Firm/product reputation and new-product recalls

Kashef Majid
University of Mary Washington, Fredericksburg, Virginia, USA, and
Mooweon Rhee
Yonsei University, Seodaemun-gu, South Korea

Received 26 November 2017
Revised 21 January 2018
4 March 2018
9 March 2018
13 March 2018
Accepted 14 March 2018

Abstract

Purpose – The purpose of this paper is to identify the rate of recall for new products vs established products and to explore the simultaneous impact of a firm's reputation and a product's reputation on the market response to a product recall.

Design/methodology/approach – The authors first use an accelerated hazard model to establish that new products are more vulnerable to damage than established products. Once this is established, the authors use a hierarchical linear model to explore the simultaneous impact of the firm and product reputation on the market response to a product recall.

Findings – The findings indicate that new products have a greater probability of recall over time than existing products and after a product recall a positive firm reputation can negatively impact the firm and hence becomes a liability. However, when the product is first introduced, the product reputation can help offset any negative market response; the product reputation can therefore be an asset.

Research limitations/implications – New products are more flawed than their established counterparts. A positive reputation can be a liability but a positive product reputation can offset the negative impact of the firm reputation and this is especially pertinent to new products.

Originality/value – The majority of prior research has focused on the reputation and assumed that the firm represented the product as well; the findings of this study reveal that the reputation of the product can have contrasting effects to the reputation of the firm.

Keywords New products, Reputation, Product recalls

Paper type Research paper

Introduction

The development of new products spans several disciplines including but not limited to engineering, operations, management, and marketing. A great deal of research has espoused new products as assets (see Hauser *et al.*, 2006) which provide value to the firm over time. However, the novelty of a new product can make it susceptible to flaws once it is released into the marketplace. For example, a new edition of a popular selling smartphone may display connectivity issues once consumer purchases it because the new hardware had not endured the rigors of actual market conditions (Kelly, 2016). Once the flaw is revealed and determined to be systematic, the product must be recalled and the firm must deal with the fallout. Prior work has found that firms can suffer from legal penalties, costs associated with fixing the product, and reduced market share (Bapuji, 2011; Rhee and Haunschild, 2006). Between 2014 and 2015, over 200,000 consumer products (US Consumer Product and Safety Commission, 2015) and no less than 100,000 vehicles sold in the USA (National Highway Traffic Safety Administration, Office of Defects Investigations, 2016) were recalled but it is unclear what proportion of these recalls were new products. One of the biggest predictors of the market reaction to product recalls has been the reputation of the firm; firms with a positive reputation suffer the most because their expectations are violated by a product recall (Rhee and

The authors acknowledge the help of Johny K. Johansson and Hari Bapuji in the preparation of this manuscript. The authors would also like to thank the anonymous reviewers and the editor for their valuable feedback throughout the review process. This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2017S1A5A2A01025232).

Marketing Intelligence & Planning

0263-4503
DOI 10.1108/MIP-11-2017-0309

Haunschild, 2006). However, new products represent a new challenge because they contain more novel elements than established products and they are developing their own reputation which may be different from the reputation of the firm (Rahman and Areni, 2014). Our paper takes a novel approach by examining the rate of recall for new products and how reputation of the firm and the product may impact the market response to the product recall. Specifically, we make the argument that new products are more susceptible than established products to a product recall and because the product is gaining awareness, the market response to the product recall may depend upon both the reputation of the product and the firm.

Our focus in this study is on incremental innovation, technology that does not displace the existing technology. Our work examines products versions that are being sold for the first time vs products that are updated versions of previous products (e.g. a new model of car and not a self-driving car). We build on prior work (Dewar and Dutton, 1986; Min *et al.*, 2006) and conceptualize a new product not simply as an updated version of a previous design, but as a product that contains a unique design for that particular firm.

The study is structured as follows. We first demonstrate the basic assertion that, compared to established products, new products contain greater uncertainty in terms of product flaws and thus have a greater probability of being recalled. Once the basic premise of our study has been demonstrated, we then move on to the following research question:

RQ1. How does the firm's and the product's reputation distinctly affect the market's response to the new-product recall?

Key variables used to predict the market response to the product recall are then proposed and relationships are tested. We conclude with a summary of our findings, along with a discussion of their theoretical and managerial implications.

