Trying Before Buying: The Moderating Role of Online Reviews in Trial Attitude Formation Toward Mobile Applications

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ABSTRACT: Online reviews on mobile app marketplaces help consumers evaluate whether a mobile app fits their needs before upgrading or purchasing it. This study explores how online reviews influence trial attitude formation, a process that naturally bears on cognitive structure as much as on users' emotional responses to online experience. We experimentally manipulate the valence (positive vs. negative) and consistency (one-sided vs. two-sided) of online reviews exposed to participants in a laboratory-controlled app trial scenario considering two different aspects of use (hedonic and functional). We find that review valence and consistency alter the emotional process during trial attitude formation but do not affect the cognitive process. In particular, negative reviews compared to positive reviews and two-sided reviews compared to one-sided reviews are more influential in trial attitude formation. Interestingly, two-sided reviews weaken the emotional process during the use of functional apps, but strengthen it during the use of hedonic apps. The study contributes to the literature by identifying the moderating role of online reviews on product trial experience, which in turn influences the formation of product attitudes. The findings help app developers and marketers understand how to elicit positive evaluations during app trials by highlighting the importance of online reviews.

KEY WORDS AND PHRASES: Electronic word of mouth, eWOM, mobile applications, mobile apps, online ratings, online reviews, product evaluation, review consistency, review valence, software trials.

Software programs operating on mobile devices or "apps" are applications that can be downloaded and operated on smartphones, tablet computers, or other devices. With the advent and continuous development of mobile platforms, apps have become incredibly popular over the past few years, and a wide range has been developed with a great variety of functions. According to ABI Research [1], the mobile app market will be valued at US$27 billion, and mobile commerce is expected to account for 24.4 percent of total global e-commerce revenues by 2017, making it a significant software market with greater potential than the traditional desktop one. Flurry Analytics [26] reported that mobile subscribers spend more time using apps than using mobile Web browsers, and on average eight new apps were launched per day in 2012. This ongoing market growth has become a growing focus for researchers and practitioners such as marketers and technology developers, who are trying to discover key indicators that make an app desirable to be downloaded and/or purchased by millions of smartphone owners.

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What makes mobile apps a special case from a distribution point of view is the ability to version them with minimal costs across functionality and platforms, thus representing an ideal example of a "versioned" information good [77] where introductory or "light" versions can be offered to trial users with the aim to "convert" them to paid users through a product trial. Product trials refer to consumers' first-time use experiences with new products or services [41], and they allow consumers to use, examine, and test a product within a limited time frame at no or minimal cost. Nonetheless, a trial version of a product might provide only limited functions and users are asked to pay to receive the complete version [49]. Studies in marketing and consumer psychology have consistently shown that product trials are a powerful mechanism leading to the formation of attitudes toward the product or the service. For example Wang, Wu, and Wang [85] found that a mobile newspaper trial increases the purchase of mobile newspapers. Soscia, Arbore, and Hofacker [79] concluded that product trials have an effect on perceived ease of use and thus influence the adoption of new technology in the case of mobile TV. The direct experience that occurs with a trial reduces perceived risk, and is a better predictor of behavior than an indirect experience, such as that occurring through advertising [24, 42, 78]. Previous research has explored some key issues regarding trials, such as comparing attitude formation in relation to functional and hedonic products [40], and the role of consumer involvement in product trials [44].

A trial version of products or services is a direct approach for consumers to experience a product or service and to evaluate its utility for free or at a reduced cost, but consumers also tend to rely on an indirect approach by seeking the opinions of other consumers. Thus, the study of this electronic word-of-mouth (eWOM) communication has profound implications for sellers and marketers [14]. Various aspects of eWOM have been reported and analyzed by a number of researchers in relation to sellers. For example, Utz, Kerkhof, and van den Bos [82] reported that consumer reviews are important predictors of the trustworthiness of online stores, and even more influential than overall reputation and assurance seals. The influence of reviews has also been examined in different businesses, such as the movie industry and publishing [21] as well as tourism [90].

Although a wealth of studies have discussed how reviews affect a consumer's decision to purchase a product, there is limited research on how reviews influence a customer by positively or negatively influencing his/her attitude during a product trial. There is previous research on software product trials such as virus scanners, grammar-checking software, and video games as well as content subscription trials [5], but we believe mobile apps represent an opportunity to observe such a case. Therefore, our primary focus in this study is to take the case of mobile apps and investigate how online reviews can influence the attitudes of users during an app trial.

More specifically, we focus on two main components of product trial attitude formation as identified in the literature, namely: users' cognitive structure and their emotional response [11]. The general research questions we wish to address are: "In what way do user reviews affect the formation of consumers' trial attitudes? and "Do valence (positive and negative) of online

reviews and their consistency (one-sided and two-sided) have an effect on trial attitudes?" We define review valence as one-sided positive or one-sided negative reviews, and consistency as the extent to which information in a review is consistent with information in other reviews. And if yes, how do these effects change with regard to different product use characteristics. To address that we use a two-stage approach in a controlled experiment with 300 participants. First, we examine whether valence and consistency of online reviews has an effect on mobile app trial experience. Second, we take this further and use a treatment design that considers different aspects of use (hedonic/functional).

The study contributes to the literature by bridging research in product trials and online reviews in various ways. First, whereas a large body of literature has reported that user reviews play an important role in purchase intention (e.g., online shopping and movie ticket sales), few studies have discussed whether user reviews will integrate with trial experience and have an effect on product trial attitude formation. Thus, this study contributes by (a) adding user reviews to the discussion and, in particular, examining whether review valence and consistency affect the product trial attitude formation process for mobile apps. Second, by categorizing mobile apps into functional and hedonic, the study also examines whether the effect of online reviews differs with regard to these two categories.

Conceptual Development

Mobile Applications and Product Trials

Mobile apps are designed to satisfy a broad range of needs, such as entertainment, communication, information, and commerce [17]. Although the majority of apps are totally free of charge for users [50], others charge a one-time price or monetize through the services they provide to a sponsoring entity (e.g., mobile shopping and mobile banking services) or by advertising revenues. With regard to paid apps, these may need to be purchased before they can be downloaded, or are free to download and then paid for at a later time—when the trial period has expired or when the user wants access to the full range of functions. Mobile apps are a subclass of software products where free (freeware) and trial (trialware) versions have been a standard approach on market entry. Based on Lee and Tan's [49] categorization scheme, freeware allows users to use the basic functions of the app without a time limit, and customers can upgrade to the full version. Trialware includes all the functionality of the app, but its use is limited to a certain time frame, beyond which payment is required.

Whereas trialware tends to represent the norm on consumer software products, mobile apps, due to their centralized and regulated distribution channel, are usually found in "lite" and "full" versions. The "full" version comes at a price, but "lite" versions allow the consumer to experience some of the functionality completely free of charge. This can lead to a monetization

for the app developer either by the customer's downloading the full version or by doing an in-app purchase of some of the functionality in a later stage. The experience that users gain from interaction with the lite version of the app is highly critical for converting them from "free" to "paid" customers and thus represents the main variable that we consider in this study. Our main intuition in this perspective is that since the strategy of offering "lite" and "full" versions is common to app developers, it is very important for them to know how to encourage users to use a full app. In this study, we focus on the trial experience of apps because users are usually exposed to reviews at the point of download, and first-time usage critically determines their willingness to adopt the app.

The study of product trials can be traced back to the early work of Fazio and Zanna [24] and Smith and Swinyard [78]. In some cases, trials have been found to outweigh advertising with regard to the effect on brand strength, confidence, and attitudes. Wright and Lynch [87] argued that the experiential attributes of a product or service receive greater attention during trials than when the same attributes are presented in advertisements. Gerlich, Browning, and Westermann [29] reported that the "peel and taste" approach, a means by which to attach samples to printed advertising to enable consumers to experience the flavor or taste of a product, has positive effects on feelings toward the product and the likelihood of making a purchase.

