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As technology advances, it becomes more feasible to load products with a large number of features, each of which individually might be perceived as useful. However, too many features can make a product overwhelming for consumers and difficult to use. Three studies examine how consumers balance their desires for capability and usability when they evaluate products and how these desires shift over time. Because consumers give more weight to capability and less weight to usability before use than after use, they tend to choose overly complex products that do not maximize their satisfaction when they use them, resulting in "feature fatigue." An analytical model based on these results provides additional insights into the feature fatigue effect. This model shows that choosing the number of features that maximizes initial choice results in the inclusion of too many features, potentially decreasing customer lifetime value. As the emphasis on future sales increases, the optimal number of features decreases. The results suggest that firms should consider having a larger number of more specialized products, each with a limited number of features, rather than loading all possible features into one product.

Feature Fatigue: When Product Capabilities Become Too Much of a Good Thing

A common way to enhance and differentiate a product is by increasing its number of features (Goldenberg et al. 2003; Mukherjee and Hoyer 2001; Nowlis and Simonson 1996), which provides greater functionality for consumers. This strategy has become especially popular as new developments in electronics and information technology (e.g., miniaturization and integration of electronic components) have enabled products to include more functions yet cost less and require less time to be manufactured (Freund, König, and Roth 1997).

Each additional feature provides another reason for the consumer to purchase a product (Brown and Carpenter 2000) and may add desired capabilities, but too many features can make products overwhelming for consumers,

leading to dissatisfaction and "feature fatigue." Anecdotal evidence suggests that consumers do not use all the features of the products they buy (Ammirati 2003), and even more significantly, empirical evidence indicates that consumers may experience negative emotional reactions, such as anxiety or stress in response to product complexity (Mick and Fournier 1998).

Why do consumers seem to make choices that do not maximize their long-term satisfaction? One potential reason is that consumers do not make a connection between increasing the number of product features and the difficulty of using a product. Another reason is that consumers understand that products with more features will be more difficult to use, but because features are bundled together, they are forced to buy features they do not want in order to obtain features they do want. Finally, consumers may understand that products with more features will be more difficult to use, but they may give ease of use too little weight in their purchase decisions.

In this research, we examine how consumers balance their competing needs for functionality and ease of use when evaluating products. First, we measure the effects of adding product features on two distinct product dimensions, the perceived capability of the product and the perceived usability of the product. Second, we test the degree to which consumers consider usability compared with capability when evaluating products before using them. Third, we measure the relative weights of capability and usability in

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consumers' expected utility (before use) and experienced utility (after use) and test for significant differences in these weights before and after product use. Whereas previous research has focused on either preusage evaluations, such as purchase intentions (e.g., Carpenter, Glazer, and Nakamoto 1994), or postusage evaluations, such as satisfaction (e.g., Bolton and Lemon 1999) and usability (e.g., McLaughlin and Skinner 2000), we integrate these perspectives by comparing evaluations of products both before and after use.

We organize the article as follows: First, we briefly discuss the effects of adding product features on consumers' evaluations of products. Second, we report the results of three studies we designed to test our hypotheses. On the basis of our results, we propose an analytical model to help managers balance the sales benefits of adding features against the customer equity costs of feature fatigue. We conclude with a discussion of our results, their theoretical and managerial implications, and directions for further research.

THE EFFECTS OF ADDING PRODUCT FEATURES ON PRODUCT EVALUATIONS

Both economic theory and current market research techniques predict that increasing the number of features will make products more appealing. Economic theory models consumers' preferences using an additive utility function that links product attributes to consumer demand (Lancaster 1971). Each positively valued attribute increases consumers' utility. Similarly, market research techniques, such as conjoint analysis or discrete choice analysis, model each product as a bundle of attributes and estimate partworths for each attribute (Srinivasan, Lovejoy, and Beach 1997). Because market shares are predicted on the basis of these partworths, each positively valued feature increases a product's market share compared with products without the feature.

The behavioral assumption underlying decompositional models such as these is that consumers infer functional product benefits from concrete product attributes. Because the utility of a product is based on its potential benefits to the consumer rather than product features per se, consumers translate information about concrete product attributes into functional benefits in their mental representations (Olson and Reynolds 1983). Consistent with this mapping process, research has shown that added features provide positive differentiation by giving a product perceived advantages over competitive products (Carpenter, Glazer, and Nakamoto 1994). Consumers seem to use added features in an instrumental reasoning process that makes the brand with more features appear superior in a choice set (Brown and Carpenter 2000). Although these inferences have been demonstrated to occur for both irrelevant and important attributes (Brown and Carpenter 2000), consumers must perceive a benefit from the added feature for product evaluations to increase. Nonnegative features that consumers perceive to add little or no value (e.g., calculator functions that are useful only to biochemistry students) tend to decrease brand share because they provide reasons against choosing the enhanced product (Simonson, Carmon, and O'Curry 1994).

Thus, we predict that perceived product capability (i.e., the consumer's beliefs about the product's ability to perform desired functions) will increase as more features that provide perceived benefits are added to a product. Whereas

previous research has asked participants to compare products that differ on a single feature (e.g., Brown and Carpenter 2000), we predict that consumers will perceive greater capability as the number of features increases, even when evaluating a single product. Moreover, whereas previous research has focused on consumer perceptions before use, we predict that this relationship will hold both before and after product use.

H₁: As the number of beneficial features included in a product increases, perceptions of the product's capability increase.

In addition to the product's capability, consumers should consider their ability to use the product and benefit from its features. Research on usability and user-centered design suggests that adding features to products has a negative effect on consumers' ability to use them across several product categories (Wiklund 1994). Every additional feature is "one more thing to learn, one more thing to possibly misunderstand, and one more thing to search through when looking for the thing you want" (Nielsen 1993, p. 155). Usability research has focused on measures that enable a consumer's usage experience to be compared across products, such as the ease of learning how to use a product, the propensity to make errors while using it, and the efficiency of using it (McLaughlin and Skinner 2000). The time taken to complete a task, the ratio of successful to unsuccessful interactions with a product, and the number of errors are typical operationalizations of usability (Nielsen 1993). However, although usability research supports the principle that less is more, this research is based on consumers' actual experiences using products rather than their perceptions about their ability to use products.

There is some evidence that consumers account for learning costs when features are added to products. For example, adding a novel feature to a Web television or personal computer had a positive effect on product evaluations when the feature was described as fully automatic, but it had a negative effect on product evaluations when it was described as manually operated, presumably due to consumers' inferences about learning costs (Mukherjee and Hoyer 2001). However, although these findings are suggestive, consumer perceptions were measured in response to varying a single feature across products, and consumers did not use the products being evaluated.

