

Lifting Vendor Loyalty Through Trust: Testing the “Chutes and Ladders” Metaphor

Full paper

D. Harrison McKnight
Eli Broad College of Business
Michigan State University
mcknight@broad.msu.edu

Peng Liu
Mihaylo College of Business & Economics
California State University, Fullerton
peliu@fullerton.edu

Tae Hun Kim
Eli Broad College of Business
Michigan State University
thkim@broad.msu.edu

Abstract

Trust in technology is a nascent but growing Information Systems research domain. This paper applies and tests both trust theory and loyalty theory to trust in technology. Researchers show that trust builds loyal relationships over time. Even though trust is a known key loyalty antecedent, few have followed trust's effects on loyalty over time or how trust develops and changes over time. This paper investigates the relationship between trust in technology and loyalty to the technology vendor at time 0 and time 8. Then it tests Lewicki and Bunker's "chutes and ladders" metaphor of trust change, which we apply to trust in technology. We find trust is related to loyalty, but that this relationship changes over time. We also provide empirical evidence consistent with the chutes and ladders theory. We find trust change occurs more frequently when users are new to a technology versus experienced with it.

Keywords

Trust, loyalty, experience, trust change, vicious cycle, virtuous cycle, chutes and ladders theory.

Introduction

One of the important roles of trust is to help build consumer loyalty to the vendor of a product or service. Building customer loyalty is a key to the survival and success of any business enterprise, especially in the online context (Reichheld and Scheffer 2000). This has been established in both marketing and electronic commerce domains (Anderson and Weitz 1989; Pavlou 2002). We believe the role of trust is especially important with products that are technology-based, given how rapidly technology-mediated products are introduced in today's business world. In this paper, we apply these ideas to trust in a specific technology and the related loyalty to the vendor of that technology. We test whether trust in a specific technology predicts loyalty to the technology vendor.

This paper goes further by attempting to understand how the upward or downward trajectory of trust affects the degree to which trust changes over a given time period. While most trust studies have examined trust at one or two (e.g., Gefen et al. 2003a) or occasionally three points in time (e.g., Kanawattanachai and Yoo 2002), we measure trust across several time periods. We find that in some cases, trust increases over these time periods, and in other cases it decreases. Trust that increases over time is said to form a virtuous cycle of trust formation, while trust that decreases is experiencing a vicious cycle (Sabherwal 1999). The virtuous cycle increases trusting, while a vicious cycle may lead to distrusting.

While trust at two or three timeframes has been studied, we know of no research that compares the trends of virtuous trust change cycles versus vicious trust change cycles. This is important because it may be that they behave quite differently, such that interventions for virtuous cycles do not work for vicious cycles. In this initial study, we are interested in whether the degree of trust change differs between the virtuous trust

change cycle and the vicious trust change cycle. In examining this question, we attempt to test the theory of Lewicki and Bunker (1996) that initial trust increases (in a virtuous cycle) at a relatively slower pace than it decreases (in a vicious cycle).

If the rate of change differs between the virtuous and vicious trust cycles, then it may be important to manage these two cycles differently. Hence, this study may provide practical implications for those trying to increase trust in a technology and thereby trying to influence consumer loyalty. Theoretically, in addition, this paper contributes to the relatively sparse literature on trust in technology, an important study domain for a discipline that has undergone criticism for drifting away from study of the “IT artifact” (e.g., Orlikowski and Iacono 2001).

To compare trust change in virtuous and vicious cycles, we examine how trust changes over eight brief time periods. Our subjects did not use the technology, but encountered new information about it. Half of the information is positive and half is negative. Just as trust in people can change across brief time periods based on the behavior of the other party during rounds of a Prisoner’s Dilemma game, so we believe trust can change over brief time periods when one encounters new information about a technology from a presumably reputable and neutral third party. Our study assumes trust can form quickly (McKnight et al. 1998), as do other early impressions (Tractinsky et al. 2006). We also reason that if trust can form quickly, then trust can also change quickly, especially in its initial stage of development.

Theory Development

Trust in a Technology and Loyalty to the Technology Vendor

The success of an enterprise is crucially determined not only by loyalty to a vendor but also to the vendor’s products. In this paper, we examine consumer loyalty to a vendor, which we define as the extent to which one is likely to continue to purchase or use a vendor’s service or product offerings. In other words, loyalty involves an intention to continue one’s relationship with a vendor (Singh and Sirdeshmukh 2000). We define trust in a specific technology as the willingness to depend on (i.e., become vulnerable to) that technology (Mayer et al. 1995). Trust can also be conceptualized as a set of beliefs (Gefen et al. 2003a). However, we study a user’s willingness to depend on a certain technology because willingness to depend addresses the kind of risk involved in trusting situations.