The seminal work of Kempf and Smith [41] formalized a product trial model where two main processes, namely, cognition and emotion, were identified as two important predictors of trial attitudes. Figure 1 provides a conceptual overview of our approach on trial attitude formation for mobile apps. Consumers use a trial version of the app and interact with it by developing emotional and cognitive responses. Motivated by the theoretical insights from Kempf and Smith [41], we distinguish between a functional and a hedonic aspect of app use in order to evaluate how these two processes affect trial attitude formation.

As the purpose of a trial is to evaluate the target product, consumers are expected to consciously evaluate product attributes using cognitive

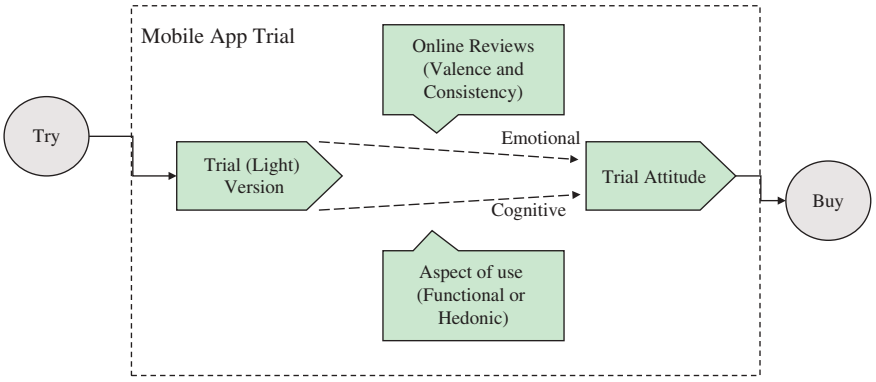

Figure 1. The Conceptual Model

efforts, and thus product-related thoughts based on the trial are generated. For instance, consumers will judge whether the trial allows them to adequately experience product attributes or whether the samples are good representations of the actual products. However, emotional reactions to the products or the trial experiences are also critical in the trial model [56]. Because trials involve direct sensory contact with a product, its hedonic attributes will evoke emotional effects and dramatize a stronger role than cognitive effects will in the evaluation of product trials [44, 63, 67]. Likewise, we believe that individuals form trial attitudes of mobile apps through both cognitive and emotional processes. They may carefully assess whether the target application can provide the benefits they require, and at the same time also rely on emotions during the trial (e.g., [56]). In particular, we propose that emotion has a greater effect than cognition on the formation of trial attitudes toward mobile apps.

Online Reviews and Aspect of Use

How word-of-mouth communication influences attitudes during a trial has been studied extensively in the literature. For example, Kempf and Smith [41] argued that when a product trial is inconclusive, the presence of informative messages such as those found in advertisements have an influence on trial perceptions. An early study by Herr, Kardes, and Kim [32] pointed out that preusage attitudes can be influenced by the presence of (offline) word-of-mouth. Their findings, which are based on the availability/diagnosticity theory introduced by Feldman and Lynch [25], indicated that information provided by reviews can help consumers to identify quality characteristics.

Online reviews dramatize a highly significant role in shaping an individual's view or attitudes during the purchase/adoption process by involving peers in the decision process [81], even for repeat purchases [52]. Reviews can be found on either the retailers/sellers websites or a rating aggregator such as Yelp. In addition, due to the conformity effect [12], individuals change their views, attitudes, or behaviors in response to the opinions of others. A review is normally represented by a numerical star rating scale representing its valence and the accompanying justification or feedback text comments. Evidence suggests that online reviews have an influence on product sales because they reduce uncertainty and enhance trust in online stores [82]. They are seen as being less biased than advertisements [32, 34]. In fact, online shoppers trust online store reviews more than store reputation and assurance seals [82].

Among numerous studies of online reviews, one-sided review valence (positive or negative) has been seen as the main provider of *heuristic cues*, which then induce peripheral processes of attitude formation or attitude change, which have an influence on product or service choice [43]. For example, students are influenced by the valence of reviews when choosing courses [51]. Positive reviews have been shown to have positive influences on attitudes toward websites [20], growth of new product sales [15], and purchase intention [48]. However, a psychological tendency toward criticizing with a negative

attitude, known as a *negativity bias* has also been found in the context of online reviews [88], with consumers relying more on negative than positive reviews [89]. Furthermore, some researchers have found boundary conditions for the negativity bias. For instance, for familiar and preferred brands, positive reviews have a greater effect on purchase intention than do negative reviews on resistance to making a purchase [4]. In addition, negative reviews are less useful than positive reviews for hedonic product evaluation because readers are more likely to attribute reviewers' negative thoughts to the individual reviewer than to a product-related motivation [76].

Aside from one-sided review valence, mixed or two-sided reviews from the literature have reported inconclusive results in regard to their effects on product choice. One group of researchers has found that mixed reviews are helpful and credible because two-sided arguments can be more persuasive [18, 38] or encapsulate positive effects based on optimal arousal theory [23]. Two-sided reviews have also been shown to enhance emotional trust and thus increase the probability of a purchase being made [92]. In contrast, another group of researchers found that mixed ratings and review contents are less helpful and less persuasive than more direct ones [74]. In fact, very high or low ratings with one-sided review arguments were found to be as or more persuasive than those with two-sided arguments, and moderate ratings along with two-sided arguments can also produce favorable judgments [73]. On the other hand, two-sided reviews can have negative influences on users' ability to differentiate between high-credibility and low-credibility cues [54].

Research on the effect of online reviews in the context of mobile apps has been somewhat limited so far in the literature. App reviews were found to be crucial for evaluating mobile games [33] by providing information and feedback on both technical (e.g., stability) and entertaining aspects (e.g., challenge and difficulty). This rich source of information can also be beneficial for app developers [36] in order to establish an improvement cycle. Reviews have even been shown to increase consumers' willingness to pay more for a product than its original price [46]. Therefore, we articulate that whether the review population is one-sided (positive/negative) or two-sided (mixed) will have an effect on trial attitudes toward mobile apps when users are exposed to them before trying.

Online reviews can also vary based on the apps' aspect of use. Batra and Ahtola [7] posited that two dimensions, hedonic and utilitarian (or functional), can be embedded simultaneously within the same object, although both dimensions are weighed differently for different products. In addition, utilitarian shoppers are motivated mainly in a deliberate goal-directed manner, while hedonic shoppers are motivated more by the entertaining dimensions of the shopping experience [6, 57]. In general, consumers will focus on the functional attributes of functional products when judging their quality during trials. In contrast, consumers will pay attention to the entertaining features of hedonic products [40]. Because functional and hedonic applications are different in nature, and consumed for different purposes, it is necessary to discuss the varied influences of online reviews on both aspects of use.