On the basis of both usability studies and consumers' inferences about the effects of adding a feature to a product, we predict that perceived product usability, or the consumer's beliefs about the difficulty of learning and using the product, will decrease as more individually beneficial features are added to a product. This should be true even when consumers evaluate a single product and should hold both before and after consumers use the product.

H₂: As the number of beneficial features included in a product increases, perceptions of the product's usability decrease.

How will consumers' expertise within a product category affect their perceptions of product capability and product usability? Experts have a better understanding of product-related information and are better able to discriminate between important and unimportant features than novices (Alba and Hutchinson 1987). As a result, experts should be better able to assess product capability than novices. However, whether experts perceive a given product's capability

to be higher or lower than novices will depend on the specific features of the product and the benefits they are believed to provide. Therefore, we cannot make a general prediction about the effect of expertise on perceived product capability. In contrast, the effect of expertise on perceived usability is clear. Experts perform product-related tasks more automatically, freeing cognitive resources that can be used to learn new product features (Alba and Hutchinson 1987). For example, experts were more successful in solving tasks and were more efficient when using a mobile phone than novices (Ziefle 2002). Experts also may be better able to handle complex products because they focus their attention on a smaller, more diagnostic number of inputs (Spence and Brucks 1997). Thus, we predict that because experts are better able to learn and use each product feature than novices, usability ratings will be higher for experts than for novices.

H₃: Expertise has a positive effect on perceptions of product usability.

HOW CONSUMERS WEIGH CAPABILITY AND USABILITY IN THEIR PRODUCT EVALUATIONS

If increasing the number of product features has positive effects on perceived capability (H₁) and negative effects on perceived usability (H₂), how do consumers integrate these two product dimensions when forming their overall product evaluations? Previous research suggests that consumers consider both the benefits and the costs of adding a new feature to a product (Mukherjee and Hoyer 2001). We propose that the net effect of increasing the number of product features on product utility depends on the relative weights that consumers give to capability and usability in their product evaluations and that these weights may vary across time and situations.

Experimental research has shown that when people evaluate options for the distant future, they favor highly desirable options that are less feasible over less desirable options that are highly feasible. However, the opposite is true when people evaluate options in the near future (Lieberman and Trope 1998). The relative weights of desirability (i.e., the expected value of the goal, or the “why” aspect of an action) and feasibility (i.e., beliefs about the difficulty of reaching the end state, or the “how” aspect of an action) change because the construal of more distant future events tends to be more abstract, favoring desirability, whereas the construal of near future events tends to be more concrete, favoring feasibility (Lieberman and Trope 1998).

Thus, we propose that consumers will create more abstract construals of products in their evaluations before use, assigning greater weight to the desirability of the promised benefits (e.g., What can this product do for me?), than in their evaluations after use. In contrast, we expect that consumers will develop a more concrete construal of the product in their evaluations after use, placing more weight on feasibility (e.g., Is this product easy to use?), than in their evaluations before use. On the basis of this expected shift in the importance of capability and usability, we predict the following:

H₄: Consumers give more weight to product capability in their expected product utilities (before use) than in their experienced product utilities (after use).

H₅: Consumers give less weight to product usability in their expected product utilities (before use) than in their experienced product utilities (after use).

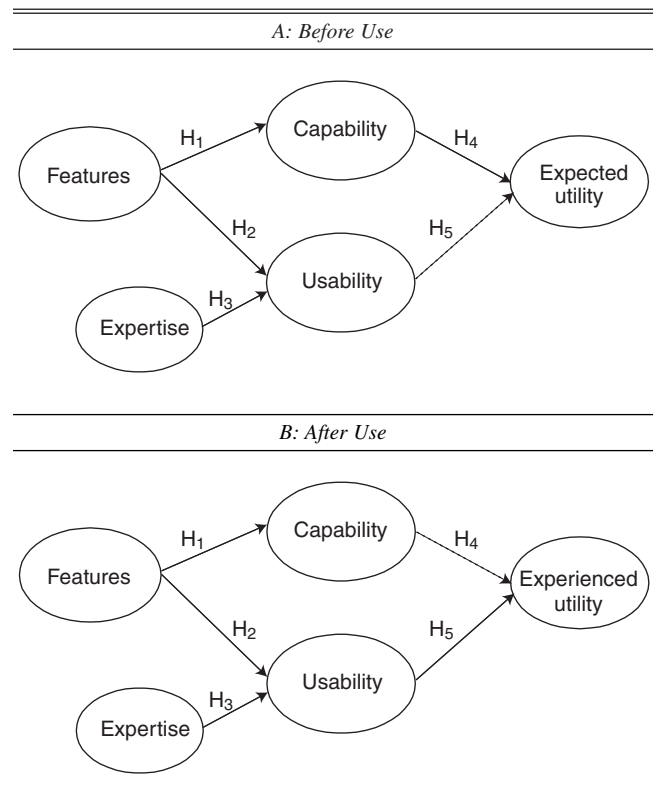
To test our hypotheses, we ran three studies in which participants evaluated or used Web-based products. Studies 1 and 2 examine consumers’ intuitions about the effects of adding product features on capability (H₁) and usability (H₂ and H₃) before use. Study 3 directly compares consumers’ ratings of capability and usability and their overall product evaluations before and after using products (H₄ and H₅). Our goal is to demonstrate that though the effects of increasing the number of features on perceptions of product capability and usability are significant both before and after product use, there is a shift in the relative weights of these dimensions on consumers’ product evaluations. Figure 1 summarizes our hypotheses.

STUDY 1: CONSUMERS’ INTUITIONS

We designed Study 1 to simulate an in-store experience. Our goal was to test how consumers’ intuitions about product capability and usability were related to the number of product features (H₁ and H₂) and whether perceived usability was related to expertise (H₃).

Consumers’ involvement in the evaluation task may affect their motivation to process product information (Celsi and Olson 1988). For example, highly involved consumers are more likely to elaborate on product information and form inferences (Celsi and Olson 1988). Thus, involvement with the task could potentially affect participants’ judgments about product capability and usability. To control for this, we manipulated involvement across conditions.

Figure 1
CONCEPTUAL MODEL



Stimuli

To develop the stimuli for our studies, we conducted a pretest in which 40 participants (69% females, $M_{\text{age}} = 21.8$) rated the importance of and their familiarity with 30 features of the following four products: a digital audio player, a digital video player, a personal digital assistant, and an online product-rating database. Participants also rated their involvement and expertise with each product category. We selected digital audio players and digital video players because participants were involved and familiar with these product categories. Three models of each product were created, differing only in their number of features. The low level of features included the 7 most important features, the medium level included the 14 most important features, and the high level included the 21 most important features.

