How Prior Users’ Helpfulness Votes on a Review Influence Subsequent Users’ Trust of the Review and Corresponding Product Evaluations in E-commerce Context

Completed Research Paper

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Abstract

We focus on how two numeric characteristics of prior users’ votes influence user’s attitude towards the product/service reviewed. These characteristics are 1) vote ratio and 2) vote magnitude. The former is the ratio of prior viewers who believe that a review is helpful, and the latter is the total number of prior viewers who vote the review. We draw on social influence theory and propose vote ratio influential across positive and negative reviews but vote magnitude influential only for negative reviews. We conduct two experiments to test the research model. Our research finds that regardless of the valence of reviews, vote ratio enhances trustworthiness and guide corresponding product evaluation. By contrast, vote magnitude is significantly influential only for the negative review. These findings contribute to review helpfulness literature and extend social influence theory. Our research also provides practical implications for online voting system providers, general participatory sites, and online retailers.

Keywords


Introduction

People use voting as a means of making proximal decisions. For example, voting is practiced in political election to select the most promising candidate based on the voting inclination of the majority. The recent concept of voting indicates the limited access of participants to voting dynamics without knowledge of prior votes before publicity of final voting results. By contrast, modern online voting systems highlight the transparency and real-time dissemination of the entire voting process. This process suggests that users may use the votes of prior users as reference for their own judgment. Helpfulness voting system is a typical form of modern voting system embedded in online review websites (e.g., Amazon.com, Dine.com). This system can be used by users to publicly evaluate the helpfulness of a review, which not only presents product reviews contributed by users, but also displays votes by other users on the review. Given that voting systems play an important role in detecting helpful reviews, helpfulness voting system has gained intensive attention from academics, particularly on the determinants of helpfulness votes on a review (Mudambi & Schuff 2010; Yin et al. 2014). These studies aim to answer the following question: What makes a helpful review? However, a fundamental question should be clarified before exploiting the predictability of the helpfulness voting system. What is the outcome of this voting system for online sites that enable the publicity and dissemination of user opinions on a product or service? Given the exposure of previous opinions to potential users, we intend to go further on the voting system by investigating the impact of votes of prior users on the decision-making of other users. We propose that the votes contributed by prior users exert social influence.
on subsequent users. They tend to rely on prior users’ votes as a rational act of trust building on the review of others user, and the corresponding attitude towards the product/service discussed in the review. We focus on two key metrics of prior votes, namely, ratio and magnitude. Ratio indicates the proportion between helpful votes and unhelpful votes, and magnitude depicts the total number of votes, including both helpful and unhelpful votes. Thus, helpfulness of a review can be interpreted by users referring to either the ratio or magnitude. This approach raises a question of whether subsequent users may react differently or selectively to the ratio or magnitude of prior users’ votes. Two experiments are conducted in this paper to test the link between prior votes and subsequent users’ attitude towards the product/service discussed in the review. Experiment 1 verifies the effect of vote ratio across positive and negative reviews. A positive review with a high helpfulness ratio is more influential than that with a low ratio of helpfulness votes in fostering the favorable attitude of customers. By contrast, a negative review with a high helpfulness ratio is influential in driving unfavorable attitude. The result also indicates the mechanism of the ratio effect, namely, trust on the review. Experiment 2 examines the magnitude effect. We find that unlike vote ratio, which is a basic and consistent trust driver, the effectiveness of magnitude depends on the valence of the review. A negative review, which contains sensitive and attention-tracking information, is likely to motivate users to consider magnitude as reference. Our findings extend online product review literature. most of current studies aim to identify the determinants of review helpfulness (e.g., Mudambi & Schuff 2010; Yin et al. 2014), and inconsiderable research directly studied the numeric characteristics of helpfulness information and their consequences. The present study is the first to investigate the effectiveness of helpfulness voting system on the online behavior of users.