Context

Our context for this study is the US automobile industry during the period from 2000 to 2010. During this time, over 90 million cars were sold within the USA (*Automotive News*, 2011). The automobile industry is characterized by continuous new-product introductions and the updating of existing models. Each year, the automobile industry introduces new versions of existing models into the marketplace, a practice that has evolved due to competitive pressures and the need to maintain market share (Ingrassia and White, 1995). For example, the Ford Focus was first introduced into the North American market in 2000 in order to compete with other mid-size sedans and provide appeal to consumers who wanted both comfort and styling in that product category. The Focus has been updated annually since its introduction, with an improved version of the automobile appearing in showrooms each year. The updated versions are based largely on prior designs of the original product and thus, according to our conceptualization, do not constitute a completely "new" product (Clark *et al.*, 1987). In our discussion, we distinguish between new products and updated versions (Pauwels *et al.*, 2004). In keeping with our earlier example, the Ford Focus would constitute a new product in 2000, while the 2010 Ford Focus would be an updated version.

We created our sample of new cars[1] based on an analysis of data from *The Automotive News* and the publications: *Car and Driver Magazin*e and *Consumer Reports*. For the purposes of our study, we classified a given car as being a new product only in the first two years of its introduction. Therefore, the 2000 Ford Focus and the 2001 Ford Focus automobile were both counted as new products. The rationale for including both years was based on the production cycle for automobiles, which can start over a year before the product is released into the marketplace. During the time period of our investigation (2000-2010), 33 different automakers released a total of 138 new cars into the marketplace. We took both the entry year and the subsequent year to obtain a sample of 271 automobiles that could be classified as new products. It should be noted that our sample is not equivalent

to twice the number new cars introduced into the marketplace. This is because five vehicles were introduced in 2010 and this was the last year of our data collection thus we were unable to use the second year of these five vehicles.

We then matched the new products with established products from each firm. For example, BMW introduced the Z4 during our period of analysis, but during the course of our analysis, the firm also offered 15 other models for sale as well. Thus, the total sample of BMW models was 16, of which one was classified as a new product for two years. In total, we found that the firms in our sample sold 429 vehicle models between 2000 and 2010, and of these, 138 were classified as new cars. Data on product recalls were obtained from reports provided by the National Highway Traffic Safety Administration (NHTSA) to the US Department of Transportation.

New-product flaws

Using the sample we identified above, we divided our sample of cars sold from 2000 to 2010 into two distinct categories: new cars and established cars. Based on our earlier conceptualization, our sample of new cars contained 281 vehicles which we recalled a total of 332 times over the course of our investigation. Our remaining sample of established cars was recalled a total of 2,274 times during the same time period.

We calculated the time in months between the time the new car was first manufactured and the time the recall notice was first received by the NHTSA. In order to calculate the probability of a new car being recalled, we also included new cars that were introduced but never recalled during our period of analysis (2000-2010).

In order to compare the probability of a new car being recalled vs an established car, we chose to develop a discrete time hazard model. The following equation represents the hazard rate of a new car being recalled at time (t) vs the probability of an established car being recalled at time (t), where time was measured in months (i). New entrants were represented by a dummy variable, which was indicated by 1 for new entrants or 0 for established cars:

$$h_{it} = \Pr[T_i \geq t, \text{ New Car}_i], \; t = 1 \text{ to } 192$$

In order to assess differences between the two groups, we compared the probabilities across time using both the log-rank ($\chi^2 = 7.0499$) and the Wilcoxon signed-rank test ($\chi^2 = 13.5576$), both of which revealed significant differences at the $p < 0.01$ level. New products started with a higher likelihood of being recalled, and that likelihood increased until a time period between 50 and 75 months, when the likelihoods of a product recall for both established and new products converged.

Therefore, our initial argument (i.e. that once they enter the market, new product entrants are more likely to be recalled earlier than are established products) was supported.

Hypotheses concerning reputation

Reputation is a multidimensional construct (Fombrun, 1996; Puncheva-Michelotti and Michelotti, 2010). Any product carries with it two reputations: that of the firm and that of the product itself. The Toyota Camry carries with it the reputation of the firm (Toyota) and the reputation of the product (Camry). The majority of research on reputation (Shapiro, 1982; Fombrun and Shanley, 1990) has examined this characteristic at the firm level (Cabral, 2000; Yoo *et al.*, 2000), with the firm's reputation then being extrapolated to its products. Prior work (Yoo *et al.*, 2000) has identified product reputation as being distinct from firm reputation but has treated it as an antecedent to the firm's reputation. Under this treatment, a product that failed would then be perceived negatively in the marketplace, in turn dealing a negative blow to the firm's reputation (Yoo *et al.*, 2000). We use the introduction of new automobiles into the marketplace, along with any ensuing recalls, as an opportunity to

examine the differing roles of product reputation and firm reputation. It is important to note that we investigate the reputation of the product embedded within the reputation of the firm. The use of new products allows us to examine how reputation can change over time and to observe the subsequent impact of this change. Based on our findings above, a new product often contains more flaws than its established counterpart.