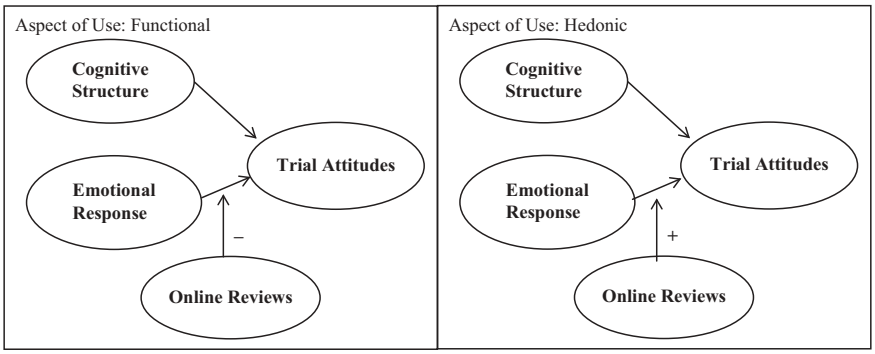

Figure 2. Effects of Online Reviews on Trials of Mobile Apps

Theoretical Model and Hypotheses

In order to materialize the conceptual model discussed in the previous section, we provide a theoretical model and the related hypotheses. We use online reviews as a moderator by examining their effects (strengthening/weakening) in terms of one-sided reviews (one-sided positive/negative) and two-sided reviews (mixed). Taking into account the aspects of use (*functional* and *hedonic*), we evaluate the influence of online reviews on attitude formation for both functional and hedonic apps. Figure 2 illustrates the theoretical path model for this study.

Effects of Online Reviews on Trials of Mobile Apps

Following Kempf [40], we consider a set of two processes of attitude formation that occur during a product trial, namely, cognitive structure and emotional response. We seek to examine whether online reviews influence one or another process. In line with our theoretical argument we wish to explore the effect of online reviews at two levels. First, we question whether the presence of online reviews will have an effect on the trial attitude formation and then we examine the effect of review valence. Past research on word of mouth in the context of product trials (e.g., [32]) has argued that reviews offer additional information related to the product. Nonetheless, mobile apps represent a simple and intuitive software product where users have a high level of familiarity related to product use. In that capacity, users will perceive online reviews as informative judgments related to the utility of the app, and thus will not increase their cognitive effort to assess the apps when reviews are presented during the trial. On the contrary, reviews will act in a way that adheres to the "sufficiency principle," where their content might limit a user's cognitive effort and thus weaken the development of a cognitive process during the trial [13]. Therefore, the first hypothesis is developed, as follows.

Hypothesis 1a (review presence): *Online reviews do not have moderating effects on the cognitive process during mobile application trials.*

On the other hand, emotional responses are contagious [66] and can be influenced by the surrounding atmosphere, information, or people [58]. In order to influence readers, reviewers will make them pay more attention to the reviewers' feelings about product performance in the review message [10, 93]. In that context, review valence might affect the emotional response in a different way. One-sided reviews provide emotional cues in which positive reviews deliver pleasure and satisfaction, whereas negative reviews express resentment and anger [71]. In addition, two-sided reviews can also help determine product attitudes because they are seen as more helpful to users[23]. Therefore, it is reasonable to infer that the emotions elicited during product trials are very likely to be influenced by the emotions expressed by reviewers. Thus:

Hypothesis 1b (review presence): *Online reviews have moderating effects on the emotional process during mobile application trials.*

Seeking to establish whether the presence of reviews has an effect on the emotional response process, we also wish to investigate the effect of the review valence (positive and negative). In the case of the one-sided valence, it would be interesting to evaluate the effect of one-sided positive word-of mouth (PWOM) versus one-sided negative word-of mouth (NWOM). The literature suggests that "bad is stronger than good" [9]. NWOM is more persuasive [82] and more widely disseminated than PWOM [35]. It influences users' perception regarding the trustworthiness and possible manipulation of reviews [18, 19]. In addition, NWOM contributes more informative value than does PWOM [22]. In line with the above reasoning, we hypothesize that negative one-sided reviews will have a stronger effect on the emotional process. Thus:

Hypothesis 2 (review valence): *Negative reviews have stronger moderating effects on the emotional process than positive reviews during mobile application trials.*

Past research has found that two-sided and one-sided messages have different effects on consumer perceptions of products. There is evidence that two-sided reviews tend to be less trustworthy and helpful than one-sided reviews [8, 72, 92]. This can be attributed to the fact that two-sided opinions elicit ambivalent feelings that are highly related to negative emotional outcomes, such as confusion and anxiety [70, 83]. In contrast, another group of researchers found that two-sided reviews are helpful and credible, which can lead to positive outcomes such as assurance [18, 23]. Although the two groups present opposite findings, they both indicate that two-sided reviews alter consumers' emotions. We proposed earlier that the presence of online reviews influences the emotional response during a trial. Here we further propose that two-sided (inconsistent)

reviews will have a greater moderating effect on the emotional process than one-sided (consistent) reviews. Bearing this in mind, we hypothesize the following.

> ***Hypothesis 3 (one-sided vs two-sided):*** *Two-sided (inconsistent) reviews have stronger moderating effects on the emotional process than one-sided (consistent) reviews.*

Having hypothetically established the influence of online reviews on the emotional response during an app's trial, we take the case of review valence and consistency across different aspects of use. We outline additional hypotheses in the sections that follow.

Aspect of Use: Functional Apps

Functional or utilitarian products are consumed for the benefits they bring, so attitudes toward such products are determined largely by utilitarian components, such as usefulness, efficiency, and convenience [6]. In most cases, the evaluation process is done primarily through cognitive assessment. Given that consumers rely on cognitive processes during trials of functional products [40], even when positive or negative reviews that provide additional information are presented, readers will continue evaluating functional products in the same way because consumers converge on their preferences due to a low level of preference heterogeneity [94]. For one-sided valence, positive reviews can be regarded as guidelines or directions, which help readers to stay focused on evaluating the functional attributes of products, and at the same time stabilize emotion. On the other hand, as mentioned earlier, negative reviews possess extrinsic and product-related information [76]. Therefore, during trials, the role of cognitive structures remains important when evaluating functional applications, whereas emotions become less important. As such, both positive and negative reviews will mitigate the influence of emotions on trial evaluations.

Coming to two-sided reviews, Korfiatis, García-Bariocanal, and Sánchez-Alonso [45] posited that online reviews with high levels of conformity are more helpful to readers, with two-sided or mixed reviews being more confusing and thus less helpful. Furthermore, through an analysis of neural responses, Ochsner and Gross [60] postulated that cognitive processes regulate emotions, especially in the case of reappraisal or reinterpretation of the meaning of a stimulus. As such, it is hypothesized that during trials that resemble the reappraisal stage, when two-sided messages are provided, users will experience a reduction in the influence of emotional effects and will focus mainly on cognitive structure to judge the trial experience because there is a need to determine whether their attitudes are in accordance with the comments. Based on the above reasoning, the following hypotheses are developed:

Hypothesis 4a (one-sided): *For functional mobile applications, positive reviews negatively moderate the emotional process during trials.*

Hypothesis 4b (one-sided): *For functional mobile applications, negative reviews negatively moderate the emotional process during trials.*

Hypothesis 4c (two-sided): *For functional mobile applications, two-sided reviews negatively moderate the emotional process during trials.*

Aspect of Use: Hedonic Apps

The literature suggests that attitudes toward entertainment products are influenced mainly by hedonic components. For example, Liang and Yeh [53] found that playfulness has a direct influence on attitudes toward mobile games, but not on their ease of use. Pihlström and Brush [68] also reported that emotional value has stronger effects than utilitarian value in the case of mobile entertainment services. In addition, feelings with emotional value, such as curiosity or novelty, have been found to have greater effects than either monetary or convenience value with regard to such services [68]. It is thus reasonable to infer that emotional responses to trials of hedonic applications will play a stronger role in trial attitude formation compared to cognition.