Literature Review

Concerning research on review helpfulness, Most existing studies on review helpfulness aim to identify the determinants of review helpfulness votes (Mudambi & Schuff 2010; Yin et al. 2014); however, the consequences of helpfulness votes, such as its effect on user’s attitude, are not explored sufficiently. The present study is the first to investigate the effectiveness of helpfulness voting system on the online behavior of users. Unlike existing studies that examined the link between Facebook likes and product sales (Kuan et al. 2014), which suggests how product endorsements temper a user’s purchase intention, the present study exploits how prior users’ votes on the review tease the purchase of another user on a recommended product in the review. Instead of simply focusing on the number of Facebook Likes (FBLs) (Kuan et al. 2014), we consider the numerical ratio of helpfulness votes as a means of examining the valence of social influence, thereby extending previous studies that manipulated the valence of social influence by self-reports (Graziano et al. 1993) or separately regarded up-votes as positive influence and down-votes as negative influence (Muchnik et al. 2013). Unlike existing studies that focused on the voting behavior induced by prior votes (e.g., Muchnik et al. 2013), which reveals herding effect in voting behavior, the present study extends the social influence exerted by prior votes from its effect on users’ voting behavior to how subsequent users utilize votes for assessing review and the corresponding product discussed in the review. With respect to the impacts of review helpfulness, a few relative studies exist. For instance, Purnawirawan et al. (2012) demonstrated the association between perceived review helpfulness and customer attitude, indirectly implying the importance of helpfulness of reviews. However, perceived review helpfulness is not a good way to illustrate the numeric characteristics of review helpfulness in online review platforms (e.g., Amazon.com). Chen et al. (2008) directly identified a larger impact of reviews with a high proportion of helpful votes for less popular books. However, both studies do not give a complete and direct examination of helpfulness information itself. Thus, more direct and comprehensive depiction of the helpfulness voting system is needed, as well as more empirical evidence for the effectiveness of review helpfulness votes.

Theoretical Background and Research Model

User Trust and Social Influence

Given the information asymmetry between buyer and seller (Ackerloff 1970), a buyer has to search for trustworthy information as reference for his or her product evaluations and final purchase decisions. Customers who have uncertain purchase decisions can rely on the observed collective opinion or action polarity to reduce uncertainty and enhance trust in their decisions. Trust is demonstrated as important
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antecedents of behaviors that rely on the advice or actions of others (Mayer et al. 1995). Research about information search suggests that following others can reduce the time and energy associated with searching information and experimentation (Muchnik et al. 2013). Therefore, we expect that social influence in the form of online product reviews will function as trust cues to assist user evaluations.

Social influence plays an important role in the consumption process (Burnkrant & Cousineau 1975). Social influence reflects the perception of an individual toward the behavior influence of others. Social influence reflects individuals’ perception of others’ behavior influence. That is, the observed collective behaviors or opinion polarity can be regarded as information such as high-quality signal, to help make a decision. On the other hand, the observed behaviors can be perceived as normative pressure, that is, the decision-making is not owing to the obtainment of information by observation but because the group pressure. In a word, others’ behavior can be perceived as either a kind of information for usage called informational influence or the group pressure that have to obey called normative influence (Deutsch & Gerard 1955). According to Kelman (1961), social influence operates through three distinct processes termed compliance, identification, and internalization. Internalization occurs when people accept the majority opinion and integrate it into their belief systems. Compliance occurs when people conform to the majority opinion but obtain their original opinions outside the group influence situation. Identification arises when people adopt group attitudes or behaviors to establish a relationship with the group. These three processes can relate to Deutsch and Gerard (1955)’s two forms of social influence, informational influence and normative influence. Informational influence leads to acceptance of information, which corresponds to internalization while normative influence is the tendency to conform to the expectations of others, which could be attributed to compliance or identification.

Research Model

We draw on social influence theory to explain the underlying rationales behind the research model (see Figure 1). Deutsch and Gerard (1955) proposed two forms of social influence, namely, informational and normative influence. Informational influence is based on the acceptance of information from others as evidence of reality. This study viewed review content as informational influence and especially focused on review valence.