We start by first distinguishing between the product and the firm, based on temporal characteristics. The firm predates the product and often exists long after the product has disappeared from the market[2]. Firms often have greater longevity than their products and are fairly stable; thus, the reputation of the firm develops over a longer period of time and is less amenable to change (Fombrun, 1996; Eisenbeiss *et al.*, 2014). In contrast, a product's reputation develops over a shorter period of time and is more amenable to change because the product undergoes a series of changes as newer versions are introduced.

The reputation of a product develops through assessments by consumers and by third parties (such as expert raters), and these assessments are based on interactions with the current and previous models of the product (Rhee and Haunschild, 2006). A *Consumer Reports* analysis of expert ratings of new cars reveals that new products receive the lowest ratings when they are first introduced into the market, but these ratings gradually improve as subsequent versions of the cars are introduced, thereby illustrating the dynamic nature of a new product's reputation. Our earlier results demonstrated that flaws are more likely to appear in new products than in established products, and thus, expectations regarding the likelihood of a product flaw in new products may demonstrate this relationship as well. When a product flaw in a new product is revealed, those products that initially contained a positive reputation would arguably have an advantage in the marketplace simply because they are perceived as less likely to have future flaws (Rhee and Haunschild, 2006).

Products can be assessed at multiple levels. Consumers may evaluate the abstract components of the product when consumption is near, but they evaluate the abstract components when product consumption is distant (Castano *et al.*, 2008). Evaluating both abstract and tangible elements of product creates the possibility that products are evaluated at multiple levels. We content that this relates to the reputation of a product. Products that fail test the reputation of the product at both the level of the product and the firm. From the consumer's perspective, the lowest level (in this case the product) is the most tangible. Consumers can use and test the quality of the product. Above the product is the firm which is more abstract to consumers. Due to the encompassing nature of the firm a consumer cannot simply extrapolate one experience with a firm's product to the firm as a whole. For example, a consumer who purchases a child's toy which is then recalled is unlikely to extrapolate poor quality on to all of the firm's diverse products (Bapuji, 2011). In the following, we propose different effects of a product recall based on a product's reputation and a firm's reputation. We argue that product reputation relates to the abilities of the product. Consumers are able to use the product and test its performance, which causes the product reputation to vary based on consumer assessments (Archak *et al.*, 2011). We draw upon consumer learning theories to argue that consumers of new products are able to hypothesize performance of new products and then test these hypotheses by using the product to develop their assessment of the product (Hoch and Deighton, 1989). Products which receive a good reputation have been tested by others which increases the likelihood that when a consumer performs the test himself/herself the product will perform well. The experience of testing the product oneself can overcome gaps in knowledge of conflicting perceptions (Hoch and Deighton, 1989; Griffith and Chen, 2004). For consumers who may be wary of purchasing a new product, the reputation of the product can take on enhanced importance because it provides a signal of what the product can do, or can do well, and of what it cannot do.

Stated formally:

H1. The better a product's reputation, the lower the market penalty incurred by the new product after a product recall.

Unlike the reputation of new products, the reputation of the firm is established through multiple sources over a long period of time, and thus it remains fairly constant (Scott, 2001). If a firm's reputation is stable and positive, then a violation to this reputation may come as a shock to consumers because it contradicts their expectations with respect to product quality. Though not focused on new products, prior work by Rhee and Haunschild (2006) used the automobile sector to demonstrate that a positive reputation can in fact harm the firm when a product recall occurs. Using the expectancy violation framework, these authors argued that firms with a positive reputation create positive expectations in the minds of consumers, but when those expectations are violated, reputable firms suffer more, compared to their less reputable counterparts. In other words, firms with a positive reputation have more to lose from a product recall because the evidence of the recall violates the competitive advantage that comes from the firm's positive reputation. We use the same argument advanced by Rhee and Haunschild (2006) to propose a similar argument for new products. As discussed earlier, the reputation of a firm is generally stable, and events that contradict a stable reputation are likely to incur a negative market response. Formally:

H2. The better a firm's reputation, the higher the market penalty incurred by a new product after a product recall.

Our final hypothesis concerns the moderating relationship of length of time that has passed since a version of the product was released into the marketplace on the product's reputation. One question for the development of this hypothesis is: does the impact of the product reputation have a stronger or weaker effect over time? Recall our earlier discussion for *H1* – that is, product reputation is amenable to change. The new product's reputation starts off low, which indicates a poor initial quality (as evidenced by the low ratings given by *Consumer Reports* to new products), but over time, the firm improves its new products by fixing flaws in earlier versions and by improving the products with additional capabilities. Prior work makes the argument that a positive reputation grants the firm the benefit of the doubt when a failure occurs (Eisenbeiss *et al*., 2014) and this may be compounded for new products simply because a product that initially contained a positive reputation is less likely to signal systematic malpractice of the company.