Because consumers use hedonic applications mainly for experiential purposes, they expect that during or after use they will feel more relaxed, happier, or aroused. Online reviews, acting as external information, will encourage readers to simulate product outcomes and go through the emotional mode [93]. One-sided negative reviews make consumers doubt whether an application can provide good emotional outcomes, such as positive changes in mood. As a result, consumers will focus more on their feelings to form trial attitudes in order to determine whether their evaluation conforms to that of others, and whether this kind of application can bring them more joy [2]. In addition, it is more likely that negative and mixed messages will disturb or negatively affect users' moods. When consumers are considering using a hedonic product, which is anticipated to bring hedonic benefits, they should have positive ideas and feelings toward the application before the trial takes place. However, negative messages will lower their expectations, and sometimes even lead to a negative impression of the application [20]. Therefore, if users' negative feelings are removed or overturned during a trial, they will be more likely to have positive views of the app. In addition, Oliver, Rust, and Varki [61], provide evidence that if the actual performance of products exceeds expectations, this causes positive affect. As such we expect that the emotional response during the trial of a hedonic application will be enhanced when one-sided and two-sided reviews are read.

Therefore, we hypothesize the following:

Hypothesis 5a (one-sided): *For hedonic mobile applications, positive reviews positively moderate (strengthen) the emotional process during trials.*

Hypothesis 5b (one-sided): *For hedonic mobile applications, negative reviews positively moderate (strengthen) the emotional process during trials.*

Hypothesis 5c (two-sided): *For hedonic mobile applications, two-sided reviews positively moderate (strengthen) the emotional process during trials.*

Methodology

Design and Subjects

A 2 × 4 between-subjects experimental design using two types of mobile applications (functional application and hedonic application) and four conditions of online reviews (no reviews, one-sided positive reviews, one-sided negative reviews, and two-sided reviews) was employed. The condition of no reviews is used as the control condition (baseline). Students who owned a smartphone with Internet access and reported that they had not used any of the two assigned mobile applications joined the experiments voluntarily, and were given a TWD50 convenience store voucher as a reward for participating in the study. To make the procedure as realistic as possible, the students were randomly assigned to one of the eight conditions. First, each of the participants was exposed to either no reviews (baseline control treatment), one-sided positive reviews, one-sided negative reviews, or two-sided reviews. Next, they were immediately asked to download the assigned mobile application, either MOVIE GO or CHEESE TOWER. After a fifteen-minute trial, the subjects were told to complete the questionnaire they had been given.

A total of 300 undergraduate students from universities in Taiwan joined the study: 91.7 percent were under the age of twenty-five, and 51.8 percent of the respondents were male; 75.9 percent used Android as the mobile operating system, and the others used iOS; 42.4 percent used Chung Hua Telecommunication services, 25.9 percent Taiwan Mobile services, and 22.7 percent Far Eastern Telecommunication services. Of the 300 returned questionnaires, 22 were eliminated due to omitted values or because they stated that they had actually used the application before. A total of 278 questionnaires were thus used for the analysis, with cell sizes between 32 and 37.

Selection of Apps and Use of Reviews

While students have great interest in using smartphones and are keen to try new apps, it is important to choose ones that are likely to appeal to them. The first app chosen for the experiments, MOVIE GO, is classified as a functional application that provides information about movies, such as reviews and theater schedules. It also applies the user's location to help find the nearest theaters, and can be used to buy tickets. The second app, CHEESE TOWER, is classified as an entertainment application. This physics-based puzzle game asks players to guard cheese from mice. In the pilot test,

it is confirmed that MOVIE GO was used more for a functional purpose, and CHEESE TOWER was more for hedonic use.

According to Lee, Park, and Han [47], users usually read six to eight online reviews about a product in which they are interested. We created seven reviews for each treatment, based on actual reviews of the applications. The number of stars given by a reviewer, from one to five, was shown along with each review, with five stars being the highest rating. All six designs for the reviews were the same in length and style. Examples of the two-sided reviews are shown in Appendix 1. The manipulation of online reviews was checked in the pilot test.

Pilot Test

One pilot test was conducted to check the effectiveness of the manipulation of product types and online reviews, and thirty-two subjects were recruited for this. To check whether there were significant differences between the two apps in the perception of subjects, the following question was asked: "Would you characterize this mobile app as primarily a functional or entertainment application?" After reading the introduction to the mobile app and trying it, the participants answered the question using a seven-point scale, for which 1 was "primarily for functional use" and 7 was "primarily for entertainment use." A significant difference was found, (F [1,30] = 30.638, $p < 0.001$), and the participants thus perceived the MOVIE GO as a functional product ($M = 3.188$, $SD = 1.515$) and CHEESE TOWER as a hedonic one ($M = 5.875$, $SD = 1.088$).

The pilot test also checked the manipulation of reviews before the main study. The question "How would you summarize the review?" was asked, with responses ranging from 1 "very negative" to 5 "very positive." Analysis of variance (ANOVA) showed significant differences between the positive and negative conditions. The mean difference of positive and negative comments was 2.25 and highly significant (F [1,22] = 14.748, $p < 0.001$). The question "Do you think the reviews are consistent?" was also asked, with responses ranging from 1 "very inconsistent" to 5 "very consistent." ANOVA showed significant differences between the one-sided reviews (including one-sided positive and one-sided negative) and two-sided reviews. The mean difference was 1.625 (F [1,22] = 16.415, $p = 0.001$).

Measures and Controls

Perceived Diagnosticity

We wanted to make sure that the trials did not differ greatly with regard to the information provided because past research has indicated that diagnosticity affects trial evaluations [41]. One question was used to evaluate trial diagnosticity, and the participants were asked: "Overall, how

helpful would you rate the trial experience you just had in judging the performance of the application?" Participants answered on a scale of 1 to 7, ranging from "not helpful at all" to "extremely helpful." The mean of perceived diagnosticity for the functional application was 5.01 (SD = 1.146; on a scale of 1 to 7). The mean for the hedonic application was 5.15 (SD = 1.159). The mean difference of perceived diagnosticity levels for the functional application and the hedonic application was 0.298, (F = 0.678, p = 0.411, t = 0.316), which was not significant. In addition, an ANOVA analysis indicated that the difference was not significant among the eight conditions (F [7,270] = 1.310, p = 0.246).

Cognitive Structure and Emotional Responses with Regard to the Applications

We used performance expectancy and effort expectancy scales to measure cognitive structure. In line with Im, Hong, and Kang [37] and Venkatesh et al. [84], performance expectancy is defined as the extent to which an individual perceives that using a mobile application will help him/her accomplish tasks, and effort expectancy is the degree of ease associated with the use of mobile applications. A seven-point Likert-type scale anchored by "strongly disagree" and "strongly agree" was adopted for these items. Emotional responses were measured by using the pleasure and arousal scales. In accordance with Kempf and Smith [41] and Mehrabian and Russell [59], pleasure in this study is defined as the extent to which the emotion that is felt is pleasant, whereas arousal is defined as the intensity of the emotion that is felt. The items for pleasure were four semantic differential items: unhappy-happy, annoyed-pleased, unsatisfied-satisfied, not contented-contented. Five arousal scale items used were calm-excited, relaxed-stimulated, unaroused-aroused, sleepy- wide awake, sluggish-frenzied [9].

Dependent and Controlled Variables

A three-item semantic differential scale was adopted to assess the trial attitudes. The question was, "Overall, how would you rate this trial application?" The endpoints were labeled bad–good, unpleasant–pleasant, and unfavorable–favorable [40, 44].

Previous research has suggested that involvement will affect a user's trial and product attitudes. Lee, Park, and Han [47] found that under situations characterized by high involvement, high-quality negative online reviews have a greater effect on product attitudes than low-quality negative online reviews. In addition, high involvement consumers decrease purchase intention when overloaded with eWOM information [65]. An involvement scale using the three items in the statement "To me, this application is important–unimportant/relevant–irrelevant/and involving–uninvolving" was included to obtain a set of control variables. In order to

control for the influence of gender, mobile operating system (iOS and Android), and mobile telecom carrier, data on these were also obtained and used as control variables. A summary of the definitions and measures is shown in Appendix 2.