Vendor loyalty will be built up over time as a person experiences or hears about the products or services of a vendor. However, it is likely true that trust in a specific technology product will influence a consumer’s loyalty to the vendor of that product. For example, Singh and Sirdeshmukh (2000) argue that trust will mediate the effects of satisfaction on vendor loyalty. Similarly, Pavlou (2002) argues that the expectation of future transactions with a vendor (comparable to vendor loyalty) is developed as trust in that vendor is developed. He cites Morgan and Hunt (1994), who find a relationship between trust and a commitment to continuing an alliance between two organizations. Pavlou (2002) also finds this relationship, which suggests that trust influences loyal continuance, as Ribbink et al. (2004) and Cyr (2008) also find. Thus, we propose a positive association between trust in a specific technology and loyalty to its vendor:

Hypothesis 1: Trust in a technology will be positively related with loyalty to the technology vendor.

However, the degree of relatedness between trust and loyalty will depend on the timeframe. Although vendor loyalty is likely to be a fairly stable construct, initial trust in a technology will probably change significantly over time as a customer gets to know the technology better. So while initial trust in a technology will relate to initial vendor loyalty, it is likely that the ongoing trust, which a user possesses at the end of a timeframe, will be more closely related to vendor loyalty at that timeframe than will the initial trust. This distinction between initial and ongoing trust over time generates the following:

Hypothesis 2: End-of-period trust in a technology will be more strongly related with vendor loyalty than will initial trust in a technology.

If hypotheses 1 and 2 prove correct, then it is important to understand better how trust develops and changes over time. This is because as trust changes over time, its effect as a loyalty predictor changes.

Trust in a Technology: Changes over Time

Gefen et al. (2003b) propose that trust increases as familiarity with the trustee grows over time. Others also suggest that trust grows as knowledge is gained or information is gathered about the trustee over time (e.g., Xiao and Benbasat 2003). Calculus-based trust refers to Lewicki and Bunker's (1996) first stage of trust development, which occurs before one has much experience with the other party. Lewicki and Bunker (1996, p. 121) said, "The appropriate metaphor for the growth of calculus-based trust is the children's game Chutes and Ladders." Like in the game, they suggest that in the calculus-based trust stage, upward trust progress takes place in slow steps. By contrast, they suggest that downward trust movement can happen quickly. They explain that this is because early trust is fragile. This is in harmony with the idea that negative reactions are stronger than positive reactions, as Baumeister et al. (2001) argue. This idea is also consistent with the greater power of negative framing versus positive framing in prospect theory (Kahneman and Tversky 1973). That is, while positive information about a trustee will yield only a small increase in trust, negative information about the trustee will yield a small to large decrease in trust. On average, therefore, the decreases should be larger than the increases.

We believe that such different magnitudes between the positive and negative trust change effects will likely be true both at the event level of analysis and at the respondent level of analysis. By event, we mean at each period of time just after the respondent reads a news brief about the technology. More information about the events used in this study is described in the following research methodology section. At the event level, we hypothesize that the magnitude of trust change in a vicious cycle is larger than in a virtuous cycle:

Hypothesis 3: *Following a single trust-related event, the average magnitude of change in trust that decreases will exceed the average magnitude of change in trust that increases.*

We also propose the difference in magnitude of trust change between vicious and virtuous cycles at the respondent level:

Hypothesis 4: *During a given timeframe (e.g., eight time periods), respondents' magnitude of change in trust that decreases (i.e., in a vicious cycle) will exceed respondents' average magnitude of change in trust that increases (i.e., in a virtuous cycle).*

Changes over Time in a More Mature Relationship

So far we have assumed that all the relationships are alike. But some relationships are of greater duration or depth than others. When one has already experienced and come to know the other party over time, then trust in that person is likely to be more stable than during the initial, calculus-based stage. Lewicki and Bunker (1996, p. 122) posit that the calculus-based trust stage is succeeded by the knowledge-based stage and explain: "At [the knowledge-based trust] level, trust is not necessarily broken by inconsistent behavior. If people believe that they can adequately explain or understand someone else's behavior, they are willing to accept it (even if it has created costs for them), 'forgive' that person, and move on in the relationship." Thus, one's trust in the other has become firmer with experience and knowledge, such that an event will hold fewer surprises that one cannot deal with. Lewicki and Bunker (1996, p. 128) conclude that "The more developed the relationship, the more the parties have the capacity to handle violations." Thus, we propose the role of experience in terms of the magnitude of trust change over time, as follows:

Hypothesis 5: *Following a single trust-related event, the more experienced the relationship, the lower the average magnitude of change in trust.*

Hypothesis 6: *During a given timeframe (e.g., eight time periods), the more experienced the relationship, the lower respondents' average magnitude of change in trust.*

Research Methodology

We designed an online Qualtrics survey for anonymous respondents. Such a survey design helps avoid social desirability and common method biases (Podsakoff et al. 2003). Respondents, undergraduate business students at four U.S. universities, were incented to participate through course extra credit. The survey took about 20 minutes. 1,799 subjects responded about their trust in one of five technologies:

TomTom GPS, Ford SYNC in-car entertainment system, the Apple Siri feature, Facebook, and Google driverless car. These technologies were selected, first, because they should be interesting to most of our young adult subjects. They were also selected because they are each offered by vendors with a prominent reputation within their domain. Third, they were selected to give a variety of levels of experience with the technology, from no experience with Google's driverless car to frequent experience with Facebook.