We also draw on prior work to argue that time benefits those that have a negative reputation (Eisenbeiss *et al*., 2014). Low reputations are less stable than those which are positive and thus more amenable to change (Eisenbeiss *et al*., 2014). For products that consistently have a positive reputation, their length of time on the market strengthens the impact of positive reputation because time reinforces the quality and abilities of the product through multiple iterations. The strengthening effect of time on new products is fairly intuitive what is less intuitive is the positive effect of time on products that once had a negative reputation. Products that once had a negative reputation benefit because the length of time that passes since earlier versions gives the firm time to improve the product. The product's evolving reputation in the marketplace allows it to signal to customers that the parent firm is making use of its resources to improve its products, which allows the consumer to make a comparison between recent and earlier versions. Thus, it stands to reason that the impact of a positive reputation will be strengthened by the amount of time that passes between the product's initial introduction and the time of its recall. We advance the following hypothesis:

H3. The more time a product with a positive reputation spends in the market, the lower the loss in market share after a product recall.

Methods

As discussed earlier, the US auto industry (2000-2010) serves as our study context. As a result of the high degree of scrutiny across the auto industry, a wealth of information is available regarding the reputation of the firm, the value of its products, its sales figures, and a host of other measures, all of which have allowed us to pursue our research question.

Measures and models

Each product recall is incurred not simply by the product but by the firm as well. The recall itself stands as the primary level and the product brand (e.g. Toyota Camry) stands as the second level. To examine the effect of multiple levels, we use a hierarchical linear model (HLM), with variables related to the recall representing Level 1 and variables related to the brand representing Level 2.

Dependent variable – change in market share

The change in market share before and after the product recall was used as our proxy for the market-level impact. The market-share change represented the most appropriate measure because it was less susceptible to seasonality effects than sales and because it recognized the proportion of sales within the particular product category (Rhee and Haunschild, 2006). Our calculation of market share for the month in which the recall occurred is represented by the following equation, where market share is represented by the term M for recall j of product brand k, while t represents the month in which the product recall occurred. A product (k) can undergo multiple recalls (j), but, central to our hypotheses regarding product reputation, we had to incorporate the specific product brand into the calculation of market-share change. Thus, we separated products from recalls by denoting each recall as j and each product brand as k[3]:

$$M_{jkt} = \frac{\text{Sales}_{kt}}{\text{Total sales per product category}_{t}}$$

The product category was first identified through *Car and Driver Magazine*, which rates vehicles based on this grouping. The category was then refined through a comparison with the product groupings of automobile types in *Consumer Reports*. A further round of refinement was conducted by approaching major dealerships within a large metropolitan area in order to ask about their primary competitors for each model. Dealerships for Honda, Toyota, Ford, and Mazda agreed to participate in this request and, based on the results of this final round, the product categories and the models that populated each category were finalized. The number of cars per product category was continually changing, as new entrants entered the market and previous models were retired. Our calculation of market share reflected this variation across time, and the denominator was calculated independently for each recall that the product brand may have undergone.

Based on our calculation of market share, our calculation of market-share change is represented by the following equation:

$$\Delta M_{jk} = \frac{M_{jkt} - M_{jk(t-1)}}{M_{jk(t-1)}}$$

It should also be noted that we centered the market-share change by dividing the gross difference by the market share from the month prior.

Independent variables

Product reputation. A significant amount of prior work has developed measures for reputation which have relied solely on consumer evaluations (Fombrum, 2007). One weakness of this approach though is that for new products consumers may not have a fully formed view of the product and thus reputation of the product may simply be an extension of how the consumer evaluates the firm. To alleviate this issue we used a triangulation of methods to form our measures of reputation. Our measure of reputation was based on the work of Rhee and Haunschild (2006) from the realm of organizational science. In their study of reputation, these authors used a composite measure that contained third-party ratings, user reviews, and product depreciation. The third-party ratings were scaled, summed, and then averaged from two car-rating sources in the USA: *Consumer Reports: Buying Guide*, and J.D. Power and Associates. These two sources represent the two most popular rating agencies in the automotive sector, and they form their ratings based on two sources: expert assessments and customer feedback. Based on the work of Rhee and Haunschild (2006), the rates of depreciation were then used to form a second measure of reputation. The logic behind using depreciation rates was based on the concept that the greater the degree of uncertainty regarding an automobile's quality, the greater the depreciation would be. Data on depreciation were obtained from used car sale values provided by the National Automobile Dealers Association. Once the composite scores were compiled, we then reweighted each third-party rating and depreciation score on a spectrum from 0 to 1. Products that received the highest ratings were given a score of 1, and those with the lowest ratings were given a score of 0. Once the two rankings were complete, the two scores were averaged to create one measure of reputation for each individual car.