Analysis and Results

Underlying Assumptions and Common Method Bias

The variable-to-sample ratio was 1 to 10, satisfying the minimum threshold [31]. Kaiser–Meyer–Olkin's measure of sampling adequacy was 0.92, and Bartlett's test of sphericity also showed a significant p value at a 0.001 significance level, indicating substantial support for the twenty-one items used in the study. The normality assumption was also satisfied because skewness for all scale items ranged between –0.792 and –0.001, and kurtosis ranged between –1.273 and 1.259 (both of these being within the acceptable range of –2 to +2). We also checked the variance inflation factors (VIF) and condition indices among the indicators. The maximum VIF was 2.667, and the maximum condition index was 2.785, so multicollinearity was not a concern [86].

Because self-reported surveys may have common method bias [69], we took several steps to address this issue. First, we used different measurement scales. A five-point Likert scale was used to assess the manipulation of online reviews, and a seven-point Likert scale was adopted to assess performance expectancy, effort expectancy, and trial attitudes. In addition, we used semantic differential items to measure the pleasure and arousal constructs. During data analysis, we employed Harman's one-factor test, and it showed that the first factor accounted for 36.19 percent of the variance.

Podaskoff et al. [69] proposed that there is no fixed rule for judging how much variance the first factor should extract before it is considered a general factor. We performed another test for the purpose of checking and controlling for common method variance. Items were allowed to load on their theoretical constructs as well as on a latent common method variance (CMV) factor, and the significance of the structural parameters was examined both with and without the latent CMV factor in the model. None of the individual path coefficients corresponding to the relationships between the indicators and method factor was found to be significant. Furthermore, the overall pattern of significant relationships was not affected by CMV. The results of both tests showed that CMV was not a significant problem in our research.

Construct Reliability

The item-to-total correlation for each item should be 0.5 or higher, and the item factor loading should be at least 0.7 [31]. Because the item-to-total correlations and factor loadings for items PEE1, PEE2, AR1, and AR2 were

Table 1. CFA Model Fit Indices.

Constructs	Variance extracted	Construct reliability	Measures	Standardized factor loading
Cognitive structure	0.704	0.950	Performance expectancy	
			PEE3	0.756***
			PEE4	0.975***
			PEE5	0.842***
			Effort Expectancy	
			EFP1	0.781***
			EFP2	0.952***
			EFP3	0.813***
			EFP4	0.736***
Emotional responses	0.685	0.932	Pleasure	
			PL1	0.750***
			PL2	0.796***
			PL3	0.887***
			PL4	0.865***
			Arousal	
			AR3	0.808***
			AR4	0.779***
			AR5	0.802***
Trial attitudes	0.776	0.912	OTE	
			OTE1	0.872***
			OTE2	0.926***
			OTE3	0.856***

Notes: Cognitive structure is the second-order factor of performance expectancy and effort expectancy; emotional responses is the second-order factor of PL and AR. Model fit indices: $\chi^2 = 245.120$; DF = 124; $\chi^2/DF = 1.977$; CFI = 0.915; GFI = 0.915; RMSEA = 0.059; ***$p < 0.001$.

lower than the recommended thresholds of 0.5 and 0.7, we excluded these four items from our analysis.

Table 1 presents the results of the reliability tests for each construct. The cognitive structure is the second-order factor of performance expectancy and effort expectancy, while emotional responses is the second-order factor of pleasure and arousal. All coefficient alpha reliabilities exceeded the 0.7 threshold. All the factor loadings were significant ($p < 0.001$). The convergent validity of the measures was assessed by examining the path coefficients (loadings) for each latent factor toward their manifest indicators. The analysis indicated that all items loaded significantly on their corresponding latent factors. The composite reliability of the measures was over the threshold of 0.7 [27]. In addition, the average variance extracted (AVE) across the constructs exceeded the 0.5 benchmark. The smallest AVE of the constructs was 0.685, exceeding the threshold of 0.5 [75]. In Table 2, the bold diagonal elements are the square roots of the variance extracted. All the square roots of the variance extracted were higher than the correlations between constructs. The discriminant validity was thus acceptable [27]. The

Table 2. Correlations and Variances Extracted from Constructs.

	M	SD	COG	EMO	OTE
COG	4.730	0.837	**0.839**		
EMO	4.490	1.035	0.464	**0.828**	
OTE	4.974	1.167	0.562	0.697	**0.881**

Notes: COG = cognitive structure; EMO = emotional responses; OTE = overall trial attitudes. The correlations shown above are all significant ($p < 0.05$). Diagonal elements (in bold font) are the square root of the variance extracted. Off-diagonal elements are the correlations. The correlation coefficients are estimated from the CFA measurement model.

measurement properties of the constructs were assessed using confirmatory factor analysis. The model fitted the values recommended by Gerbing and Anderson [28] ($\chi^2(124) = 245.120$, $p > 0.05$; $CFI = 0.915$; $GFI = 0.915$; $RMSEA = 0.059$).

Validation of the Theoretical Model

How Do User Reviews Influence the Cognitive and Emotional Aspects of a Mobile Application Trial Process?

Because the key objective of this study is to evaluate how reviews moderate the process of trial attitude formation. The moderators are categorical, so we followed the procedure of Stone-Romero, Alliger, and Aguinis [80], Gupta and Kabadayi [30], and Jones, Mothersbaugh, and Beatty [39], and used hierarchical moderated regression models to test the hypotheses. The measures of all constructs were mean centered prior to the analyses in order to avoid multicollinearity [3]. The results of the collinearity diagnostics indicated that multicollinearity did not affect the model.

To test H1a and H1b, we separately ran three hierarchical moderated regression models for the conditions of one-sided positive reviews vs. no reviews, one-sided negative reviews vs. no reviews, and two-sided reviews vs. no reviews (see Table 3). Taking no reviews as the control condition, we created a dummy variable coded 1 for one-sided positive, one-sided negative reviews, or two-sided reviews in each model, and 0 for no reviews, and then generated interaction terms between the dummy variables and the two independent variables, cognitive structure (COG) and emotional responses (EMO), and ran hierarchical moderated regressions. In step 1, only the four control variables were entered. In step 2, the main variables, cognitive structure, emotional responses, and reviews, were entered along with the control variables. Finally, in step 3, the interaction effects between COG/EMO and reviews were entered along with the control variables and main variables. Evidence of interactions would exist if the interaction terms accounted for a significant incremental variance in explaining trial attitudes, either individually, manifested by beta values, or collectively, as revealed by the incremental *F*-statistic.

Table 3. Hierarchical Moderated Regression Analysis for Testing the Effect of Online Reviews on Trials of Mobile Applications.

	Model 1			Model 2			Model 3		
	One-sided positive reviews vs. no reviews			One-sided negative reviews vs. no reviews			Two-sided reviews vs. no reviews		
	(*n* = 140)			(*n* = 144)			(*n* = 142)		
Variables	**Step 1**	**Step 2**	**Step 3**	**Step 1**	**Step 2**	**Step 3**	**Step 1**	**Step 2**	**Step 3**
Gender	–0.070	–0.029	–0.034	–0.013	–0.018	–0.030	–0.027	–0.002	–0.002
Telecom carrier	–0.069	–0.027	–0.024	–0.070	–0.031	–0.034	–0.017	0.005	0.007
Operating system	0.188**	0.097**	0.098	0.132*	0.073	0.048	0.130*	0.066	0.059
Involvement	0.405***	0.083***	0.083	0.423***	0.120*	0.101	0.467***	0.148**	0.143**
COG		0.264	0.307**		0.266***	0.247**		0.269***	0.236***
EMO		0.467	0.446***		0.515***	0.403**		0.446***	0.525***
Reviews[a]		–0.011	–0.007		–0.003	0.027		0.037	0.045
Reviews × COG			–0.054			0.044			0.055
Reviews × EMO			0.024			0.174*			–0.150**
ΔF		25.562***	0.155		39.656***	2.90*		52.432***	3.975*
Adjusted R^2		0.449	0.442		0.540	0.553		0.508	0.522
Change in R^2 from Model 2			–0.007			0.013			0.014

†$p < 0.1$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
[a]Coded as a dummy variable with 1 = experimental condition and 0 = control condition.
Note: Each model is compared against the experimental baseline treatment (No reviews).