We eliminated 33 cases with incomplete responses, producing a final dataset of 1,766 respondents. After seeing a brief Wikipedia description of a certain technology, each subject answered survey questionnaires about initial trust in the technology and other variables at Time Zero (T₀). Next, they were shown a series of eight negativity-balanced news briefs about the technology (four positive, four negative; given randomly in one of eight different patterns: i.e., [+ - - - - + -], [- - - - - + +], [+ - - - - + - -], [- - - + - - - +], [+ + + - - - -], [- - - - - + + +], [+ + - - - - + +], and [+ + - - + - - -]). The patterns were chosen to test theory outside this paper. The degree of news brief negativity/positivity was balanced within each respondent, based on negativity/positivity ratings by separate raters, on a -3 to +3 scale. That is, no matter the pattern of news briefs received, each respondent received eight news briefs that averaged zero negativity/positivity. The news briefs were selected from recent Nexis international newspaper articles and were shortened to an average of 58 words to make them faster to read and understand. The message and meaning of the news briefs were retained. The methods to shorten them were: to change passive tense to active tense, to reduce use of prepositions, and to remove redundancy. The news briefs discuss features of the technology or other users' experiences with that technology product. Ongoing trust was measured after respondents saw each of the eight news briefs and answered three questions unrelated to this study. We removed cases with no trust change from T₀ to T₈; cases increasing 1 or more levels (T₀-T₈) formed the virtuous group, while cases decreasing 1 or more levels constituted the vicious group.

We conducted a pilot test with multi-item construct measures. We found that the study constructs had acceptable reliability, all .78 or higher—above the .70 standard. We next examined convergent validity with average variance extracted (AVE) as the indicator. All the constructs had acceptable AVEs, above the .50 standard (Fornell and Larcker 1981). For discriminant validity, we first examined the loading-cross-loading matrix and found that cross-loadings of the constructs are at the acceptable level—all below .24. Then we examined a correlation analysis to test discriminant validity. We found that all the square-roots-of-the-AVEs exceed any correlations in the same row or column, thus supporting discriminant validity in our study (Fornell and Larcker 1981).

Russell et al. (1989, p. 493) suggested multi-item scales may be “too time-consuming or too distracting” when using “quickly repeated observation.” In fact, they suggested that in “repeated-measures designs” multi-item scales may cause subjects to “become less conscientious or, in longitudinal studies, to drop out” (Russell et al. 1989, p. 493). Due to the survey length with multiple news brief iterations, we decided to reduce respondent frustration by using single-item measures. The item chosen to represent each construct was the one that we felt best represented the overall meaning of the concept, comparing the item loadings. We follow a general consensus that single-item measures can be more reliable and valid than multi-item ones, depending on specific research questions and situations (Drolet and Morrison 2001; Gardner et al. 1998; Jordan and Turner 2008; Wanous et al. 1997). Klein and Rai (2009) identified the conditions in which single items are more acceptable than multiple items: (1) when it is required to keep respondents' high concentration by shortening the length of instruments (Straub et al. 2004); (2) when the addition of indicators seriously causes unnecessary and wasteful redundancies among multiple items (Rossiter 2002); and (3) when constructs are considered unambiguous and narrowly focused one dimensional concepts (Bergkvist and Rossiter 2007). The use of a repeated-measure design with quickly repeated measures also recommends use of single-item scales, according to Russell et al. (1989). After careful consideration, we felt these conditions applied to this study.

The one-item trust scale says: “For [main function of technology—e.g., networking socially online], I feel I can depend on the [technology name—e.g., Facebook].” An example loyalty scale says, “As long as TomTom makes GPS systems, I doubt that I would buy these from anyone else.” Other items are available upon request. While most scales were 7-point, trust was measured on an 11-point scale to capture smaller changes. Our response rate was 85% of subjects possible, which high rate supports a low likelihood of nonresponse bias, so we did not solicit those who did not participate. Nor could we, because we did not collect email addresses. A correlation analysis was performed to investigate inter-correlations between our study variables. We found correlations acceptably low (all 0.45 or below), as shown in Table 1.