Firm reputation. We measured firm reputation based on the work of Rhee and Haunschild (2006). Our firm-level reputation scores were based on a composite measure that included third-party ratings, user reviews, and product depreciation rates. Once the composite scores had been compiled, we then reweighted each score on a spectrum from 0 to 1. The firm that received the highest score received a 1 while the lowest rated firm received a 0.

Time between the release of the car and the recall date. The time between the release of a particular model and the time it was recalled was calculated in number of months. The time the product was first introduced was determined by exploring press releases using the EBSCOhost database, automobile company websites, and, in one case (Ford), the firm itself.

Control variables

Severity of recall. The severity of the recall was assessed by two different measures: the size of the recall and the possible outcome of the product flaw. Larger recalls affect more consumers and thus garner more attention compared to smaller recalls. The number of automobiles potentially affected was reported by the manufacturer and the US Department of Transportation.

In our study, in order to assess the outcome of the product flaw, the first author searched the EBSCOhost newspaper database for any mention of possible death or serious injury, but no instance of death or serious injury was reported. A research assistant blind to the hypotheses and research question of the present paper independently evaluated each recall notice as well. Recall notices that listed the possibility of death or serious injury were classified as severe recalls; those that did not mention serious injury or death were not classified as severe. Both classifications were then compared, and discrepancies between the separate evaluations were resolved through discussion and compromise. Severity was rated as a binary variable, with 1 indicating that the recall was severe and 0 indicating that the recall was non-severe.

Country of origin. We controlled for the location where the brand was based. The reason for the inclusion of this variable was due to the fact that the country of origin may influence the way consumers respond to a product recall (Majid and Bapuji, 2012).

Growth. Prior work suggests that the growth curve affects market share (Bass, 2004). To account for the impact the growth curve may have imposed on the change in market share, we calculated the change in market share over the course of the two months that preceded the recall, using the same formula as that used for our dependent variable. All of our variables are listed and described in Table I.

HLM

For the purpose of assessing the market-level impact of the recall of a new product, we developed an HLM. The use of HLM was particularly relevant for pursuing our research question because product recalls are affected by multiple factors that are embedded within multiple levels. First, the recall occurrence contains several unique factors that vary by incidence. For example, the number of units that are recalled and the severity of the recall represent differentiating factors associated with the recall itself. The recall is then embedded within different brands of automobiles, which may influence the recall-level variable to varying degrees. The time between release and recall was treated as a fixed effect. Product reputation was also treated as a fixed effect. The fixed effects identified the direct impact of these variables on the dependent variable in our model.

Our hierarchical model is represented by the following equations and the relationship between variables:

$$\triangle M_{jk} = \beta_{0j} + \beta_{1j} TB_{jk} + \beta_{2j} RP_{jk} + \beta_{3j} DH_{jk} + \beta_{4j} \log\ SZ_{jk} + \beta_{5j} GR_{jk} + \\ + \beta_{6j}\left(TB_{jk}\right) \times \left(RP_{jk}\right) + \varepsilon_{jk} \quad (1)$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01} R_k + \gamma_{02} A_k + \gamma_{03} E_k + \gamma_{04} AS_k + \mu_{0k} \quad (2)$$

$$\beta_{1j} = \gamma_{10} + \mu_{1k} \quad (3)$$

$$\beta_{2j} = \gamma_{20} + \mu_{2k} \quad (4)$$

Table I. Listing of variables

Variable	Level (recall or firm)	Type	Sources
NS = Severity of recall	Recall	Independent	NHTSA
SZ = Log (Number of cars affected)	Recall	Independent	NHTSA
TB = Time between the release of the car to the recall date	Recall	Independent	*Car and Driver Magazine*, NHTSA, company sources
GR = Growth, the market share the month prior	Recall	Control	*The Automotive News*
R = Reputation	Firm	Independent	National Automobile Dealers Association (NADA), J.D. Power and Associates, *Consumer Reports*
A = American-origin manufacturer	Firm	Control	*The Automotive News*
E = European-origin manufacturer	Firm	Control	*The Automotive News*
AS = Asian-origin manufacturer	Firm	Control	*The Automotive News*

$$\beta_{3j} = \gamma_{30} + \mu_{3k} \quad (5)$$

$$\beta_{5j} = \gamma_{40} + \mu_{4k} \quad (6)$$

$$\beta_{6j} = \gamma_{50} + \mu_{5k} \quad (7)$$

In accordance with Singer (1998), we calculated the intra-class correlation to validate our choice of a hierarchical-level model. The intra-class correlation is used to describe how strongly the cars (Acura TSX 2004, Acura TSX 2005, etc.) under each firm (Acura) are related to each other:

$$p = \frac{65.9199}{65.9199 + 301.28} = 17.95$$

This result tells us that there is a fair bit of clustering of change in market share within each firm, suggesting that an OLS regression analysis of these data would likely yield misleading results (Singer, 1998).