Participants, Design, and Procedures

Our study comprised 130 undergraduate students (50.8% females, $M_{\text{age}} = 20.5$) who we randomly assigned to conditions. The study had a 2 (player: video, audio) \times 3 (feature: low, medium, high) \times 2 (involvement: low, high) mixed design. We manipulated player and involvement between subjects and number of features within subjects. In the high-involvement condition, we told participants that after they evaluated three models, they would choose one model to perform a series of tasks. We told low-involvement participants simply that they would evaluate three models of video (audio) players. We conducted the study using Media-Lab software, and we ran sessions in a computer lab with groups of 3 to 18 students. Participants worked individually.

Participants first rated their expertise with digital video (audio) players. Next, they viewed the user interface and the list of features for each model. Participants rated their perceptions of each model's capability and usability and then provided an overall evaluation of each model. The order in which participants evaluated the low-, medium-, and high-feature models was counterbalanced between subjects, according to a standard self-conjugate Latin square. After rating all three models, we asked participants to choose one of the models.

Measures

We measured participants' expertise using five items (e.g., How familiar are you with digital video [audio] players? How frequently do you watch videos [listen to music] on your computer? Mitchell and Dacin 1996). We measured product capability using three items (extent to which the products were likely to perform poorly/well, offer few/a lot of advantages, and add little/a lot of value; Mukherjee and Hoyer 2001). We measured product usability using eight items (e.g., Learning to use this product will be easy for me, Interacting with this product will not require a lot of my mental effort, It will be easy to get this product to do what I want it to do; Chin, Diehl, and Norman 1988). We measured expected product utility using six items (bad/good, unlikable/likable, not useful/useful, low/high quality, undesirable/desirable, unfavorable/favorable; Peracchio and Tybout 1996). After choosing one of the models, participants rated their decision confidence and the difficulty of the choice. All items used seven-point scales.

Results

Reliability for expertise, capability, usability, and overall product evaluations all exceeded .83. To assess the construct validity of our capability, usability, and overall product evaluation scales, we ran a confirmatory factor analysis for each of the low-, medium-, and high-feature models. A three-factor model indicated an acceptable goodness of fit and significant loadings for each observed variable in their respective latent factor (all $ps < .001$).¹ Involvement did not affect any dependent measures (all $ps > .13$), and we collapsed the data across involvement conditions.

To test H_1 , we ran a 2 (player) \times 3 (features) repeated-measures analysis of covariance (ANCOVA) on product capability with expertise as a covariate. There was a main effect of number of features ($F(2, 250) = 24.1, p < .001$). No other effects were significant ($ps > .08$). As we predicted, the within-subjects linear contrast for capability across feature levels was significant ($F_{\text{linear}}(1, 125) = 27.8, p < .001$), indicating that perceptions of product capability significantly increased as the number of product features increased ($M_{\text{low}} = 3.4, M_{\text{medium}} = 4.9, \text{ and } M_{\text{high}} = 6.0$).

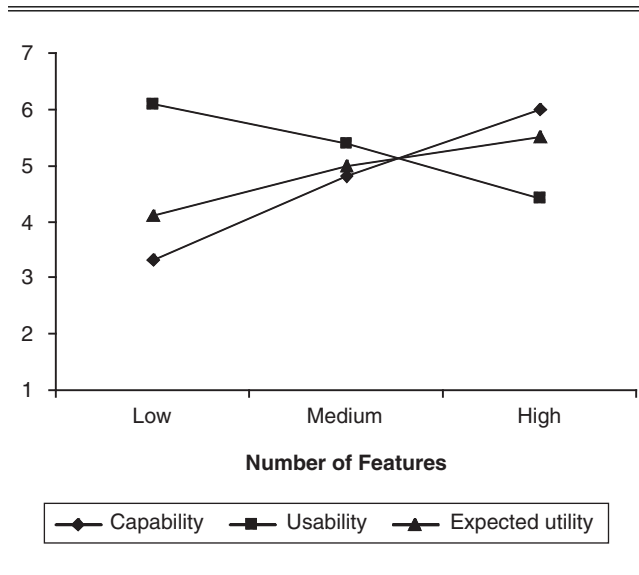
To test H_2 , we ran a 2 (player) \times 3 (features) repeated-measures ANCOVA on product usability with expertise as a covariate. There was a significant main effect of number of features ($F(2, 250) = 17.6, p < .001$). The main effect of player and the interaction between number of features and player were not significant ($ps > .09$). As we predicted, the within-subjects linear contrast for usability across feature levels was significant ($F_{\text{linear}}(1, 125) = 22.7, p < .001$), indicating that perceptions of product usability significantly decreased as the number of features increased ($M_{\text{low}} = 6.2, M_{\text{medium}} = 5.6, \text{ and } M_{\text{high}} = 4.8$). When we controlled for the number of features, expertise had a positive effect on usability ($F(1, 125) = 43.1, p < .001$). Perceived usability for both video and audio players was higher for experts than for novices, in support of H_3 .

A 2 (player) \times 3 (features) repeated-measures ANCOVA on product expected utility with expertise as a covariate revealed only a significant main effect of features ($F(2, 250) = 7.5, p = .01$). No other effects were significant ($ps > .16$). The within-subjects linear contrast for product expected utility across feature levels was significant ($F_{\text{linear}}(1, 125) = 8.4, p < .01$), indicating that expected utility increased as the number of features increased ($M_{\text{low}} = 4.1, M_{\text{medium}} = 5.1, \text{ and } M_{\text{high}} = 5.6$). Regardless of expertise, expected utility was most favorable when the product included the highest number of features. Thus, before use, capability appears to have a stronger effect than usability on product expected utility. Figure 2 shows the impact of increasing the number of features on ratings of capability, usability, and expected utility for the video player.

After evaluating the three models, participants chose one of them to perform a series of tasks. Participants' choices

¹The comparative fit indexes (CFI) ranged from .91 to .93, capability items loadings ranged from .58 to .95, usability items loadings ranged from .70 to .96, and overall evaluation items ranged from .49 to .96. Each of the three factors had an average extracted variance greater than 62%. Capability and usability were not correlated for any of the models. However, capability and overall evaluations were correlated for all three models ($r_{\text{low}} = .76, r_{\text{medium}} = .83, \text{ and } r_{\text{high}} = .69$; all $ps < .001$), and usability and overall evaluations were correlated for the high-feature model ($r = .29, p < .001$).