Normative influence is the tendency to conform to expectations of others. Ratio indicates the direction of normative influence, that is, the positive influence delivering agreement, whereas negative influence communicates disagreement (Muchnik et al. 2013). By applying the valence of social influence in review helpfulness, vote ratio implies the percentage of peers viewing the review as helpful, high helpfulness ratio, i.e., dominating more helpful votes than unhelpful votes, low helpfulness ratio, i.e., more unhelpful votes than helpful votes. Magnitude indicates the strength of normative influence, which is the strong conformity indicating the large size of the majority, whereas weak social influence is related to a small size of the majority. Vote magnitude indicates the total number of votes, including both helpful and unhelpful votes. As shown in Figure 1, we illustrate three factors to explain user trust and attitude, namely, vote ratio and magnitude, as well as review valence. We argue that vote ratio and magnitude as well as their interactions with review valence lead to different degrees of attitude, which is mediated by consumer trust of the review.
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Figure 1. Research Model

Hypotheses Development

Impact of Vote Ratio

In terms of high helpfulness ratio, a substantially high number of peers who view the review as helpful indicate that the review content can be understood, and most of the peers agreed with the reviewer's comments on product or service. The majority of previous viewers of the review who reached an agreement on the helpfulness of the review indicate that the reviewer tells the truth that the recommended product or service is as good (bad) as described in the positive (negative) review, which strengthens the credibility of the review. Therefore, high helpfulness ratio enhances users' trust of the review. By contrast, low helpfulness ratio indicates that majority of previous viewers of the review think that the review is not helpful. This review may be composed of complicated or irrelevant words, which are difficult to comprehend and understand. The high number of unhelpful votes is attributed to low quality of the review itself. Thus, customers experience difficulty in inferring the quality of the review, thereby decreasing their trust on the review and conspicuousness about product quality discussed in the review.

According to prospect theory, positive reviews induce an adoption of the reference point. The corresponding decision is perceived as possible gains, whereas in negative reviews, the purchase decision is perceived as possible losses and may elicit avoidance of such behavior (Kahneman & Tversky 1979). Therefore, when the majority of individuals think of the review as helpful (unhelpful), i.e., high (low) helpfulness ratio, subsequent customers are likely to follow the majority to adopt (ignore) the review, and are likely (unlikely) to favor (disfavor) the product in the positive (negative) review to others. A high review helpfulness ratio with the majority perceiving the review as helpful is more likely to strengthen the attitude toward the product mentioned in the review to others, conversely, a low review helpfulness ratio has the majority perceiving the review as unhelpful. Thus, we hypothesize,

H1a. Users exposed to a positive (negative) review with a high helpfulness ratio will have more favorable (unfavorable) attitude towards the evaluated product or service than those exposed to the review with a low ratio.

H1b. The impact of helpfulness ratio on users' attitude is mediated by their trust of the review.

Impact of Vote Magnitude

Given the vote ratio constant, the large magnitude indicates the large size of the majority, whereas the small magnitude suggests the small size of the majority. Increasing the size of the majority implies the addition of users with the same view, which will further confirm the majority as a representative sample of the whole population. In terms of large magnitude, a large number of users reach consensus on the helpfulness of the review. The increasing size of the majority implicates underlying information about reality and strengthens the power of the majority to reward and punish. Moreover, large helpfulness magnitude implies a large difference between the number of helpful and unhelpful votes, which is dominating consensus. A review with a large vote magnitude is less uncertain and more trustworthy. By contrast, a low number of viewers for a small magnitude reach consensus on the helpfulness of the review. The small size of the majority indicates that the review may not be attractive and convincing to be adopted by many individuals because of the minor difference between the number of helpful and unhelpful votes, which is weak consensus.

According to prospect theory, individuals under risk interpret outcomes as gains and losses, and are more sensitive to losses than to commensurate gains or loss aversion (Kahneman & Tversky 1979). This behavior is attributed to individual experience of loss, which appears greater than the gains associated with obtaining an amount equivalent to that which was lost because the value function is steeper for losses than for gains (Kahneman & Tversky 1979). In this sense, users are supposed to be more sensitive to negative reviews, and thus need more cues to support their corresponding unfavorable evaluations than positive reviews. Thus, negative reviews are more likely to motivate users to take advantage of vote magnitude as reference for internalization of online negative information.

H2a. As the vote ratio constant, review valence moderates the magnitude effect such that only for the negative review, users exposed to a review with large vote magnitude will have lower attitude toward the evaluated product or service and such effect is not applicable to the positive review.