Results

We began by examining the direct effects of our variables on the dependent variable; the parameter estimates are listed in Table II. We found that product reputation did not have a significant impact on the market response to the product recall (*H1*). In contrast, firms that have built their reputation over a longer period of time are more likely to suffer from expectancy violations which explains why firm reputation had a negative main effect on increasing the market penalty incurred by the new product after a product recall, and thus, *H2* was supported. In terms of our final hypothesis, we found that the time since product introduction moderated the relationship between the product reputation and the change in the market share, the impact of a positive product reputation on the change in market share would be lessened as the time between product release and recall increased (*H3*).

Fixed estimates of market-share change, 2000-2010 ($n = 332$), dependent variable – change in market share (centered)

Variables	Model 1	Model 2	Model 3
Constant	−0.20	0.38	0.67*
LogPotaff	0.03	−0.07	−0.06
Severe Recall	0.10	0.07	0.40
Growth	−0.01	−0.01**	−0.01**
American-origin	0.20	−0.03	−0.01
European-origin	0.05	0.13	0.04
Asian-origin	−0.05	−0.03	−0.00
Reputation (Car) (*H1*)		0.19	−0.28
Reputation (Firm) (*H2*)		−0.27***	−0.27*
Time Between Release and Recall		−0.00	−0.01*
Reputation (Car) × Time between release and recall (*H3*)			0.02*
AIC	599.9	352.7	348.7
SBC	602.5	356.4	352.5
−2LL	595.9	352.9	342.7

Notes: Standardized coefficients are shown. All p values reported are at two-tailed significance. *$p < 0.05$; **$p < 0.01$; ***$p < 0.10$

Table II. Fixed estimates of market-share change

As consumers became more familiar with the product over time, its reputation served as a signal of quality which lessened any negative market effects.

We next examined the random effects within our model – specifically, whether the intercepts would vary per recall based on firm-level factors. The random effects within our model showed that the variance components for intercepts were not significantly different from 0 ($p = 0.148$); therefore, we could reject the null hypothesis that the intercepts vary by automaker. This result also suggests that variation in the change in market share for each brand was sufficiently explained by our firm-level variables. The variance components for slopes could not be estimated (largely because of a lack of similarity in reputation scores across firms), and thus, we did not see significant variance across slopes. The component representing the covariance between intercepts and slopes was also small (0.016), and we could not reject the null hypothesis that it, too, was 0 ($p = 0.32$). We interpreted this result as an indication that the relationship between the intercept and slope did not differ by automaker.

Discussion

Theoretical contribution

Our work advances theory on reputation by disentangling the reputation of a product from that of a firm and by exploring the product's evolution during the introduction of new products. The significance of a firm's reputation has been well documented in prior work (Shapiro, 1982; Fombrun and Shanley, 1990) and has been found to be a liability during a product-harm crisis (Rhee and Haunschild, 2006; Custance *et al.*, 2011). The firm's reputation develops over time and represents the culmination of all of its products, and thus, it provides consumers with an expectation that is less amenable to change. Due to the large amount of research on the firm, reputation has largely been inferred to be a fairly static mechanism. However, the product develops its own reputation over time and through multiple versions, and thus, product reputation constitutes a dynamic mechanism. When a new product is first introduced, its abilities and performance are at the lowest point, partly due to product flaws that have not yet been detected and partly due to a lack of feedback from the marketplace. Over time, the product is improved upon, and its reputation subsequently improves. Though our results did not support a main effect of product reputation on the change in market share after a product recall, we did find that time played a significant role. As time passes, a reputable product can stand to lose more if a product recall occurs, but this effect is moderated by the time between the product release and the recall. If a product flaw is revealed and a recall is issued several years after the product was first introduced, then a positive product reputation can limit the damage caused by the flaw. This finding is significant because our results indicate that the roles of firm reputation and product reputation differ in the event of a recall. A product reputation can help a firm when a product recall occurs but the degree of help varies with the amount of time that passes. The more time that passes, the more beneficial it is for the product.