Figure 2
EFFECTS OF NUMBER OF FEATURES ON DEPENDENT
VARIABLES FOR THE DIGITAL VIDEO PLAYER (STUDY 1)



strongly indicated a preference for products with a higher number of features and greater capability, regardless of expertise. The majority of the respondents chose the model with the highest number of features (62.3%) rather than the model with a medium number of features (28.5%) or the model with the lowest number of features (9.2%). A multinomial logistic regression of player and expertise on choice showed that neither of these factors affected choice (all p s > .55). Notably, despite the lack of difference in their choices, novices rated the difficulty of choosing marginally higher than experts ($F(1, 128) = 3.5, p = .06$), and experts were more confident in their choices than novices ($F(1, 128) = 9.8, p < .01$).²

Discussion

The results of Study 1 suggest that consumers believe that increasing the number of features decreases the usability of products and increases their capability. However, regardless of participants' expertise, their expected product utility and choices still favored products with a higher level of features. Therefore, consumers' initial preferences appear to be driven more by product capability ratings than by usability ratings.

One limitation of Study 1 is that varying the number of features within subjects may have increased the salience of the number of features when they judged capability and usability. However, a replication of Study 1 using a between-subjects design produced the same results, indicating that salience does not explain the effect.³ We also

²This result is based on a median split on the expertise variable (median = 4.0).

³In the follow-up study ($N = 73$), we showed participants only one model of the video player (either low or high feature) and asked them to provide product evaluations. The results were consistent with those of Study 1. Perceived capability increased with number of features ($F(1, 71) = 23.8, p < .001$), perceived usability decreased with number of features ($F(1, 69) = 3.9, p = .05$), and expected utility increased with number of features ($F(1, 69) = 8.2, p < .01$).

address this concern by using a between-subjects design in Study 2. A second limitation of Study 1 is that because the three models of video and audio players were the same for all participants, they may have included features that participants did not consider important, potentially decreasing usability without adding significant capability. Although this is a realistic choice situation—companies often find it cheaper to produce feature-rich products that can satisfy the needs of heterogeneous consumers than to produce more narrowly targeted products with fewer features—we want to disentangle supply side and demand side explanations for feature fatigue. In Study 2, we allow participants to customize their products so that the products being evaluated include only desired features.

STUDY 2: CUSTOMIZING A PRODUCT

In Study 2, participants customized their own products by selecting the features they would like to add from a list of features. We predicted that consumers who chose more features would perceive their products to have more capability but less usability than consumers who chose fewer features. Support for H_2 will show that consumers predict degradation in usability as the number of features increases, even when products include only desirable features.

Participants, Design, and Procedures

Study 2 comprised 141 undergraduate students (55.3% females, $M_{age} = 21.1$). We asked the participants to imagine that they were about to subscribe to and download a new digital audio player and a digital video player and that they would have the opportunity to choose the features they wanted. Product category was manipulated within subjects. The order in which they designed the two products was counterbalanced between subjects.

As in Study 1, we used a digital audio player and a digital video player as our products. For each product, we presented participants with 25 different features that they could select. Participants checked off each feature they wanted to include in the product they were buying. To isolate the effects of usability constraints from the effect of financial constraints, we informed them that their budget for the purchase would allow them to select as many features as they wanted. After selecting features, participants rated the product's perceived capability and usability. We measured product capability, product usability, and expertise using the same scales as in Study 1. Participants also rated their familiarity with each feature and the importance of each feature (1 = "not at all important/familiar" and 7 = "very important/familiar").

Results

The reliability for expertise, capability, and usability ranged from .78 to .93. A confirmatory factor analysis on the capability and usability measures for each media player supported the construct validity of these constructs. A two-factor solution yielded a reasonable goodness of fit and significant loadings of each observed variable in their respective factor (all p s < .001).⁴ The order in which participants

⁴The CFI ranged from .95 to .96. Capability loadings ranged from .66 to .83 (average extracted variance was greater than 54%). Usability loadings ranged from .46 to .92 (average extracted variance was greater than 64%). The correlation between the two factors was not significant.

customized the products was not correlated with any of our measures (all $ps > .10$), except with usability for the video player ($p = .04$). We included order as a covariate in all analyses related to the perceived usability of the video player.

The average number of features chosen among the 25 available was 19.6 (standard deviation = 4.8) for the video player and 19.6 (standard deviation = 4.3) for the audio player. Approximately half of the sample chose more than 80% of the available product features, and the median number of features chosen for both players was 20. Notably, although the specific features chosen by experts and novices differed, the number of features chosen by experts and novices did not differ ($ps > .25$). Experts reported significantly greater familiarity with all 25 video player features and with 23 of the 25 audio player features. The features that experts chose more frequently were among those rated least familiar by novices. For example, the three audio player features that experts chose significantly more frequently than novices (i.e., the equalizer/bass boost, preamp and equalizer settings, and encoded file name control) were three of the seven features for which the difference in familiarity ratings between experts and novices was largest.

In H_1 , we predicted that participants who chose more features would perceive that their products had greater capability than participants who chose fewer features. As we expected, when we regressed ratings of product capability on the number of selected features and expertise, we found a positive and significant coefficient for both the video player ($\beta = .50$, $t = 6.9$, $p < .001$) and the audio player ($\beta = .47$, $t = 6.2$, $p < .001$), in support of H_1 . The effect of expertise on capability was not significant for either the video or the audio player ($ps > .07$).

We predicted that usability would have a negative relationship with number of features (H_2) and a positive relationship with expertise (H_3). We found a significant, negative effect of number of selected features on the perceived usability of the video player ($\beta = -.16$, $t = -2.2$, $p = .03$). However, the effect was not significant for the audio player ($\beta = .01$, $t = .70$, $p = .48$). Thus, the findings partially support H_2 . When we controlled for the number of features, expertise had a significant, positive effect on perceived usability for both players (video player: $\beta = .52$, $t = 7.0$, $p < .001$; audio player: $\beta = .98$, $t = 52.9$, $p < .001$), in support of H_3 .

Discussion

Overall, the results of Study 2 support our predictions. The number of features participants selected increased perceived product capability for both products and decreased perceived product usability for one of the two products. Thus, the connection between adding product features and decreasing usability seems to hold even when the consumer individually selects each of the included features. Consistent with our expectations, expertise significantly improved ratings of product usability but did not affect ratings of product capability.

On average, participants chose a high number of features, again suggesting that a desire for capability is driving decisions more than a desire for usability. Notably, the average number of features chosen in Study 2 was nearly the same as the number of features in Study 1's high-feature condition. Using two different types of choice tasks, participants clearly favored high-feature products over low-feature prod-

ucts. However, Studies 1 and 2 test choices before using products. In Study 3, we compare the ratings of participants who have not used the product with ratings of participants who have used the product.