Variables	1	2	3	4	5	6	7	8	9
1. D_Patn2	1.000								
2. D_Patn3	-.139**	1.000							
3. D_Patn4	-.139**	-.140**	1.000						
4. D_Patn5	-.140**	-.141**	-.140**	1.000					
5. D_Patn6	-.142**	-.143**	-.143**	-.144**	1.000				
6. D_Patn7	-.143**	-.144**	-.144**	-.145**	-.147**	1.000			
7. D_Patn8	-.140**	-.141**	-.141**	-.142**	-.144**	-.145**	1.000		
8. Gender	.041	-.005	-.034	.008	.000	-.001	.013	1.000	
9. Age	.008	-.009	-.022	.009	.019	.028	.004	.169**	1.000
10. Trust in Media	.001	.022	.021	-.031	.017	-.017	-.005	-.075**	-.047*
11. Loyalty (To)	.027	.048*	.007	-.044	.032	-.028	-.023	-.094**	-.087**
12. Perceived Risk	-.055*	-.011	.016	.012	-.008	.005	.021	-.044	.001
13. Reputation	.048*	.011	-.003	-.016	.028	-.012	-.004	.019	-.027
14. Use Frequency	-.023	.005	-.001	-.022	-.006	.018	.030	-.016	-.055*
15. Trust (To)	.042	.006	.020	-.030	.011	-.016	.004	.068**	-.004
16. Trust (T8)	.062**	-.086**	.106**	-.080**	.098**	-.081**	.092**	-.005	-.026
17. Abs. Trust Change	-.037	.043	-.086**	.093**	-.054*	.042	-.065**	.016	.007
Mean	.120	.120	.120	.120	.130	.130	.120	.640	21.800
S.D.	.325	.328	.328	.330	.334	.338	.330	.481	2.781
Variables	10	11	12	13	14	15	16	17	
10. Trust in Media	1.000								
11. Loyalty (To)	.174**	1.000							
12. Perceived Risk	-.005	.041	1.000						
13. Reputation	.084**	.085**	-.302**	1.000					
14. Use Frequency	.079**	.127**	-.100**	.334**	1.000				
15. Trust (To)	.073**	.037	-.356**	.449**	.235**	1.000			
16. Trust (T8)	.066**	.158**	-.288**	.296**	.266**	.398**	1.000		
17. Abs. Trust Change	.023	-.081**	-.050*	.039	-.052*	.045	-.375**	1.000	
Mean	3.430	3.580	3.400	4.430	2.330	6.840	6.140	1.950	
S.D.	1.561	1.936	1.321	1.260	1.990	2.325	2.661	2.047	

Note. $N = 1,766$. * $p < .05$, ** $p < .01$.

Table 1. Construct Inter-Correlations and Descriptive Statistics

To examine the research questions, we primarily used regression models for consistency across tests. The models included a consistent set of controls: dummy variables for the eight news brief delivery patterns, age and gender. The first pattern [+ - + - + -] was the reference group, so the results compare each pattern shown (2-8) to pattern 1. We also controlled for likely trust/loyalty predictors: perceived technology risk (Zand 1972), trust in news media, and technology reputation (Jøsang et al. 2007). We also controlled for vendor loyalty at Time Zero (To). Initial vendor loyalty may affect trust change because very loyal people reluctantly lower their trust in the face of negative evidence about that person (Holmes 1991).

Results

To test Hypotheses 1 and 2, we ran a series of regressions with vendor loyalty at time eight (T8) as the dependent variable. The first regression included controls only. As shown in Model 1 of Table 2, reputation ($p < .001$), vendor loyalty at To ($p < .001$), and Pattern 5 dummy variable ($p < .05$) had significant coefficients. When trust at To was entered as a predictor (Model 2), the same controls were significant at the same levels and trust at To had a significant coefficient ($t = 2.7$, $p < .01$), supporting H1. We next substituted trust at To for trust at T8 (Model 3), then trust at T8 was significant ($t = 8.8$, $p < .001$), thus supporting Hypothesis 1 further. When both trust at To and T8 were included (Model 4), we found only trust at T8 was significant ($t = 8.4$, $p < .001$), supporting Hypothesis 2 that end-of-period trust is more strongly related to vendor loyalty than is initial trust. To complete Baron and Kenny's (1986) mediation tests we also regressed trust at T8 on trust at To, finding trust at To was a significant predictor ($t = 12.0$, $p < .001$). This indicates that trust at T8 fully mediates the effect of trust at To on loyalty at T8.

The results for Hypotheses 1 and 2 suggest that not only does trust affect loyalty, but that as trust changes

over time, the power of initial period trust levels to predict loyalty decreases. We also found that trust does change over time. In fact, trust at T0 and trust at T8 are correlated with each other at only .40, such that they hardly resemble each other. On the other hand, the correlation between vendor loyalty at T0 and loyalty at T8 was .61, indicating that initial loyalty is more robust and stable than is initial trust. That is, technology trust changed significantly more than did vendor loyalty. Since trust is a good predictor of loyalty, and since trust changes so much over time, it seems clear that we need to understand more clearly what induces trust to change over time in order to understand what builds up vendor loyalty. The rest of this study examines trust change over time.