Managerial contribution

Though product reputation did not have a main effect in our model, our findings support the view that firms should invest in improving their new products and developing the positive reputation of these products, regardless of their overall firm reputation. A positive firm reputation has been found to provide the firm with increased market value, financial performance, and possibly greater access to capital (Smith *et al.*, 2010). However, for firms with a positive reputation, prior work has demonstrated that, in the event of a product recall, these firms suffer negative market responses primarily due to the positive expectations they have previously created (Rhee and Haunschild, 2006). A firm with a positive reputation creates expectations in the minds of consumers, and when these expectations are violated,

such firms suffer more when compared to firms with less-than-positive reputations. However, by focusing on developing the reputation of the product, the firm can offset any negative responses from the market. This focus is important for new products that often contain more flaws than their established counterparts. Our results indicate that firms should focus on improving the new product rather than abandoning it at the first sign of trouble. It is not unusual for a new product to have a bad reputation when it is first created. However, whether the firm chooses to improve the product and how it does so is vital to the establishment of product reputation. If the firm improves the product over time, then the product's reputation becomes positive and can help to offset a loss in market share after a product recall. It is important to note that the strategy of improving the product can have the corresponding effect of improving the firm's reputation. Manufacturers with a weak firm reputation can spend their resources attempting to improve this reputation, but the process would take considerable time and resources to accomplish. A more efficient strategy for firms would be to focus their resources on improving their products since a strong product reputation (moderated by time) can positively impact the market's response when a product flaw is revealed.

Limitations and future research

Due to data limitations, our study was restricted to the US auto industry which limits our generalizability. The US auto industry is characterized by the regular introduction of updated products. Industries such as fashion and consumer electronics follow similar schedules but other industries such as fast-moving consumer goods and the service sector do not innovate on a regular schedule. Thus, our results may not apply to industries that limit new product/service introduction because consumers may primarily use the firm reputation without regard to the product reputation. For example, a consumer who experiences a breakdown in the mobile application for her/his bank may be influenced more by the reputation of the bank than the application itself. Another limitation, and possible avenue for future research, is the focus on incremental innovation over radical innovation. For radical innovations consumer knowledge is still forming, the reputation of the firm may not play as big a role in the market response to a product flaw because of the flaws expected of radically new technologies.

Conclusion

New products can be an asset to the firm but in the short term they are likely to display flaws that their established counterparts do not have. When the product recall occurs, firms with a positive reputation suffer the most but over time as the product develops its own reputation this reputation can offset any negative market responses. For firms that are concerned about product flaws associated with new products, improving product reputation through improved versions of the product stands out as a process that merits the firm's commitment. Over time, product reputation can become an asset, in turn providing future revenues for the firm and offsetting the liability of new-product flaws.

Notes

1. The term new is used to refer to cars that are have never been used before; the purchase of a used car does not constitute the purchase of a new car.
2. There are exceptions to this statement, such as the case of Twinkie Snacks, where the product separated from the firm; however, these instances are rare.
3. For example, the Honda Civic may be recalled in both May 2008 and June 2009; thus, we denoted the recall in May 2008 as j and the Honda Civic as k.

References

Archak, N., Ghose, A. and Ipeirotis, P. (2011), "Deriving the pricing power of product features by mining consumer reviews", *Management Science*, Vol. 57 No. 8, pp. 1485-1509.

Automotive News (2011), "North American sales data 2000-2011".

Bapuji, H. (2011), *Not Just China: The Rise of Recalls in the Age of Global Business*, Palgrave Macmillan, New York, NY.

Bass, F.M. (2004), "Comments on 'A new product growth model for consumer durables: the bass model' ", *Management Science*, Vol. 50 No. 12, pp. 1833-1840.

Cabral, L.M. (2000), "Stretching firm and brand reputation", *RAND Journal of Economics*, Vol. 31 No. 4, pp. 658-673.

Castano, R., Sujuan, M., Kacker, M. and Sujan, H. (2008), "Managing consumer uncertainty in the adoption of new products: temporal distance and mental stimulation", *Journal of Marketing Research*, Vol. 45 No. 3, pp. 320-336.

Clark, K.B., Chew, W.B. and Fujimoto, T. (1987), "Product development in the world auto industry", *Brookings Papers on Economic Activity*, Vol. 1987 No. 3, pp. 729-781.

Custance, P., Walley, K. and Dongni, J. (2011), "Crisis brand management in emerging markets – insights from the Chinese infant milk powder scandal", *Marketing Intelligence & Planning*, Vol. 30 No. 1, pp. 18-32.

Dewar, R.D. and Dutton, J.E. (1986), "The adoption of radical and incremental innovations: an empirical analysis", *Management Science*, Vol. 32 No. 11, pp. 1422-1433.

Eisenbeiss, M., CorneliBen, M., Backhaus, K. and Hoyer, W.D. (2014), "Nonlinear and asymmetric returns on customer satisfaction: do they vary across situations and consumers?", *Journal of the Academy of Marketing Science*, Vol. 42 No. 3, pp. 242-263.

Fombrum, C. (2007), "List of lists: a compilation of international corporate reputation ratings", *Corporate Reputation Review*, Vol. 10 No. 2, pp. 144-153.