As can be seen in Table 3, for Models 1, 2, and 3, the interaction term of reviews and cognitive structure (COG) in step 3 were all insignificant (in Model 1, reviews × *COG* = –0.054, $p > 0.1$, R^2 change = –0.007, $\Delta F = 0.155$, $p > 0.1$; in Model 2, reviews × *COG* = 0.044, $p > 0.1$, R^2 change = 0.013, $\Delta F = 2.90$, $p < 0.05$; in Model 3, reviews × *COG* = 0.055, $p > 0.1$, R^2 change = 0.014, $\Delta F = 3.975$, $p < 0.05$). The results show that H1a is supported, indicating that reviews do not have any moderating effects on cognitive process during app trials. With regard to H1b, Table 3 shows that no interaction effects occur in Model 1 (reviews × *EMO* = 0.024, $p > 0.1$; R^2 change = –0.007, $\Delta F = 0.155$, $p > 0.1$). This indicates that positive online reviews do not change the relationship between emotional responses and trial attitudes. However, in Model 2, which compared the interaction terms between no reviews and negative reviews, the interaction terms of negative reviews and EMO were significant (reviews × *EMO* = 0.174, $p < 0.05$; R^2 change = 0.013, $\Delta F = 2.90$, $p < 0.05$). This indicates that negative reviews have a moderating effect on the relationship of EMO with trial attitudes. In addition, in Model 3, which compared the interaction terms between no reviews and two-sided reviews, the interaction term of reviews and EMO was significant at –0.150, $p < 0.01$ (R^2 change = 0.014, $\Delta F = 3.975$, $p < 0.05$). This shows that two-sided reviews have a moderating effect on the relationship between emotional responses and trial attitudes. As a result, H1b was partially supported because both one-sided negative and two-sided reviews, but not one-sided positive ones, moderate the relationship between emotional responses and trial attitudes.

To test H2, a dummy variable coded 1 for negative reviews and 0 for positive reviews were created. In Table 4 for Model 1, the interaction term for reviews and EMO was marginally significant at 0.160, $p < 0.1$. (R^2 change = 0.014, $\Delta F = 3.368$, $p < 0.05$). This shows that negative reviews had a stronger effect on the relationship between emotional responses and trial attitudes than positive reviews, and thus H2 was marginally supported. With regard to H3, which compared one-sided and two-sided reviews, we created a dummy variable coded 1 for two-sided reviews and 0 for one-sided reviews. In Table 4, Model 2, the relationship between reviews and EMO had a significant interaction effect on trial attitudes (reviews × *EMO* = –0.201, $p < 0.01$, R^2 change = 0.018, $\Delta F = 4.885$, $p < 0.05$). H3 was thus supported, showing that two-sided reviews have stronger effects on the relationship between emotional responses and trial attitudes than one-sided reviews.

Effects of Online Reviews on Trials of Functional Apps

Table 5 presents the results of testing H4a, H4b, and H4c for the functional app. Dummy variables were created in the same way as for testing H1a and H1b. For H4a, no reviews and positive reviews were compared. In Model 1, after adding the interaction terms in step 3, no interacting effects occur (reviews × *COG* = –0.157, $p > 0.1$; reviews × *EMO* = 0.026, $p > 0.1$, R^2 changed by 0.009, $\Delta F = 0.635$, $p > 0.1$). This indicates that positive online reviews do not change the relationship between emotional responses and

Table 4. Hierarchical Moderated Regression Analysis for Testing the Effect of Online Reviews on Trials of Mobile Applications.

	Model 1			Model 2		
	One-sided positive vs. one-sided negative reviews (n = 136)			One-sided vs. two-sided reviews (n = 204)		
Variables	**Step 1**	**Step 2**	**Step 3**	**Step 1**	**Step 2**	**Step 3**
Gender	0.010	0.005	0.003	-0.003	0.024	0.019
Telecom carrier	0.049	0.029	0.028	0.050	0.041	0.043
Operating system	0.219*	0.057	0.064	0.146*	0.061	0.043
Involvement	0.494***	0.133†	0.146*	0.512***	0.182**	0.167**
COG		0.240**	0.179*		0.256***	0.214**
EMO		0.549***	0.420***		0.439***	0.567***
Reviews[a]		0.013	0.023		0.042	0.049
Reviews × COG			0.087			0.069
Reviews × EMO			0.160†			-0.201**
ΔF		34.830***	3.368*		35.450***	4.885**
Adjusted R^2		0.602	0.616		0.522	0.540
Change in R^2 from Model 2			0.014			0.018

$^{\dagger}p < 0.1$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
[a]Coded as a dummy variable with 1 = experimental condition and 0 = control condition.
Note: Model 1 tests for difference in one-sided positive vs one-sided negative and Model 2 tests for one-sided vs. two-sided reviews.

Table 5. Hierarchical Moderated Regression Analysis for the Functional Applications.

	Model 1			Model 2			Model 3		
	One-sided positive reviews vs. no reviews			One-sided negative reviews vs. no reviews			One-sided vs. two-sided reviews		
	(*n* = 71)			(*n* = 74)			(*n* = 76)		
Variables	**Step 1**	**Step 2**	**Step 3**	**Step 1**	**Step 2**	**Step 3**	**Step 1**	**Step 2**	**Step 3**
Gender	0.099	0.130	0.118	–0.01	–0.007	–0.013	0.082	0.090	0.089
Telecom carrier	0.000	0.041	0.044	–0.058	–0.048	–0.047	–0.087	–0.013	–0.022
Operating system	0.067	–0.016	–0.002	0.043	0.059	0.060	–0.014	0.021	0.021
Involvement	0.291*	–0.062	–0.050	0.342***	0.066	0.066	0.362**	0.080	0.081
COG		0.306**	0.419**		0.429***	0.473**		0.471***	0.398**
EMO		0.538***	0.500***		0.453***	0.439**		0.279	0.498***
Reviews[a]		0.026	0.064		0.015	0.013		0.139	0.091
Reviews × COG			–0.157			–0.052			0.095
Reviews × EMO			0.026			0.005			–0.321**
ΔF		21.433***	0.635		30.811***	0.086		19.151***	3.487**
Adjusted R^2		0.519	0.513		0.582	0.594		0.495	0.530
Change in R^2 from Model 2			0.009			0.001			0.044

†$p < 0.1$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
[a]Coded as a dummy variable with 1 = experimental condition and 0 = control condition.

trial attitudes for functional applications. H4a was not supported. To examine H4b, no reviews and negative reviews were compared in Model 2. The interaction term, negative reviews and EMO, was not significant in the model (R^2 changed by 0.001, $\Delta F = 0.086$, $p > 0.1$; reviews × *EMO* = 0.005, $p > 0.1$). This indicates that negative online reviews do not have a moderating effect on the relationship between EMO and trial attitudes with regard to functional apps, and thus H4b was not supported. For testing H4c, no reviews and two-sided reviews were compared in Model 3. The interaction term, reviews and EMO, was significant at –0.321, $p < 0.01$ and the R^2 changed by 0.044, $\Delta F = 3.487$, $p < 0.01$. Because the beta value was negative, this shows that two-sided reviews weaken the relationship between EMO and trial attitudes, which supports H4c.