STUDY 3: CONTRASTING EVALUATIONS BEFORE AND AFTER PRODUCT USE

In Study 3, we compared consumers' evaluations of products with a low, medium, or high number of features before use and after use. We expected that consumers would give more weight to capability before use than after use (H_4) and that consumers would give less weight to usability before use than after use (H_5).

Participants, Design, and Procedures

Study 3 comprised 190 participants (52.1% males, $M_{\text{age}} = 20.5$) who we randomly assigned to conditions using a 2 (product use: before, after) \times 2 (feature: low, high) between-subjects design. We conducted the study using MediaLab software, and we ran sessions in a computer lab with groups of 2 to 18 students. Participants worked individually. Each participant evaluated one model of the product, either before or after product use. The use of a between-subjects design was critical because making predictions about capability or usability before use can bias participants' evaluations of the product after use (Jones 1977).

The product we used in this study was the same digital video player that participants evaluated in Study 1. Two working models of the product were created, one with 7 features (low-features condition) and one with 21 features (high-features condition). Participants who used the product were provided with a manual of the video player that described the features of their model and how to use them. In the low-features condition, the manual had four pages, and in the high-features condition, the manual had eight pages. The layout of the manual was identical across conditions.

We asked participants to imagine that they were considering subscribing to and downloading a new digital video player. In the before-use condition, participants viewed the user interfaces and a list of features for three models of players, one with a low number of features (7 features), one with a medium number of features (14 features), and one with a high number of features (21 features). The order of presentation was counterbalanced between subjects. Participants evaluated either the low- or the high-feature model and then chose their preferred model.

We told participants in the after-product-use condition that they would use one model of a new digital video player. We asked them to perform a series of four tasks using either the low- or the high-feature model of the player. These tasks included choosing a specific movie from a playlist, watching parts of the movie, modifying the audio settings, and recording parts of another movie available in the playlist. After completing these tasks, participants were free to use the player at their leisure. Next, participants evaluated the product they used. After completing their evaluations, they viewed the user interfaces and a list of features for two additional models of digital video players (e.g., models with a low and medium number of features if they had used the high-features model). The order of presenting the other two

models was counterbalanced between subjects. Finally, participants chose their preferred model.

Measures

We measured expertise and product usability using the same measures as in Studies 1 and 2. We measured product capability using three items (this digital video player performs many functions, has many capabilities, and has a large number of features). We measured expected and experienced utilities separately using the six-item measure for overall product evaluation that we used in Study 1 and one item about product satisfaction (How satisfied would you be if you subscribed to the digital player? [in the before-use condition] How satisfied were you with the digital player you used? [in the after-use condition]). We measured all items using seven-point scales.

After participants had either evaluated or used one of the models, we asked them to choose one of the three models. As in Study 1, participants rated their confidence in their decision and the difficulty of making the decision. We also recorded participants' clickstreams as they used the video player in the after-use condition. We gathered information on how many tasks participants completed, the time it took them to complete the tasks, and how long they used the player.

Results

The reliability of the multiple-item scales ranged from .89 to .98. A confirmatory factor analysis on the capability, usability, and overall product evaluation scales showed an acceptable goodness of fit for the three-factor solution and significant loadings for each observable variable in their respective latent factors (all $ps < .001$).⁵ Because order was not significant for any of the dependent variables (all $ps > .06$), we collapsed the data across order conditions for subsequent analyses. Table 1 shows the means of the dependent variables across conditions.

A 2 (product use) \times 2 (features) ANCOVA on perceived capability with expertise as a covariate showed a significant

main effect of number of features ($F(1, 185) = 132.9, p < .001$), indicating that capability increased with the number of features ($M_{low} = 3.2, M_{high} = 5.2$). Thus, there is support for H_1 . In addition, we found a significant main effect of product use ($F(1, 185) = 5.2, p = .02$). Perceived product capability was lower after use ($M_{after} = 4.0$) than before use ($M_{before} = 4.4$). The interaction between number of features and product use on ratings of capability was also significant ($F(1, 185) = 67.2, p < .001$), indicating that the number of features had a smaller effect on perceptions of product capability after use than before use. The effect of expertise on perceived product capability was not significant ($p > .60$).

A 2 (product use) \times 2 (features) ANCOVA on perceived usability with expertise as a covariate showed that usability significantly decreased with the number of features ($F(1, 185) = 33.1, p < .001$), in support of H_2 ($M_{low} = 5.9, M_{high} = 4.9$). Consistent with H_3 , participants' expertise had a positive effect on their perceptions of product usability ($F(1, 185) = 12.7, p < .001$). No other effects were significant ($ps > .17$).

Consistent with H_4 and H_5 , a 2 (product use) \times 2 (features) ANCOVA on overall product evaluations with expertise as a covariate revealed a main effect of features ($M_{low} = 4.5, M_{high} = 5.1; F(1, 185) = 15.8, p < .001$) that was qualified by a significant interaction between features and product use ($F(1, 185) = 31.5, p < .001$). When we controlled for expertise, product evaluations before use significantly increased with number of features ($M_{low} = 4.0, M_{high} = 5.6; F(1, 91) = 49.0, p < .001$), but product evaluations after use did not ($M_{low} = 5.0, M_{high} = 4.7; F(1, 93) = 1.6, p = .20$). The effect of expertise on participants' overall product evaluations was not significant ($p > .40$). A 2 \times 2 ANCOVA on product satisfaction produced similar results.

To investigate the relative weights of product capability and usability on consumers' product utilities before and after product use, we ran a multisample path analysis using maximum likelihood estimation.⁶ Number of features, expertise, and their interaction entered the model as independent variables. We partialled out the main effects of number of features and expertise from the interaction effect and used the regression unstandardized residuals as the

⁵The CFI was .93. Capability loadings ranged from .94 to .97 (average extracted variance = 91%). Usability loadings ranged from .52 to .93 (average extracted variance = 64%), and overall evaluation loadings ranged from .55 to .92 (average extracted variance = 70%). The correlation between usability and capability was not significant. Overall evaluations were correlated with capability ($r = .63, p < .001$) and usability ($r = .29, p < .001$).

⁶We also estimated the models using partial least squares, and the results were consistent with those we obtained using maximum likelihood estimation.