Variables	Standardized regression coefficients predicting Loyalty (T8) [Dependent Variable]			
	Model 1	Model 2	Model 3	Model 4
D_Patn2	-.020	-.020	-.039	-.039
D_Patn3	-.005	-.006	-.004	-.004
D_Patn4	.031	.030	-.001	-.001
D_Patn5	-.051*	-.051*	-.055*	-.055*
D_Patn6	-.015	-.015	-.042	-.042
D_Patn7	-.014	-.014	-.018	-.018
D_Patn8	.000	.000	-.031	-.031
Gender	-.021	-.024	-.020	-.020
Age	.005	.005	.006	.006
Trust in Media	.001	-.001	-.002	-.002
Perceived Risk	-.025	-.011	.018	.019
Reputation	.097***	.076***	.059**	.057**
Loyalty (T0)	.597***	.596***	.571***	.571***
Trust (T0)		.058**		.007
Trust (T8)			.182***	.180***
R ²	.381	.383	.407	.406
Number of Observations	1,766	1,766	1,766	1,766

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 2. Result Summary of Hypotheses 1 and 2 Testing

We tested Hypotheses 3 and 5 together because they are both at the event level of analysis. Hypothesis 3 says that the magnitude of trust change will be higher for trust that decreases than for trust that increases. Here we mean the absolute value of the trust change, so we can compare the negative and positive change on an equivalent basis. H5 proposes trust change will be smaller in magnitude when respondents have a more experienced relationship with the technology than when they have a less experienced one. We operationalized the experienced relationship as the frequency of respondent use of the technology because such frequency of use deepens the relationship through experience. To test H3, we regressed the absolute trust change (dependent variable) on a group difference variable (D_Decrease), for which 1 = trust decreases and 0 = trust increases. We also included another variable, which measures the frequency of technology use (Use Frequency), to test H5. In testing Hs 3 and 5, we dropped out all the cases in which trust did not change over time. We included the same controls as we did for the Hs 1 and 2 tests. We first ran the model without D_Decrease and Freq1 and then with them. The R^2 increased from Model 5 to Model 6 marginally, as shown in Table 3. When entered, D_Decrease was not significant, thus not supporting H3 (see Model 6). On the other hand, H5 was supported, in that Use Frequency was a significant predictor ($t = -3.0$, $p < .01$; see Model 6). This indicates that the more frequent the use (i.e., the more experienced the relationship), the lower the magnitude of trust change after an event. Several of the control variables were significant too: i.e., age, gender, perceived risk, and T0 loyalty.

Finally, we tested Hypotheses 4 and 6 at the respondent level of analysis (Table 3). Hypothesis 4 proposes that over eight time periods, trust change will be greater for respondents in the vicious cycle than for respondents in for the virtuous cycle. Hypothesis 6 argues that the more experienced the relationship, the lower the magnitude of trust change. Just as with Hypotheses 3 and 5, we also used D_Decrease and Freq1 variables to test Hypotheses 4 and 6; yet the tests were done at the respondent level. Both Hypotheses 4 and 6 were supported. When Freq1 and D_Decrease were added, the R^2 increased from Model 7 to Model 8 considerably, as shown in Table 3. D_Decrease was significant ($t = 4.3$, $p < .001$; see Model 8), which means that the vicious cycle had a higher trust change magnitude than did the virtuous

cycle. Use Frequency was significant in the model ($t = -2.2$, $p < .05$; see Model 8), suggesting that the more frequent the use (i.e., the more experienced the relationship), the lower the magnitude of change in trust over the eight time periods.

Independent Variables	Standardized Regression Coefficients Predicting:			
	Magnitude of Trust Change (Dependent Variable) at the Event Level		Magnitude of Trust Change (Dependent Variable) at the Respondent Level	
	Model 5	Model 6	Model 7	Model 8
D_Patn2	-.013	-.016	-.099**	-.092**
D_Patn3	-.064***	-.066***	-.064	-.062
D_Patn4	-.062***	-.063***	-.152***	-.140***
D_Patn5	-.077***	-.079***	-.012	-.006
D_Patn6	-.081***	-.083***	-.134***	-.115**
D_Patn7	-.092***	-.092***	-.039	-.035
D_Patn8	-.065***	-.066***	-.162***	-.145***
Gender	-.033**	-.033**	.020	.012
Age	.042**	.041**	.026	.027
Trust in Media	.022	.023	.047	.048
Perceived Risk	-.049***	-.048***	-.042	-.040
Reputation	.014	.025	.041	.053
Loyalty (To)	-.121***	-.117***	-.105***	-.085**
D_Decrease		.006		.122***
Use Frequency		-.038**		-.064*
R ²	.027	.028	.043	.060
Number of Observations	6,665	6,665	1,252	1,252

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 3. Result Summary of Hypotheses 3-6 Testing