Effects of Online Reviews on Trials of Hedonic Apps

With regard to testing H5a for the hedonic app, the results shown in Table 6, Model 1, where positive reviews is the experimental condition, did not reveal any significant change in R^2, and there was no significant interaction effect with regard to EMO and trial attitudes (reviews × *EMO* = 0.085, R^2 change by 0.003, $\Delta F = 0.003$, $p > 0.1$). H5a, which posited that positive online reviews would strengthen the effect of emotional responses on trial attitudes for hedonic mobile apps, was not supported. With regard to H5b, no reviews and negative reviews for hedonic applications were compared in Model 2, where the interaction terms were also added. Reviews × EMO was significant at 0.334, $p < 0.01$, and R^2 was significantly changed by 0.054, $\Delta F = 5.982$, $p < 0.01$. The results supported H5b, indicating that negative online reviews strengthen the relationship between emotional responses and trial attitudes. As for H5c, one-sided reviews and two-sided reviews were compared in Model 3. In step 3, where interaction terms were added, reviews × *EMO* = 0.287, $p < 0.05$; although R^2 did not change significantly at 0.032, $\Delta F = 2.107$, $p > 0.1$. This implies that two-sided reviews did not change the explanatory power of COG and EMO, although they did change the mechanism of trial attitude formation for hedonic apps. Because two-sided reviews strengthen the influence of emotional responses on trial attitudes, H5c was supported.

In sum, seven out of the ten hypotheses were supported, and the results are summarized in Table 7.

Discussion and Implications

Discussion

Overall our findings demonstrate that reviews that are read in the context of mobile app trials will change readers' attitudes through the emotional process, but have little effect on the cognitive process. This shows that during such trials emotions are more easily altered or aroused compared to

Table 6. Hierarchical Moderated Regression Analysis for the Hedonic Applications.

	Model 1			Model 2			Model 3		
	One-sided positive reviews vs. no reviews			One-sided negative reviews vs. no reviews			One-sided vs. two-sided reviews		
	(*n* = 69)			(*n* = 70)			(*n* = 66)		
Variables	**Step 1**	**Step 2**	**Step 3**	**Step 1**	**Step 2**	**Step 3**	**Step 1**	**Step 2**	**Step 3**
Gender	0.029	–0.001	–0.001	0.118	0.042	0.007	0.099	0.071	0.067
Telecom carrier	–0.199	–0.140	–0.130	–0.196**	–0.108	–0.095	–0.103	–0.078	–0.085
Operating system	0.080	0.065	0.056	–0.023	–0.006	–0.050	0.085	0.082	0.055
Involvement	0.502***	0.186	0.174	0.619***	0.166*	0.090	0.436	0.090	0.061
COG		0.196	0.246		0.208*	0.220		0.113	0.196
EMO		0.463***	0.404**		0.552***	0.333		0.599***	0.391**
Reviews[a]		0.074	0.055		–0.033	–0.042		–0.068	–0.131
Reviews × COG			–0.053			0.039			–0.051
Reviews × EMO			0.085			0.334**			0.287*
ΔF		10.395***	0.003		18.149**	5.982**		13.842***	2.107
Adjusted R^2		0.474	0.459		0.641	0.691		0.487	0.506
Change in R^2 from Model 2			0.003			0.054			0.032

$^{\dagger}p < 0.1$; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.
[a]Coded as a dummy variable with 1 = experimental condition and 0 = control condition.

Table 7. Summary of Results.

Hypothesis	Result
H1a (review presence): Online reviews do not have moderating effects on the cognitive process during mobile application trials.	Supported
H1b (review presence): Online reviews have moderating effects on the emotional process during mobile application trials.	Partially supported
H2 (review valence): Negative reviews have stronger moderating effects on the emotional process than positive reviews during mobile application trials.	Marginally supported
H3 (one-sided vs. two-sided): Two-sided (inconsistent) reviews have stronger moderating effects on the emotional process than one-sided (consistent) reviews.	Supported
H4a (one-sided): For functional mobile applications, positive reviews negatively moderate the emotional process during trials.	Not supported
H4b (one-sided): For functional mobile applications, negative reviews negatively moderate the emotional process during trials.	Not supported
H4c (two-sided): For functional mobile applications, two-sided reviews negatively moderate the emotional process during trials.	Supported
H5a (one-sided): For hedonic mobile applications, positive reviews positively moderate (strengthen) the emotional process during trials.	Not supported
H5b (one-sided): For hedonic mobile applications, negative reviews positively moderate (strengthen) the emotional process during trials.	Supported
H5c (two-sided): For hedonic mobile applications, two-sided reviews positively moderate (strengthen) the emotional process during trials.	Supported

cognition when additional information is provided. This phenomenon is particularly significant in the cases of one-sided negative and mixed reviews.

On the other hand, no effect was found for one-sided positive reviews on trial attitude formation in the case of either functional or hedonic applications. This is probably because consumers are used to receiving positive reviews, and thus do not think such reviews provide important and credible information since they might also be biased [18]. Evidence suggests that consumers may doubt positive reviews because they suspect that individuals provide high ratings due to incentives from marketers, especially when positive messages are presented on a website managed by product providers [47].

Results confirm that a negativity bias also exists in the trial scenario, and thus one-sided negative reviews demonstrate a stronger effect than one-sided positive ones [9, 89]. In addition, two-sided or mixed reviews are more effective than one-sided ones in altering users' trial attitudes through the emotional process. Furthermore, results show that negative reviews strengthen the emotion–trial attitude relationship for hedonic applications. But, in contrast to our expectations, they do not weaken the emotional process for functional apps. A likely reason for this is that because consumers focus on obtaining utilitarian value from functional products [6], they tend to judge functional apps in a more rational way, with emotions given less weight during the trial.

As hypothesized, two-sided reviews moderate the relationship between emotional responses and trial attitudes in the case of both functional and hedonic apps. This can be attributed to the fact that two-sided reviews

provide contrasting information. They weaken the emotion–trial attitude relationship for functional apps. On the other hand, two-sided reviews strengthen the emotion–trial attitude relationship for hedonic applications. It is known that hedonic applications are consumed mainly for their hedonic value, and that they tend to be evaluated through emotional processes. Two-sided reviews make the application seem less appealing, and lower the emotional affect before a trial. Therefore, at the end of the trial if users feel that they have been relieved from the low emotion due to the two-sided reviews, they are more likely to give the hedonic app a higher evaluation.

Theoretical Implications

Our study contributes to the literature on both online reviews and product trials and, to the best of our knowledge, this is the first study to attempt such an approach. In particular, the study contributes to the literature in three ways.

First, whereas prior research has often discussed the consequences of eWOM, such as its effect on sales [21], website evaluation [82], and product perception (e.g., [16]), the relationships that are examined in these studies are rather straightforward because no trials are involved. This study tried to explore the mechanisms underlying changes in trial attitudes, and found that when consumers are allowed to try products, online reviews induce them to evaluate products based mainly on their emotions, rather than cognition.

Second, although much research has demonstrated the existence of a negativity bias in different contexts, this study also finds support for the existence of this bias in the context of mobile app trials. In addition, two-sided reviews are quite common in real online settings, but only a few works have addressed this issue (e.g., [92]). This study contributes to the eWOM literature by comparing the effects of one-sided and two-sided reviews, and providing further evidence that the former are more influential than the latter in terms of attitude formation.