Table 1
EFFECT OF NUMBER OF FEATURES ON DEPENDENT VARIABLES (STUDY 3)

Product Use	Number of Features	Product Capability	Product Usability	Product Evaluations	Product Satisfaction
Before	Low	2.7 ^a (1.2)	6.0 ^a (.9)	4.0 ^a (1.2)	3.4 ^a (1.6)
	High	6.2 ^b (.9)	5.1 ^b (1.1)	5.6 ^b (1.0)	5.6 ^b (1.0)
After	Low	3.7 ^c (1.3)	5.8 ^a (1.1)	5.0 ^c (1.0)	5.2 ^{b,c} (1.1)
	High	4.3 ^d (1.3)	4.8 ^b (1.4)	4.7 ^c (1.3)	4.9 ^c (1.6)

Notes: N = 190 participants. Standard deviations are in parentheses. Different superscripts in the same column indicate that the difference between means is significant ($p < .05$).

interaction term. Product capability and usability were mediator variables. We estimated the coefficients with two different dependent variables that reflected product utility: overall product evaluations and satisfaction. All goodness-of-fit indexes were in an acceptable range.⁷ The interaction between number of features and expertise was not significant ($ps > .11$). Table 2 shows the standardized path coefficients before and after product use.

To test the difference in the relative weights of capability and usability on expected and experienced product utility (H_4 and H_5), we constrained each of these two parameters in the model to be equal across conditions and assessed whether the chi-square decrease in the unconstrained model was significant. The Lagrange-multiplier test showed that the effects of product capability on product evaluations and satisfaction differed significantly in the before-use and after-use conditions ($\chi^2_{(1)}_{\text{overall evaluations}} = 4.2, p < .01$; $\chi^2_{(1)}_{\text{satisfaction}} = 4.9, p = .03$). Consistent with H_4 , participants gave more weight to product capability before use than after use.

In H_5 , we predicted that consumers would give less weight to usability before use than after use. Our model comparisons partially support this prediction. The effect of usability on overall product evaluations was invariant before and after use ($p > .26$), but the effect of usability on satisfaction was significantly lower before product use than after product use ($\chi^2_{(1)} = 4.5, p = .03$). This indicates that, as we expected, participants gave less weight to usability in their predicted product satisfaction than in their satisfaction ratings after using the product.

Additional Analyses

Decomposing the direct and indirect effects in our model, we found that before product use, the indirect effect of product features on overall product evaluations mediated by product capability was strong ($\beta = .70, p < .001$) and overshadowed the significant, negative indirect effect of product features through usability ($\beta = -.10, p < .01$), yielding a positive net effect.⁸ After product use, this pattern reversed. The indirect effect of features through capability became nonsignificant ($\beta = .09, p > .05$), and the indirect effect of

features through usability was negative and significant ($\beta = -.18, p = .001$), resulting in a negative net effect. The indirect effects of number of product features on satisfaction followed the same pattern.

Participants' choices of players before and after product use show a substantial decrease in the share of the high-feature model. The majority of the respondents in the before-use condition (66%) chose the high-feature model as their preferred player. However, a significantly lower percentage of the participants who had used the high-feature model (44%) chose the high-feature model ($z = 2.5, p = .01$), even though they had already invested time learning to use this model. Moreover, participants who used the high-feature model were less confident in their choices ($M_{\text{high}} = 4.7$) than participants who used the low-feature model ($M_{\text{low}} = 5.4$; $F(1, 94) = 5.8, p = .02$), and they rated the choice as more difficult ($M_{\text{high}} = 3.1$) than participants who used the low-feature model ($M_{\text{low}} = 2.3$; $F(1, 94) = 5.7, p = .02$). When we controlled for expertise, participants' confidence in their choices was lower after use ($M_{\text{after}} = 5.0$) than before use ($M_{\text{before}} = 5.8$; $F(1, 185) = 14.8, p < .001$), suggesting that usage does not enhance confidence in product evaluations.

Finally, we analyzed the usability data. There was no difference in the number of tasks completed in the low- and high-feature conditions ($M_{\text{low}} = 3.2, M_{\text{high}} = 3.1; p = .45$). The number of tasks completed was positively correlated with perceived product usability ($r = .30, p < .01$). Participants in the high-feature condition spent marginally more time completing the four tasks than participants in the low-feature condition ($M_{\text{low}} = 6.9$ minutes, $M_{\text{high}} = 9.2$ minutes; $F(1, 94) = 3.4, p = .07$). The amount of time required to complete the four tasks was negatively correlated with both participants' expertise ($r = -.31, p < .01$) and perceived product usability ($r = -.23, p = .05$).

Discussion

The results of Study 3 show that product use structurally changes consumers' preferences. In support of our predictions, consumers gave more weight to capability and less weight to usability in their expected utilities than in their experienced utilities. After product use, consumers no longer evaluated the product with the highest number of features more favorably, supporting the existence of a feature fatigue effect. Our findings also suggest that consumers' expertise does not eliminate the feature fatigue

⁷The CFI was .95 in the before-use sample and .99 in the after-use sample. All χ^2 tests $> .07$.

⁸We computed the significance level of all indirect effects using the Sobel t statistic.

Table 2
STANDARDIZED PATH COEFFICIENTS (STUDY 3)

Independent Variables	Dependent Variables							
	Capability		Usability		Overall Evaluations		Satisfaction	
	Before Use	After Use	Before Use	After Use	Before Use	After Use	Before Use	After Use
Number of features	.85**	.20*	-.43**	-.36**	—	—	—	—
Expertise	n.s.	n.s.	.36**	n.s.	—	—	—	—
Capability	—	—	—	—	.82**	.45**	.79**	.48**
Usability	—	—	—	—	.24**	.51**	.15*	.51**

* $p < .05$.

** $p < .001$.

Notes: n.s. = not significant.

effect. The shift in preferences before and after use occurred just as strongly for experts as for novices. If adding product features improves the initial attractiveness of a product but decreases consumers' satisfaction after using the product, how should firms address this problem? How many features should managers offer to consumers?

THE EFFECTS OF PRODUCT FEATURES ON FIRMS' PROFITS

In this section, we present an analytical model based on findings from our three studies to provide managerial insights into the influence of number of features on firm profitability. We assume a scenario in which adding features is essentially free (as is the case in many information-based products), implying that incremental profitability from adding features equals incremental revenue. Thus, we express incremental profit (revenue) from number of features, R , as a function of number of features, F , for a typical customer. We decompose R into a positive effect due to product capability, C , minus a negative effect due to the lack of usability, D .