H2b. The impact of vote magnitude on users' attitude is mediated by their trust of review.
**Overview of Experiments**

We presented across two experimental studies participants with product decision scenarios that included information on evaluation on the product and the numerical judgment of prior customers on the evaluation in the form of textual reviews and prior users’ helpful and unhelpful votes on a review. To provide a thorough illustration of the social influence induced by prior customers, Experiment 1 first demonstrated the generality of vote ratio effect by focusing on positive and negative reviews. We then examined the underlying process by measuring customer trust of review. Given the validation of helpfulness ratio effect based on Experiments 1, we addressed another metric, i.e., vote magnitude in Experiment 2. To tease out the ratio effect, we focused on the helpful review varying with different degrees of vote magnitude. We focused on how the increase of helpfulness votes changes users’ perception of a review and their corresponding behavior when the helpfulness ratio is constant.

**Experiment 1**

Experiment 1 had three main objectives. First, the setup tested the helpfulness ratio effect on attitude and trust. Two levels of ratio were examined, i.e., low ratio vs. high ratio. Second, we tested whether the ratio effect can be generalized to positive and negative reviews. Third, we tested the proposed underlying mechanism, that is, the helpfulness ratio affecting user attitude by strengthening or weakening their trust of the review.

**Method**

We recruited 203 participants (116 males; Mean age=35) from Amazon Mechanical Turk. Each participant was compensated for a nominal payment. The participants were randomly assigned to one of four conditions in a 2 (vote ratio: high helpfulness ratio vs. low helpfulness ratio) × 2 (review valence: positive vs. negative) between-subjects factorial design.

Initially, participants were asked to imagine the following scenario, “You find a restaurant. Before going to the restaurant, you look it up on a review website.” They were subsequently exposed to a restaurant review. In the positive review condition, the participants were asked to read a review that recommended the restaurant by describing the positive features of the restaurant, including food, service, an environment. In the negative review condition, the participants were asked to read a review that cited unsatisfactory aspects of the restaurant. To manipulate the helpfulness ratio of the review, we learned from Amazon.com and asked a question at the end of review “was this review helpful to you”, displaying varying “Yes” and “No” records. In the high ratio condition, the participants will encounter 50 “Yes” and 6 “No,” whereas in the small ratio condition, they will face 6 “Yes” and 50 “No.” For details, please refer to Appendix1. Then participants were asked to answer several questions.

When participants finish reading the review, they were asked to answer questions with the following instruction, “Please answer the following questions based on the review you read.” At first, participants completed a three-item measure of attitude toward the restaurant (M=3.972, SD=2.251). The measure was adapted from Rucker and Petty (2004) by asking a question, “What do you think of this restaurant?” Items were answered on a seven-point scale (1=Bad/Unfavorable/Dislike, 7=Good/Favorable/Like; α=0.991).

Next, the participants completed the two-item measure of trust of the review (M=4.599, SD=1.591), i.e., “I trust this review” and “I can rely on this review.” Items were answered on a seven-point scale (1=Strongly disagree, 7=Strongly agree; α=0.958).

**Results**

*Manipulation Check.* For the manipulation check of review valence, participants were asked to indicate the extent to which they agree with the review ranging from very negative to very positive on a seven-point scale (1=very negative, 7=very positive). The one-way ANOVA result indicated that the manipulation of review valence was successful (F(1,201)=1424.277, p<0.001) in such a way that participants in the positive review condition considered the review as positive (M=6.304, SD=1.097) while participants in the negative review condition considered the review as negative (M=1.287, SD=0.766).

*Attitude.* We found significant interaction effects of helpfulness ratio and review valence on attitude (F(1,199)=19.983, p<0.001), supporting H1a. For positive review, participants had more positive attitude toward the restaurant when reading the review with high helpfulness ratio (M=6.267, SD=0.797) than the
review with low helpfulness ratio (M=5.481, SD=1.395; F(1,199)=11.947, p=0.001<0.01). For negative review, participants had less favorable attitude when reading the review with high helpfulness ratio (M=1.715, SD=0.917) than the negative review with low helpfulness ratio (M=2.371, SD=1.333; F(1,199)=8.220, p=0.005<0.01). Figure 2 illustrates the plot of the interaction effect.