Discussion

Most of the hypotheses were supported, providing empirical evidence for Hs 1-2 and 4-6. By testing Hs 1 and 2, we added to the existing evidence (e.g., Gefen 2002) that trust in technology is a key determinant of loyalty. What this study uniquely shows is two things. First, by using the theory-based control variables we used, we show that trust robustly impacts vendor loyalty at T8 even in the presence of other variables that should also have a significant effect on loyalty at T8: vendor loyalty at To, perceived technology risk, and perceived technology reputation. Second, we also show the effects of trust on loyalty change over the eight time periods. We found trust at time zero (To) to significantly predict loyalty predictor when it is the only trust predictor. However, because trust in the technology changes over time, we test and find that the impacts of To trust on loyalty at T8 are fully mediated by T8 trust, per the Baron and Kenny test. This finding underscores the importance of examining trust's impact on loyalty over time, because they both can change over time. It is striking that while each of the five well-known vendors studied offer many products, and each product's performance presumably affects customer loyalty to the vendor, yet our findings show that trust in one of its technology products can impact loyalty to the vendor. This finding shows how vital a customer's trust in a technology product is to the customer's loyalty to the vendor. Our findings also show how key it is to track trust in a technology over time, since trust is subject to change as the subject encounters news about the technology. Loyalty is a crucial success variable for any vendor of technology, so these findings have important implications for developing loyalty through trust over time.

This study offers two tests of Lewicki and Bunker's (1996) theory related to their "chutes and ladders" metaphor. Hypothesis 4 tests it at the respondent level of analysis, while Hypothesis 3 tests it at the event level. Testing the "chutes and ladders" metaphor at both levels is a design attribute unique to this study. We find that the level of analysis makes an intriguing difference. At the respondent level, the T1-T8 decline in trust in the vicious cycle is significantly steeper than the T1-T8 increase in trust in the virtuous cycle ($p < .001$). This empirical evidence not only supports the "chutes and ladders" metaphor, but also supports bad-versus-good theory and prospect theory (Baumeister et al. 2001; Kahneman and Tversky 1973), in that in a user's perceptions, encountering bad news has a greater effect on technology trust change than encountering good news. That is, this is the expected test result corresponding to the theories.

By contrast, at the event level we find the vicious cycle does not have a greater effect on trust change than the virtuous cycle. This surprising finding directly counters not only Lewicki and Bunker's trust theory, but also to bad-versus-good theory and prospect theory. In trying to explain this difference, we think the main situational difference is that at the event level, subjects have little time to think about the news brief (only a matter of seconds while they answer three other questions) before being asked for their trust level. Thus, trust becomes a relatively quick response. By contrast, at the respondent level, subjects have significantly more time to think about both the current news brief and previous news briefs. Therefore, the bad-is-stronger effect has more time to formulate or gel in the respondents' minds. Similarly, Kramer (1996) found that time taken to ruminate about a trust-related situation made a difference to trust.

Other explanations for our differential "chutes and ladders" results may exist. However, the findings still suggest that there are circumstances in which the "chutes and ladders" theory is not supported. This means additional theory is needed to explain these results, resulting in a model boundary condition.

The results of Hypotheses 5 and 6 consistently support the Lewicki and Bunker (1996) theory that trust changes to a lesser degree when better informed by personal experience with the trustee. We specifically found that higher frequency of prior use of the technology lowered the magnitude of change in trust in the technology. This finding was true at both the respondent (Hypothesis 6) and event (Hypothesis 5) levels. Our findings support Lewicki and Bunker's argument that when one has more experience with the other, one's ability to deal with events that could be interpreted as trust violations increases. This may be because over time and with experience one comes to hold a more nuanced (positive and negative) and detailed view of the other party, making one more accepting of any specific bad news about them. For example, one may rationalize the event as a quirk that is irrelevant to one's trust (Sitkin and Roth 1993).

We note that our dataset did not have widely varying levels of experience within any technology. This may have made it more difficult to find an effect. Average subject experience was generally high for Facebook, very low for Google driverless car, and fairly low for the other three technologies. Yet in the overall sample, with our mix of technologies, we were able to provide empirical evidence supporting Hypotheses 5 and 6.

Additional Research Implications

Comparing the R²s of the eight models, we can tell that it is much more difficult to explain the variance in trust change than in trust itself and other related constructs like loyalty. Predicting trust change after each event is the most difficult. This is consistent with the idea that trust can be sticky. Trust may not change immediately after each event, but is more likely to change after a series of events. As long as it changes, no matter whether in a virtuous cycle or a vicious cycle, researchers need to study the mechanisms of change and be able to predict the magnitude of change. Here, we took a first step in this direction, and we believe more future studies are needed to better understand the topic of trust change over time.