From Studies 1–3, we know that perceived product capability increases with number of features. We also know from Study 3 that adding features has a smaller effect on perceived capability after use than before use. For this reason, denoting capability before and after use as C_1 and C_2 , respectively, we model capability as follows:⁹

$$(1) \quad C_1 = dF, \text{ and } C_2 = eF$$

$$c, d, e > 0 \text{ and } d > e.$$

From Studies 1–3, we also know that usability is perceived to decline with the number of features, and based on Study 1, this decline appears to accelerate. Thus, we model lack of usability, D , as follows:

$$(2) \quad D = aF + bF^2 \quad a, b > 0.$$

We also impose $d, e > a$, to ensure that the optimal feature level will be positive (otherwise, the firm should not create the product at all).

We now construct a dynamic scenario to help generate insights into short-term and long-term profitability. For analytical parsimony and tractability, we adopt a two-period scenario in which profit from initial purchases is represented by the first period and profit from all subsequent purchases are represented by the second period. We weigh the second period by a factor, w , that represents the weight with which subsequent purchases contribute to the typical customer's net present value. This weight encompasses such things as the firm's discount rate, the typical lifetime of a customer, the length of the firm's planning horizon, and the extent to which the product category is conducive to repeat sales. Denoting profits in the first and second period as R_1 and R_2 , respectively, and the net present value of the customer's profit stream as R_{tot} , we have, from Equations 1 and 2,

$$(3) \quad R_1 = C_1 - D = (d - a)F - bF^2,$$

$$R_2 = C_2 - D = (e - a)F - bF^2, \text{ and}$$

$$R_{tot} = R_1 + wR_2 = [(d - a) + w(e - a)]F - (1 + w)bF^2.$$

We first consider a myopic profit maximization in which the firm attempts to find the number of features that maximizes initial choice (and thus initial profits). This amounts to maximizing R_1 with respect to F . It is easily shown that R_1 is maximized when $F_1 = (d - a)/2b$.

Similarly, if the firm attempts to maximize repurchase (and thus second-period profits), the firm maximizes R_2 with respect to F , leading to the optimal value of $F_2 = (e - a)/2b$. If the firm instead attempts to maximize the net present value of the customer's profit stream, as financial analysts would consider optimal, the firm maximizes R_{tot} with respect to F , leading to the optimal value

$$(4) \quad F_{opt} = [(d - a) + w(e - a)]/[2b(1 + w)].$$

If we assume that the firm wants to maximize the net present value of the typical customer's profit stream, the following results arise from these equations:

Result 1: Maximizing initial choice, sales, or profits results in the inclusion of too many features. It is easily shown that $F_1 > F_{opt} > F_2$, implying that the optimal number of features is less than the number that maximizes initial choice, sales, or profits. This casts into doubt the exclusive reliance on conjoint or discrete choice models to determine the appropriate product configuration because the use of such methods, which use initial choice as their criterion, will typically result in the inclusion of too many features.

Result 2: Maximizing repurchase results in the inclusion of too few features. This again results from $F_{opt} > F_2$.

Result 3: If the number of features is sufficiently large, additional features should not be added, even if they can be added at no cost. Specifically, when $F > F_{opt}$, adding additional features reduces the net present value of the profit stream. Again, this is in contradiction to the typical economic/conjoint utility model, which suggests that adding features can only add utility.

Result 4: As the emphasis on future sales increases, the optimal number of features decreases. This follows from $\partial F_{opt}/\partial w = (e - d)/(2b[1 + w]) < 0$ because the denominator is positive and $d > e$. This result also has meaning for managers. With business becoming more relationship focused over time and with increasing amounts of attention being paid to the lifetime value of the customer, this result implies that, on average, firms should make their products simpler to increase repurchase and future sales.

For simplicity of exposition, the preceding results have been obtained for a monopolist. However, it can be shown that the consideration of competition does not change any of the substantive conclusions.¹⁰ The only change is that in the case of choice inertia (customers choosing a brand tend to stay with a brand), the optimal number of features increases. Nevertheless, Results 1–4 still hold.

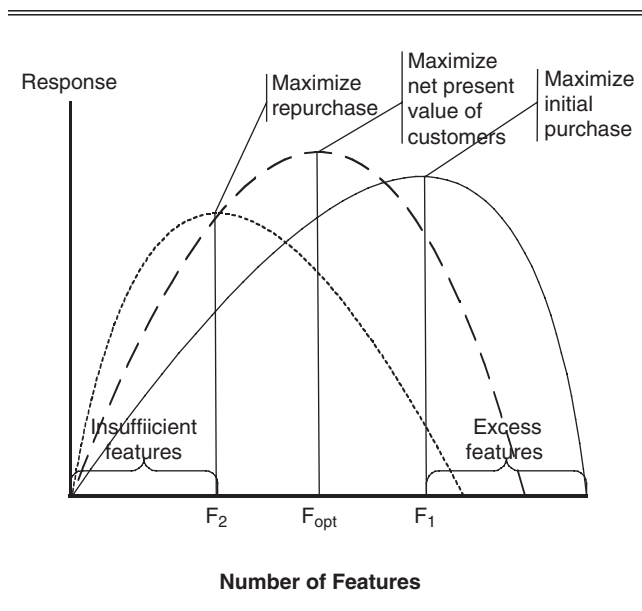
Figure 3 usefully summarizes the analytical results. As the figure shows, there is always an optimal number of features, but this optimal number depends on the goals of the

⁹For simplicity, we model this relationship as linear. However, previous research suggests that the effect of number of features on capability can have diminishing returns (Nowlis and Simonson 1996). This has no impact on our results. If we replace the linear formulation in Equation 1 with a quadratic function, all results are replicated.

¹⁰Results for the effects of competition are available from the authors on request.

Figure 3

NUMBER OF PRODUCT FEATURES AND FIRM OBJECTIVES



firm. If the firm wants to maximize initial choice (or equivalently, profits from initial purchases), the number of features F_1 is optimal. Any greater number of features is incompatible not only with the initial purchase objective but also with any profit objective. If the firm wants to maximize probability of repurchase (or equivalently, profits from repurchase), F_2 is the optimal number of features (and any less is also incompatible with any profit objective). If the firm wants to maximize the net present value of the customer's profit stream, F_{opt} is best. The only range of number of features that the firm should ever consider is the range from F_2 to F_1 , with the optimal level of features dependent on the nature of the firm's objective.

GENERAL DISCUSSION

Our goal in this research was to examine the effects of increasing the number of product features on consumers' expected and experienced product utilities. In three studies, we showed that increasing the number of product features has a positive effect on perceived capability but a negative effect on perceived usability. Thus, whether adding desirable, important features to a product will increase or decrease utility depends on the relative weights of capability and usability in consumers' utility functions. Study 3's results indicate that consumers assign more weight to product capabilities in their evaluations before use than after use and less weight to product usability in their satisfaction ratings before use than after use. Thus, what appears to be attractive in prospect does not necessarily appear to be good in practice: When using a product, consumers may become frustrated or dissatisfied with the number of features they desired and chose before using the product. In short, product capability may become too much of a good thing.

