0.520 | 0.547 | 0.077 | 0.590 | 0.463 | 0.492 | 0.497 | 0.533 | 0.411 |
| Delivery confirmation1 | 0.372 | 0.221 | 0.335 | 0.939 | 0.606 | 0.460 | 0.051 | 0.467 | 0.477 | 0.592 | 0.528 | 0.338 | 0.617 |
| Delivery confirmation2 | 0.277 | 0.119 | 0.161 | 0.866 | 0.463 | 0.303 | 0.011 | 0.285 | 0.364 | 0.441 | 0.409 | 0.242 | 0.549 |
| Delivery confirmation3 | 0.348 | 0.178 | 0.349 | 0.931 | 0.532 | 0.404 | 0.046 | 0.372 | 0.395 | 0.539 | 0.444 | 0.268 | 0.593 |
| Post-purchase trust1 | 0.581 | 0.405 | 0.498 | 0.534 | 0.935 | 0.635 | 0.097 | 0.647 | 0.692 | 0.726 | 0.693 | 0.609 | 0.616 |
| Post-purchase trust2 | 0.544 | 0.524 | 0.507 | 0.530 | 0.943 | 0.628 | 0.157 | 0.646 | 0.670 | 0.713 | 0.683 | 0.582 | 0.596 |
| Post-purchase trust3 | 0.550 | 0.411 | 0.462 | 0.605 | 0.956 | 0.647 | 0.102 | 0.628 | 0.707 | 0.735 | 0.695 | 0.546 | 0.649 |
| Post-purchase trust4 | 0.552 | 0.442 | 0.483 | 0.565 | 0.955 | 0.634 | 0.092 | 0.633 | 0.722 | 0.745 | 0.673 | 0.552 | 0.598 |
| Pre-purchase trust1 | 0.534 | 0.393 | 0.506 | 0.432 | 0.646 | 0.893 | 0.016 | 0.689 | 0.516 | 0.536 | 0.480 | 0.464 | 0.415 |
| Pre-purchase trust2 | 0.551 | 0.448 | 0.487 | 0.398 | 0.605 | 0.940 | 0.018 | 0.646 | 0.422 | 0.478 | 0.489 | 0.471 | 0.456 |
| Pre-purchase trust3 | 0.566 | 0.416 | 0.474 | 0.396 | 0.610 | 0.930 | 0.067 | 0.631 | 0.425 | 0.460 | 0.490 | 0.490 | 0.457 |
| Pre-purchase trust4 | 0.517 | 0.517 | 0.552 | 0.384 | 0.613 | 0.913 | 0.097 | 0.638 | 0.444 | 0.436 | 0.479 | 0.491 | 0.399 |
| Pre-purchase trust5 | 0.496 | 0.498 | 0.513 | 0.388 | 0.624 | 0.935 | 0.026 | 0.633 | 0.442 | 0.450 | 0.508 | 0.457 | 0.472 |
| Pre-purchase trust6 | 0.528 | 0.483 | 0.518 | 0.404 | 0.624 | 0.936 | 0.003 | 0.660 | 0.468 | 0.483 | 0.523 | 0.462 | 0.458 |
| Perceived price1 | 0.103 | 0.083 | 0.041 | 0.015 | 0.079 | 0.040 | 0.943 | 0.118 | 0.086 | 0.145 | 0.067 | 0.285 | 0.090 |
| Perceived price2 | 0.130 | 0.124 | 0.079 | 0.063 | 0.146 | 0.057 | 0.953 | 0.169 | 0.112 | 0.186 | 0.100 | 0.287 | 0.126 |
| Perceived price3 | 0.048 | 0.116 | 0.018 | 0.038 | 0.103 | 0.016 | 0.905 | 0.090 | 0.089 | 0.137 | 0.140 | 0.302 | 0.118 |
| Perceived Quality1 | 0.635 | 0.451 | 0.573 | 0.367 | 0.627 | 0.663 | 0.118 | 0.958 | 0.586 | 0.589 | 0.496 | 0.568 | 0.438 |
| Perceived Quality2 | 0.642 | 0.486 | 0.569 | 0.402 | 0.656 | 0.682 | 0.124 | 0.956 | 0.603 | 0.586 | 0.498 | 0.549 | 0.430 |