Fombrun, C. (1996), *Reputation: Realizing Value from the Corporate Image*, Harvard Business School Press, Boston, MA.

Fombrun, C. and Shanley, M. (1990), "What's in a name? Reputation building and corporate strategy", *Academy of Management Review*, Vol. 33 No. 2, pp. 233-258.

Griffith, D. and Chen, Q. (2004), "The influence of virtual direct experience on online ads message effectiveness", *Journal of Advertising*, Vol. 33 No. 1, pp. 55-69.

Hauser, J., Tellis, G. and Griffin, A. (2006), "Research on innovation: a review and agenda for marketing science", *Marketing Science*, Vol. 25 No. 6, pp. 687-717.

Hoch, S.J. and Deighton, J. (1989), "Managing what consumers learn from experience", *Journal of Marketing*, Vol. 53 No. 2, pp. 1-20.

Ingrassia, P. and White, J.G. (1995), *Comeback: The Fall and Rise of the American Automobile Industry*, Simon and Schuster, New York, NY.

Kelly, G. (2016), "Apple's iPhone 7 has a nasty new surprise", *Forbes*, December 5, available at: www.forbes.com/sites/gordonkelly/2018/04/15/apple-ios-11-3-problem-apple-music-facetime-skipping-iphone-ipad/#3f11ad396a4a (accessed April 17, 2018).

Majid, K.A. and Bapuji, H. (2012), "It's about time – increasing the speed of product recalls across markets", paper presented at the 2012 American Marketing Association Public Policy Conference, Atlanta, GA, June 6-7.

Min, S., Kalwani, M.U. and Robinson, W.T. (2006), "Market pioneer and early follower survival risks: a contingency analysis of really new versus incrementally new product-markets", *Journal of Marketing*, Vol. 70 No. 1, pp. 15-33.

National Highway Traffic Safety Administration, Office of Defects Investigations (2016), Recalls Database 2015.

Pauwels, K., Silva-Risso, J., Srinivasan, S. and Hanssens, D.M. (2004), "New products, sales promotions, and firm value: the case of the automobile industry", *Journal of Marketing*, Vol. 68 No. 10, pp. 142-156.

Puncheva-Michelotti, P. and Michelotti, M. (2010), "The role of the stakeholder perspective in measuring corporate reputation", *Marketing Intelligence & Planning*, Vol. 28 No. 3, pp. 249-274.

Rahman, K. and Areni, C.S. (2014), "Generic, genuine, or completely new? Branding strategies to leverage new products", *Journal of Strategic Marketing*, Vol. 22 No. 1, pp. 3-15.

Rhee, M. and Haunschild, P.R. (2006), "The liability of good reputation: a study of product recalls in the US automobile industry", *Organization Science*, Vol. 17 No. 1, pp. 101-117.

Scott, R.W. (2001), *Institutions and Organizations*, 2nd ed., Sage, Thousand Oaks, CA.

Shapiro, C. (1982), "Consumer information, product quality, and seller reputation", *The Bell Journal of Economics*, Vol. 13 No. 1, pp. 20-35.

Singer, J.D. (1998), "Using SAS PROC MIXED to fit multilevel models, hierarchical models, and individual growth models", *Journal of Educational and Behavioral Statistics*, Vol. 24 No. 4, pp. 323-355.

Smith, K.T., Smith, M. and Wang, K. (2010), "Does brand management of corporate reputation translate into higher market value?", *Journal of Strategic Marketing*, Vol. 18 No. 3, pp. 201-221.

US Consumer Product Safety Commission (2015), "Fiscal year 2015 annual performance report", Washington, DC.

Yoo, B., Donthu, N. and Lee, S. (2000), "An examination of selected marketing mix elements and brand equity", *Journal of the Academy of Marketing Science*, Vol. 28 No. 2, pp. 195-211.

Further reading

Consumer Product and Safety Commission (2016), "Annual report to the President and Congress", Bethesda, MD, available at: www.cpsc.gov/About-CPSC/Agency-Reports/Annual-Reports/

Kirmani, A. and Rao, A. (2000), "No pain, no gain: a critical review of the literature on signaling unobservable product quality", *Journal of Marketing*, Vol. 64 No. 2, pp. 66-79.

Maas, C.J. and Hox, J.J. (2005), "Sufficient sample sizes for multilevel modeling", *Methodology*, Vol. 1 No. 3, pp. 85-91.

Stuart, T.E., Hoang, J. and Hybels, R.C. (1999), "Inter-organizational endorsements and the performance of entrepreneurial ventures", *Administrative Sciences Quarterly*, Vol. 44 No. 2, pp. 315-349.

Corresponding author
Kashef Majid can be contacted at: kmajid@umw.edu