Limitations

This study has a number of limitations. First, it uses a single-item scale for most variables. This measurement approach limits the construct validity tests we could run; also, the results may differ if we used multi-item scales. However, we did a pilot with multi-item scales and found adequate construct validity with these. We also compared the multi-item and single-item scale correlation matrices and found the general patterns of correlations among constructs to be similar, as described in the research methodology section. The same correlations were significant, and the size of the correlations was comparable. Single-item scales allowed us not to fatigue the respondents, increasing study validity. Second, this study uses a college student sample. This means that we cannot generalize our findings into the general population or even the population of technology users. Still, students are one important set of users of technology, and technology vendors are interested in targeting their technical innovations to this group, making student perceptions of technology important to study. Third, we were not able to eliminate all the plausible alternatives to explain our results. However, follow-up studies and the use of additional constructs might enable us to further improve internal validity by eliminating other possible alternatives. We did eliminate a number of plausible alternatives using demographics and theory-based control variables for internal validity of this study. Fourth, the respondents for four of the technologies had little hands-on experience with the technology. However, we informed them about the technology first through a Wikipedia briefing and then through the news briefs, much as people might learn about some

technology that is new to them. Rather than being a major limitation, this allowed us to examine trust in its initial stage for most subjects while still, through Facebook and those experienced with the other technologies, examining trust in a more knowledgeable stage of the human-technology relationship. Fifth, we used only regression methods for our results. Future research may yield more insights using panel data methods. Similarly, future research could examine additional theory-based mediation/moderation effects.

Conclusion

In summary, this paper contributes as follows. First, it shows empirically how trust in a specific technology relates over time to loyalty to the technology vendor. Second, using repeated trust measures over nine time periods, we conducted two tests of the “chutes and ladders” metaphor. This theory has received some qualitative testing (e.g., Wiethoff and Lewicki 2005), but no robust multiple time-frame testing as we did. Our unique design allowed us to test the theory at both the individual and the event level with two different findings, potentially leading (with follow-up studies) to the ability to bound the applicability of the “chutes and ladders” theory. Third, we contribute by testing how experience with the technology affects trust in the technology over eight periods of time. This addresses the need to understand better how trust operates over time, for which research has called (e.g., Kanawattanachai and Yoo 2002; McKnight et al. 1998). This paper shows the value of researching across more than two or three time periods. We believe extending this work by examining the added dynamic aspects of how trust develops and changes over time will yield better practical recommendations than will the more static past trust studies. The results will improve long term, loyal consumer relationships with technology vendors.

Acknowledgements

We appreciate the help of Fred Rodammer, Nicholas Ball, and Nancy Lankton in gathering the data.

References

- Anderson, E., and Weitz, B. 1989. “Determinants of Continuity in Conventional Industrial Channel Dyads,” *Marketing Science* (8:4), pp. 310-323.
- Baron, R.M., and Kenny, D.A. 1986. “The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations,” *Journal of Personality and Social Psychology* (51:6), pp. 1173-1182.
- Baumeister, R.F., Bratslavsky, E., Finkenauer, C., and Vohs, K.D. 2001. “Bad Is Stronger Than Good,” *Review of General Psychology* (5:4), pp. 323-370.
- Bergkvist, L., and Rossiter, J.R. 2007. “The Predictive Validity of Multiple-Item Versus Single-Item Measures of the Same Constructs,” *Journal of Marketing Research* (44:2), pp. 175-184.
- Cyr, D. 2008. “Modeling Web Site Design Across Cultures: Relationships to Trust, Satisfaction, and E-Loyalty,” *Journal of Management Information Systems* (24:4), pp. 47-72.
- Drolet, A.L., and Morrison, D.G. 2001. “Do We Really Need Multiple-Item Measures in Service Research?,” *Journal of Service Research* (3:3), pp. 196-204.
- Fornell, C., and Larcker, D.F. 1981. “Evaluating Structural Equation Models with Unobservable Variables and Measurement Error,” *Journal of Marketing Research* (18:1), pp. 39-50.
- Gardner, D.G., Cummings, L.L., Dunham, R.B., and Pierce, J.L. 1998. “Single-Item Versus Multiple-Item Measurement Scales: An Empirical Comparison,” *Educational and Psychological Measurement* (58:6), pp. 898-915.
- Gefen, D. 2002. “Customer Loyalty in E-Commerce,” *Journal of the Association for Information Systems* (3), pp. 27-51.
- Gefen, D., Karahanna, E., and Straub, D.W. 2003a. “Inexperience and Experience with Online Stores: The Importance of TAM and Trust,” *IEEE Transactions on Engineering Management* (50:3), pp. 307-321.
- Gefen, D., Karahanna, E., and Straub, D.W. 2003b. “Trust and TAM in Online Shopping: An Integrated Model,” *MIS Quarterly* (27:1), pp. 51-90.
- Holmes, J.G. 1991. “Trust and the Appraisal Process in Close Relationships,” in *Advances in Personal Relationships, Volume 2*, W.H. Jones and D. Perlman (eds.), Oxford, UK: Jessica Kingsley, pp. 57-104.
- Jordan, J.S., and Turner, B.A. 2008. “The Feasibility of Single-Item Measures for Organizational Justice,” *Measurement in Physical Education and Exercise Science* (12:4), pp. 237-257.