Third, whereas some studies compare the effects of online reviews across product types, the results are inconclusive. Pan and Zhang [64] found that reviews are seen as more helpful for utilitarian goods than for experiential ones. Similarly, Sen and Lerman [76] demonstrated that negative reviews are perceived as more helpful for utilitarian products than for experiential ones. However, Ong [62] did not find any interaction effects with regard to negative reviews and hedonic versus utilitarian consumption. This study adds new insights with regard to this open issue. We found that negative reviews have no influence on functional product evaluation, but they affect the evaluation of hedonic goods. In addition, we explored how reviews change the evaluation process across product types. Interestingly, only two-sided reviews weaken the emotional process for functional products; on the other hand, both negative and mixed reviews strengthen the emotional process for hedonic products.

Managerial Implications

The findings of this study also have practical and managerial insights, insofar as they reveal that users judge the performance of mobile apps not only by trial experience but also based on the reviews they may have read about the focal product. App developers are thus encouraged to closely monitor reviews and take the initiative with regard to correcting false or negative reviews. Mobile app developers are now able to release initial versions of apps that may still have some faults, and then upgrade them as improvements are made. At the early stage of this process, developers aim to collect feedback from customers and then modify the app based on it. All comments and suggestions, whether one-sided or mixed, are welcomed at this stage. However, too many negative and mixed ratings may discourage new downloads and influence new trials, and thus fail to reflect the true value of the trial experience. Marketers are thus encouraged to alleviate the influence of negative reviews on trials by, for example, individually responding to the complaints in reviews or making public announcements on websites, stating that the weak points of the app have been addressed in the latest version. Such efforts may limit the effect that complaints have on the rate of new downloads, as well as opening up two-way communications with consumers.

Moreover, this study found that reviews influence user emotions mainly in opposite directions for functional and hedonic applications. In addition, as well as monitoring and minimizing the influence of reviews, marketers could work on improving the quality of the apps they offer. For functional applications, it seems that increasing the amount of hedonic value has little effect on user emotional responses and evaluations. However, any bugs or design flaws that may hinder the completion of the focal task could frustrate users, and result in low evaluations. Therefore, it is important for mobile developers to carefully design the functional attributes of functional apps. On the other hand, because users look for entertaining value in hedonic applications, they rely more on their emotions than their cognition to assess the apps when reviews are involved.

Limitations of the Study and Suggestions for Future Research

Although from a methodological perspective the results showed that the conditions related to online reviews were well manipulated in the various experimental conditions, and common method bias did not affect the testing results, there exist various shortcomings in our analysis that leave room for further improvement. First, the experimental design compared only the one-side valence and two-side valence of the reviews. Other qualitative characteristics, such as review helpfulness and authorship, were not considered. In addition, our study used a laboratory controlled experiment, and thus there was a trade-off between the external validity of our results and the need for control. Possible extensions in that direction

could include a more complex design with different product categories. A larger sample size could also help to test more hypotheses and ensure the robustness of the results. In addition, future research could use other testing approaches to help confirm the findings of this work, such as engaging in a natural experiment.

Although our study aimed to evaluate the relationship between reviews and product trial experience, we did not investigate whether consumers prefer to try the app immediately after reading the reviews. Nevertheless, it is very likely that some reviews might influence the intention to do so. Moreover, although the results show that the functional versus hedonic value of MOVIE GO was significantly lower than that of CHEESE TOWER, it is still 3.188, close to the middle point of the seven-point scale. This is considered acceptable, because our purpose is not really to find a purely functional product, but to manipulate the functional versus hedonic value as such. A repeat of the controlled experiment where a higher difference could be observed would also shed light on that direction.

This study also offers some possibilities for future research. Our experiment examined trial attitudes only for freeware or "lite" versions of the apps, which provide limited functionality of the full version. A possible extension could also examine the impact on trialware, which offers full functionality for a limited time period. Considering the fragmentation across devices and user experience factors such as screen sizes (highly typical for fragmented platforms such as Android) can also have an effect on trial attitudes. Regarding online reviews, this study did not separately discuss the influence of ratings and content of individual reviews, and it would thus be interesting to examine their possible effects on product trial attitudes. In addition, other moderating factors may be possible, such as the characteristics of message providers [45], and the characteristics of the review readers. Furthermore, mobile applications are usually inexpensive and we do not know whether the results of this work are applicable for higher priced items in which negative online reviews may be encountered less frequently if we assume that price can be a signal for quality [91]. Finally, we did not examine the relationship between prior reviews and subsequent reviews. The characteristics of prior reviews could have effects on subsequent reviews [55].

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Appendix 1. A Set of Two-Sided Reviews for the Hedonic App.

You are about to try a new mobile application (App). Please read the following consumer reviews before using it.

【Application: MOVIE GO】

Consumer reviews:

★★★★☆ by Chengzon on Jan 26, 2012

This is the best I used! The price of the ticket is really a bargain.

★☆☆☆☆ by Ron on Feb 2, 2012

Ding Ding was no longer played in Miramar Cinema on Jan 27, but it's still shown on this App. The conclusion is that I can't trust any movie app!

★★☆☆☆ by Rocker on Nov 26, 2011

The speed is too slow. Wait too long!

★★★★★ by Winnie on Nov 3. 2011

The layout is artistic. Easy to use. All the information is included. A nice App.

★★☆☆☆ by James on Dec 20, 2011

It's convenient to get ticket through it! Great!!!! But the schedule is a bit rough, not clear^^

★☆☆☆☆ by Utena on Nov 12,2011

Can't this memorize user information? It's so complicated to re-log on^

★★★★★ by Peter on Feb 8, 2011

This is the kind of App I am looking for! You can see movie reviews and check schedules. I've been waiting for it. A hit!

Appendix 2. Definitions and Measures of the Latent Constructs.

Construct definitions and measures		Scale	References
Cognitive structure		1-7 Likert scale	
Performance expectancy: The extent to which an individual perceives that using the mobile application will help him/her accomplish tasks.			Im, Hong, and Kang [37]
PEE1	I feel this product is useful.		Venkatesh et al. [84]
PEE2	This product improves my efficiency.		
PEE3	This product improves my convenience.		
PEE4	This product lets me do my task more quickly.		
PEE5	Using this system increases my productivity.		
Effort expectancy: The degree of ease associated with the use of mobile applications.			Im, Hong, and Kang [37]
EFP1	Skillfully using this app is easy for me.		Venkatesh et al. [84]
EFP2	I would find this app easy to use.		
EFP3	Learning to operate this app is easy for me.		
EFP4	My interaction with this app would be clear and understandable.		
Emotional responses		1-7 Semantic differential scale	
Pleasure: The extent to how pleasant an emotion may be.			Kempf and Smith [41]
How do I feel during the trial?			Mehrabian and Russell [59]
PL1	Unhappy-Happy		
PL2	Annoyed-Pleased		
PL3	Unsatisfied-Satisfied		
PL4	Not contented-Contented		
Arousal: The degree of intensity of emotion.			Kempf and Smith [41]
How do I feel during the trial?			Mehrabian and Russell [59]
AR1	Calm-Excited		
AR2	Relaxed-Stimulated		
AR3	Unaroused-Aroused		
AR4	Sleepy-Wide awake		
AR5	Sluggish-Frenzied		
OTE Overall how would I rate this trial application?		1-7 Likert scale	
OTE1	Bad-Good		Kempf and Smith [41]
OTE2	Unpleasant-Pleasant		
OTE3	Unfavorable-Favorable		

Note: Cognitive structure is the second-order factor of performance expectancy and effort expectancy; emotional responses is the second-order factor of pleasure and arousal.

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