These changes in the relative weights of product capability and usability are consistent with our hypotheses based on construal-level theory. Before using a product, consumers seem to be more focused on desirability issues, such as the

product's capabilities, and less focused on feasibility concerns, such as usability, than they are after using a product. Because different considerations are salient in expected and experienced utility, using a product can change the structure of consumers' preferences. Such changes in preferences are significant because they suggest that consumers may not choose products that maximize their long-term satisfaction.

The impact of product usage on preferences is an understudied area. Consumer behavior research has traditionally focused more on prepurchase processes, such as information processing and choice (Bazerman 2001). Although the services literature has long recognized the importance of relationship duration, ongoing usage levels, and satisfaction (e.g., Bolton and Lemon 1999), this literature has focused on changes over time and has not developed theoretical frameworks to explain why consumers' underlying preferences might change.

In some respects, our studies presented a conservative test of our hypotheses. First, we used college students as our sample, a demographic segment that tends to be more open to new technology and new features than other segments. A recent nationwide survey indicated that after buying a high-tech product, 56% of consumers are overwhelmed by its complexity, and this percentage is positively correlated with age (Rockbridge Associates 2004). Second, our high-feature product had only 21 features, a relatively low number of features in some product categories. The dashboard alone of the BMW 745 has more than 700 features. Further research should examine products with more features and test for nonlinearities in evaluations as features are added. Finally, our studies considered only features that added functionality to the product and were reasonably familiar to the participants. The negative effect of unimportant or highly complex features may be stronger.

Further research should also examine consumers' reactions to product features over a longer period of time. For example, it would be interesting to learn whether consumers attribute poor usability to the large number of features in the model they chose or to the brand, potentially damaging a firm's sales across multiple categories. Even if consumers learn about the negative effects of too many features after a usage experience, this learning might be forgotten in future purchase situations, when product capability again becomes the key driver of evaluations. Finally, consumers use various strategies to cope with technology (Mick and Fournier 1998). If consumers use confrontative strategies (e.g., mastering, partnering), the effects of product features on usability and experienced utility may decrease over time. However, if consumers use avoidance strategies (e.g., distancing, abandonment), the effect of product features on experienced utility is likely to remain strong.

Although supply-side explanations for the proliferation of product features abound, our results demonstrate that demand-side explanations are sufficient for feature fatigue to occur. It is certainly true that companies often find it cheaper to produce feature-rich products that can satisfy the needs of heterogeneous consumers than to produce more narrowly targeted products with fewer features. However, companies often add features to products because they believe that their customers want more features. Indeed, our results indicate that even conducting

market research may not eliminate the problem. If companies conduct market research by asking customers to evaluate products without using them, too much weight will be given to capability compared with usability, and it is likely that too many features will be added to the products.

MANAGERIAL IMPLICATIONS

Our research has several important managerial implications. First, our findings call into question the predictive power of attribute-based models for determining the optimal number of features. Firms planning new products or considering product improvements typically use market research techniques such as conjoint analysis or discrete choice analysis. The conjoint model, for example, defines the product as a bundle of attributes and estimates part-worths for each attribute. Because market shares are predicted on the basis of these part-worths, each positively valued feature increases a product's market share compared with products without the feature. Our results suggest that traditional conjoint analysis can lead to marketing myopia, in which firms maximize initial sales. This occurs because usability, a global rather than an attribute-based characteristic, is underweighted by consumers before product use but becomes a critical element in consumers' satisfaction during use. Our results indicate that a product use experience may be required to increase the salience of usability so that its relevance in choice approaches its relevance in use. Thus, consumers' preferences may be more accurately predicted using customer-ready prototypes and product-in-use research (Srinivasan, Lovejoy, and Beach 1997).

Because additional features can differentiate a product from competitors (Carpenter, Glazer, and Nakamoto 1994) and add desired functionality, the benefits of adding new features to products are evident. However, managers rarely consider the full cost of adding features. The financial costs of adding new features are typically weighted more heavily than intangible customer usability costs. Thus, as the marginal cost of adding features decreases, approaching zero for information-based products (e.g., software), firms are likely to increase product capability beyond the optimal level. This is a dangerous trend: Both our empirical findings and our analytical model suggest that adding costless features can damage firms' profitability by decreasing the usability of products and consumers' satisfaction with them.

As firms shift their focus from one-time transactions to long-term relationships with customers, the importance of product usability—and the research methods that enable managers to incorporate usability into their decision making—will only increase. Our results suggest that too many features can encourage initial purchase but damage satisfaction and reduce repurchase probabilities, leading to lower customer lifetime values. As our model demonstrates, the optimal number of features varies depending on firms' objectives. As firms' reliance on continuing customer relationships increases, the optimal number of features decreases, implying that products should be made simpler. Conducting research with customers both before and after they use products will enable firms to measure product-specific parameters for the model and, thus, to predict the number of features that will maximize their long-term profits.

What can firms do to minimize feature fatigue? Our findings suggest that managers should consider offering a wider assortment of simpler products rather than all-purpose, feature-rich products. Instead of packing one model with many features to address market heterogeneity, firms might enhance consumer satisfaction by developing more tailored products with limited sets of capabilities that appeal to different segments. Consumers can now purchase a single product that functions as a cell phone, game console, calculator, text-messaging device, wireless Internet connection, personal digital assistant, digital camera, MP3 player, and global positioning system. However, although purchasing this highly complex product may give the consumer bragging rights, each function the consumer does not actually use adds to the difficulty of learning to use the product without providing any functional benefit.

A challenge of creating and marketing more narrowly targeted products is that choosing among a wider variety of products can be more difficult for consumers (Schwartz 2004). Rather than using the heuristic of buying features they may need (but are not sure they will need), consumers will need to consider carefully which features to purchase. Moreover, our empirical results suggest that during the choice process, consumers are tempted by products that offer greater capability. To minimize feature fatigue, decision aids, such as recommendation agents that help consumers choose the right products for their needs, could be designed to increase the salience of usability. Offering extended product trials also may help consumers learn which products best suit their needs by increasing the salience of product usability. For example, the companies that sell digital media players RealOne and WinAmp offer evaluation versions of their products. By decreasing the gap between consumers' preferences during choice and use, such strategies may increase both customer satisfaction and customer lifetime value.

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