Figure 2. Impact of Helpfulness Ratio on Attitude across Positive and Negative Review

Trust. We conducted a two-way ANOVA and obtained significant main effect of helpfulness ratio on trust (F(1,199)=16.358, p<0.001). The result did not indicate significant interaction effect of ratio and valence on trust (F(1,199)=0.499, p=0.481), which suggested that the helpfulness ratio effect was significantly influential for positive and negative reviews. For positive review, participants had higher trust of the review with high helpfulness ratio (M=5.290, SD=1.143) than the review with low helpfulness ratio (M=4.269, SD=1.682; F(1,199)=11.354, p=0.001<0.01). Likewise, for the negative review, participants had significantly higher trust with high helpfulness ratio (M=4.802, SD=1.529) than the negative review with low helpfulness ratio (M=4.085, SD=1.683; F(1,199)=5.538, p=0.020<0.05). The plot of the ratio effect across the attribute-based and emotion-based review on trust is indicated in Figure 3 below.

Figure 3. Impact of Helpfulness Ratio on Trust across Positive and Negative Review

Mediation Analysis. We applied Process Model 15 (Hayes 2013) and obtained the following results. The mediation effect of trust on the relationship between helpfulness ratio and attitude (95% confidence interval: 0.4747 to 1.4673) is salient across positive and negative reviews, supporting H1b. Furthermore, for the positive review, trust positively mediated the effect of helpfulness ratio on attitude (95% confidence interval: 0.2586 to 0.8397). For the negative review, trust negatively mediated the influence of helpfulness ratio on attitude (95% confidence interval: -0.6744 to -0.2093).
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Experiment 2

Method

We recruited 190 participants from Amazon Mechanical Turk. They were randomly assigned to one of 4 conditions in a 2 (review helpfulness magnitude: large vs. small) × 2 (review valence: positive vs. negative) between-subject factorial design.

The procedure and review content are the same as Experiment 1. In the large magnitude condition, the participants would encounter 300 “Yes” and 40 “No” while in the small magnitude condition; they would face 30 “Yes” and 4 “No”. Based on the review, participants were asked to answer several questions. For details, please refer to Appendix 2.

At first, participants completed a three-item measure of attitude towards the restaurant (M=4.233, SD=2.293), adapted from Rucker and Petty (2004) by asking a question “What do you think of this restaurant?” and items were answered on a 7-point scale (1=Bad/Unfavorable/Dislike, 7=Good/Favorable/Like; α=0.992). Next, participants completed the two-item measure of trust of the review (M=4.874, SD=1.457), e.g., “I trust this review” and items were answered on a 7-point scale (1=Strongly disagree, 7=Strongly agree; α=0.956).

Results

Manipulation Check. For the manipulation check of review valence, participants were asked to indicate to what extent they agree the review ranging from very negative to very positive on a 7-point scale (1=very negative, 7=very positive). The one-way ANOVA result indicated that the manipulation of review valence was successful (F(1,188)=1141.184, p<.001): the participants in the positive review condition considered the review as positive (Mean=6.3922, SD=0.946) and participants in the negative review condition considered the review as negative (Mean=1.4773, SD=1.154).

Attitude. First, we conducted a two-way multivariate ANOVA and got significant interaction effect of review helpfulness magnitude and valence on attitude (F(1,186)=12.062, p<0.01). On the one hand, there was no difference in customers’ attitude towards the restaurant between the positive review with small helpfulness magnitude (Mean=6.058, SD=1.013) and the positive review with large helpfulness magnitude (Mean=6.160, SD=.978; F(1,186)=0.248, p=0.619). On the other hand, for the negative review, there was a significant simple main effect of helpfulness magnitude on attitude (F(1,186)=18.286, p<0.001), supporting H2a. Concretely speaking, for the negative review, participants had a significantly higher attitude towards a negative review with small helpfulness magnitude (Mean=2.556, SD=.802) than that with large helpfulness magnitude (Mean=1.609, SD=.802). The plot of interaction effect on attitude, please see the following figure 4.