- Jøsang, A., Ismail, R., and Boyd, C. 2007. "A Survey of Trust and Reputation Systems for Online Service Provision," *Decision Support Systems* (43:2), pp. 618-644.
- Kahneman, D., and Tversky, A. 1973. "On the Psychology of Prediction," *Psychological Review* (80:4), pp. 237-251.
- Kanawattanachai, P., and Yoo, Y. 2002. "Dynamic Nature of Trust in Virtual Teams," *Journal of Strategic Information Systems* (11:3-4), pp. 187-213.
- Klein, R., and Rai, A. 2009. "Interfirm Strategic Information Flows in Logistics Supply Chain Relationships," *MIS Quarterly* (33:4), pp. 735-762.
- Kramer, R.M. 1996. "Divergent Realities and Convergent Disappointments in the Hierarchic Relation: Trust and the Intuitive Auditor at Work," in *Trust in Organizations: Frontiers of Theory and Research*, R.M. Kramer and T.R. Tyler (eds.), Thousand Oaks, CA: Sage Publications, pp. 216-245.
- Lewicki, R.J., and Bunker, B.B. 1996. "Developing and Maintaining Trust in Work Relationships," in *Trust in Organizations: Frontiers of Theory and Research*, R.M. Kramer and T.R. Tyler (eds.), Thousand Oaks, CA: Sage Publications, pp. 114-139.
- Mayer, R.C., Davis, J.H., and Schoorman, F.D. 1995. "An Integrative Model of Organizational Trust," *Academy of Management Review* (20:3), pp. 709-734.
- McKnight, D.H., Cummings, L.L., and Chervany, N.L. 1998. "Initial Trust Formation in New Organizational Relationships," *Academy of Management Review* (23:3), pp. 473-490.
- Morgan, R.M., and Hunt, S.D. 1994. "The Commitment-Trust Theory of Relationship Marketing," *Journal of Marketing* (58:3), pp. 20-38.
- Orlikowski, W.J., and Iacono, C.S. 2001. "Research Commentary: Desperately Seeking the "IT" in IT research—A Call to Theorizing the IT Artifact," *Information Systems Research* (12:2), pp. 121-134.
- Pavlou, P.A. 2002. "Institution-Based Trust in Interorganizational Exchange Relationships: The Role of Online B2B Marketplaces on Trust Formation," *Journal of Strategic Information Systems* (11:3-4), pp. 215-243.
- Podsakoff, P.M., MacKenzie, S.B., Lee, J.-Y., and Podsakoff, N.P. 2003. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," *Journal of Applied Psychology* (88:5), pp. 879-903.
- Reichheld, F.F., and Scheffer, P. 2000. "E-Loyalty: Your Secret Weapons on the Web," *Harvard Business Review* (78:4), pp. 105-113.
- Ribbink, D., van Riel, A.C.R., Liljander, V., and Streukens, S. 2004. "Comfort Your Online Customer: Quality, Trust and Loyalty on the Internet," *Managing Service Quality* (14:6), pp. 446-456.
- Rossiter, J.R. 2002. "The C-OAR-SE Procedure for Scale Development in Marketing," *International Journal of Research in Marketing* (19:4), pp. 305-335.
- Russell, J.A., Weiss, A., and Mendelsohn, G.A. 1989. "Affect Grid: A Single-Item Scale of Pleasure and Arousal," *Journal of Personality and Social Psychology* (57:3), pp. 493-502.
- Sabherwal, R. 1999. "The Role of Trust in Outsourced IS Development Projects," *Communications of the ACM* (42:2), pp. 80-86.
- Singh, J., and Sirdeshmukh, D. 2000. "Agency and Trust Mechanisms in Consumer Satisfaction and Loyalty Judgments," *Journal of the Academy of Marketing Science* (28:1), pp. 150-167.
- Sitkin, S.B., and Roth, N.L. 1993. "Explaining the Limited Effectiveness of Legalistic "Remedies" for Trust/Distrust," *Organization Science* (4:3), pp. 367-392.
- Straub, D.W., Boudreau, M.-C., and Gefen, D. 2004. "Validation Guidelines for IS Positivist Research," *Communications of the Association for Information Systems* (13:24), pp. 380-427.
- Tractinsky, N., Cokhavi, A., Kirschenbaum, M., and Sharfi, T. 2006. "Evaluating the Consistency of Immediate Aesthetic Perceptions of Web Pages," *International Journal of Human-Computer Studies* (64:11), pp. 1071-1083.
- Wanous, J.P., Reichers, A.E., and Hudy, M.J. 1997. "Overall Job Satisfaction: How Good Are Single-Item Measures?," *Journal of Applied Psychology* (82:2), pp. 247-252.
- Wiethoff, C.M., and Lewicki, R.J. 2005. "Trust and distrust in work relationships: A grounded approach," in *Proceedings of the IACM 18th Annual Conference*, Available at SSRN: <http://ssrn.com/abstract=736273>.
- Xiao, S., and Benbasat, I. 2003. "The Formation of Trust and Distrust in Recommendation Agents in Repeated Interactions: A Process-Tracing Analysis," in *Proceedings of the 5th International Conference on Electronic Commerce*, pp. 287-293.
- Zand, D.E. 1972. "Trust and Managerial Problem Solving," *Administrative Science Quarterly* (17:2), pp. 229-239.