| Perceived Quality3 | 0.636 | 0.460 | 0.560 | 0.425 | 0.641 | 0.662 | 0.143 | 0.938 | 0.639 | 0.626 | 0.513 | 0.559 | 0.488 |
| Repurchase intention1 | 0.504 | 0.354 | 0.436 | 0.447 | 0.734 | 0.465 | 0.119 | 0.628 | 0.945 | 0.728 | 0.562 | 0.529 | 0.509 |
| Repurchase intention2 | 0.445 | 0.328 | 0.410 | 0.410 | 0.649 | 0.394 | 0.064 | 0.575 | 0.932 | 0.640 | 0.508 | 0.460 | 0.457 |
| Repurchase intention3 | 0.507 | 0.372 | 0.463 | 0.412 | 0.703 | 0.502 | 0.080 | 0.619 | 0.956 | 0.687 | 0.577 | 0.510 | 0.522 |
| Repurchase intention4 | 0.521 | 0.376 | 0.435 | 0.452 | 0.697 | 0.490 | 0.123 | 0.599 | 0.949 | 0.686 | 0.579 | 0.516 | 0.502 |
| Satisfaction1 | 0.527 | 0.358 | 0.446 | 0.558 | 0.732 | 0.505 | 0.147 | 0.602 | 0.703 | 0.944 | 0.619 | 0.562 | 0.623 |
| Satisfaction2 | 0.536 | 0.358 | 0.434 | 0.582 | 0.760 | 0.484 | 0.169 | 0.611 | 0.710 | 0.954 | 0.628 | 0.564 | 0.659 |
| Satisfaction3 | 0.546 | 0.365 | 0.475 | 0.524 | 0.730 | 0.500 | 0.174 | 0.599 | 0.681 | 0.951 | 0.605 | 0.569 | 0.565 |
| Satisfaction4 | 0.469 | 0.340 | 0.431 | 0.537 | 0.702 | 0.460 | 0.147 | 0.584 | 0.662 | 0.948 | 0.565 | 0.552 | 0.577 |
| Service confirmation1 | 0.457 | 0.314 | 0.417 | 0.460 | 0.656 | 0.465 | 0.130 | 0.446 | 0.543 | 0.565 | 0.929 | 0.489 | 0.550 |
| Service confirmation2 | 0.531 | 0.392 | 0.495 | 0.472 | 0.691 | 0.523 | 0.082 | 0.544 | 0.578 | 0.617 | 0.960 | 0.534 | 0.569 |
| Service confirmation3 | 0.517 | 0.375 | 0.458 | 0.510 | 0.704 | 0.526 | 0.102 | 0.504 | 0.548 | 0.621 | 0.946 | 0.526 | 0.599 |
| Perceived Value1 | 0.514 | 0.390 | 0.540 | 0.297 | 0.605 | 0.516 | 0.243 | 0.590 | 0.531 | 0.589 | 0.544 | 0.943 | 0.448 |
| Perceived Value2 | 0.458 | 0.390 | 0.494 | 0.317 | 0.575 | 0.502 | 0.309 | 0.544 | 0.479 | 0.551 | 0.524 | 0.956 | 0.415 |
| Perceived Value3 | 0.430 | 0.349 | 0.442 | 0.277 | 0.536 | 0.434 | 0.338 | 0.534 | 0.505 | 0.541 | 0.486 | 0.944 | 0.397 |
| Website confirmation1 | 0.394 | 0.157 | 0.333 | 0.552 | 0.558 | 0.349 | 0.125 | 0.391 | 0.478 | 0.590 | 0.533 | 0.434 | 0.897 |
| Website confirmation2 | 0.405 | 0.307 | 0.401 | 0.644 | 0.620 | 0.496 | 0.115 | 0.456 | 0.477 | 0.601 | 0.586 | 0.389 | 0.936 |
| Website confirmation3 | 0.445 | 0.330 | 0.369 | 0.576 | 0.611 | 0.474 | 0.088 | 0.463 | 0.496 | 0.568 | 0.551 | 0.400 | 0.921 |