![Figure 4. Interaction between Helpfulness Magnitude and Review Valence on Attitude](image.png)

Trust. Similarly, we conducted a two-way multivariate ANOVA and got significant interaction effect of review helpfulness magnitude and valence both on trust (F(1,186)=4.035, p<0.05). Furthermore, for the positive review with small helpfulness magnitude, participants estimated trust of review (Mean=5.010, SD=1.395) no significant difference from the estimated trust for the review with large helpfulness magnitude (Mean=5.292, SD=1.458).
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magnitude (Mean=4.980, SD=1.542; F (1,186) =.011, p=0.917). However, for the negative review with large helpfulness magnitude, participants estimated significantly higher trust of review (Mean=5.120, SD=1.309) than that for small helpfulness magnitude (Mean=4.310, SD=1.486; F(1,186)=6.991,p<0.01). The plot of interaction effect on trust, please see the figure 5.

![Interaction Effect on Trust](image)

**Figure 5. Interaction between Helpfulness Magnitude and Review Valence on Trust**

*Moderated Mediation Analysis.* To test the moderated mediation effect of review valence, we applied Process Model 8 (Hayes 2013) and got results as follows. The review valence significantly moderates the mediation impact of review trust on the relationship between helpfulness magnitude and attitude (95% confidence interval: .0053 to .3508). Furthermore, for the positive review, review trust did not mediate the impact of helpfulness magnitude on attitude (95% confidence interval: -.1047 to .0837). For the negative review, review trust positively mediated the impact of helpfulness magnitude on attitude (95% confidence interval: .0134 to .2972).

**Discussion**

The current study investigated how online users respond to prior users’ helpfulness votes in e-commerce context. Regardless of the valence of reviews, high helpfulness ratio enhances their trustworthiness and guide corresponding behavior. Unlike vote ratio, which is applicable to both positive and negative reviews, helpfulness magnitude is only significantly influential for negative reviews, which motivate users to take additional cues for decision making. Despite the degree of helpfulness ratio, users will avail helpfulness magnitude to evaluate the review and make a corresponding decision.

**Theoretical Implications**

These findings add to extant research that examines the commercial value of online product reviews. Online product reviews play an increasingly important role in electronic commerce in various aspects, such as informing potential users of product knowledge (Martin & Lueg 2013), reducing uncertainty of product quality (Senecal & Nantel 2004), and increasing product sales (Chevalier & Mayzlin 2006). Our findings identify another cue, i.e., helpfulness votes with commercial value. Moreover, most studies on review helpfulness aimed to identify the determinants of review helpfulness (e.g., Mudambi & Schuff 2010; Yin et al. 2014); only a few studies directly examine the metrics of helpfulness votes and their consequences. We add to the current helpfulness literature by providing a direct depiction of review helpfulness and justify its commercial value. We also extend the current research on social influence theory in two aspects. In terms of manipulating social influence, we employ an accurate factor, i.e., ratio of helpfulness votes to illustrate the valence of social influence, rather than adopting positive or negative opinions of others to reflect the valence of social influence (Graziano et al. 1993) or simply viewing up-votes as a positive influence and down-votes as a negative influence (Muchnik et al. 2013). Regarding the consequences of social influence, existing studies examine herding effect on voting behavior (e.g., Muchnik et al. 2013), whereas we move one step from primitive voting behavior of subsequent users to a more commercial purchasing behavior.
Managerial Implications

Our research has important managerial implications. Our findings suggest that beyond the detection of helpful reviews, the helpfulness voting system also plays a role in the online users’ decision-making process by enabling them to obtain additional information and make a rational evaluation of reviewed product or service. Online product reviews amplify and accelerate the reach of marketers to the point that nearly any user feedback on products or services can function as an influential information source. In addition to the content of reviews, our findings identify another means, namely, helpfulness votes, through which online retailers can increase the influence of their retail sites.

Further Research Directions

This study can be further strengthened in several ways. We analyze the effects of helpfulness votes at the individual level. Quantifying the relationship between changes in helpfulness votes and product sales through time is important to provide in-depth understanding of the dynamics of vote formation and its corresponding commercial value. Besides, this study focuses on the voting system in the third-party review platform, that is, the evaluation on a review about a product or service. However, the voting system is widely applied to online settings. The contextual moderators in our findings should be explored further given the possible distinctions of contexts. Finally, beyond customer attitude, future research can focus on other outcomes such as purchase intention.

REFERENCES

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Appendix 1—Experiment 1 Scenarios

Appendix 2—Experiment 2 Scenarios