To Add or Not To Add? The Effects of Add-ons on Product Evaluation

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The research presented in this paper provides evidence that “add-ons” are more than just simple added benefits. In three studies we show that the perceived utility of ordinary consumer goods is influenced by the presence (but not the use) of optional features. This evidence is inconsistent with standard utility theory which predicts that any assessment of base products and add-ons should be separate and independent. The authors argue that consumers incorporate information on add-ons – their type, quality, etc. – when evaluating a product and that the ultimate impact (positive or negative) of such inferences is a function of the type of enhancement provided. From a prescriptive standpoint our findings highlight the need for firms to be more attentive in managing this product extension decision.
“Add-ons” come in all shapes and sizes. For example, restaurant menus often list numerous toppings, condiments, spices, or other ingredients that patrons can add to a standard order. In the consumer electronics markets, manufacturers of goods such as digital cameras, portable music players, laptop computers, and video game consoles encourage consumers to “accessorize” with various types of gadgets (carry cases, extra memory, etc.), expansion packs, and plug-in modules. Similarly, car manufacturers sell accessory packages and extended warranties for most new vehicles; domestic airlines offer meal service and in-flight entertainment at additional cost to passengers; fitness centers charge separately for locker rental, towel service, and many supervised group activities; telephone companies market a range of value-added services such as caller ID, call waiting, and call forwarding to each newly-acquired customer; and so on across a wide variety of industries.

Given the widespread appeal of add-ons, it is becoming increasingly important to understand their impact on purchase behavior. From a marketing standpoint, the literature on product assortment suggests that consumers can benefit from the availability of add-on features as long as these provide greater variety in choice. For example, studies on the effect of assortment size on consumer welfare have shown that “more choice” is beneficial to buyers when there is sufficient heterogeneity in individual preferences, sufficient variety-seeking behavior, or both (Bayus and Putsis 1999; Hoch, Bradlow, and Wansink 1999; Kahn 1998). Given that the introduction of new features is commonly regarded as one of the most direct methods used to differentiate a product (Brown and Carpenter 2000; Carpenter, Glazer, and Nakamoto 1994; Nowlis and Simonson 1996; Simonson, Carmon, and O’Curry 1994), this line of reasoning implies that consumers should value add-ons to the extent that they improve the fit between the number of options available for consideration and individual needs.

Economists, on the other hand, have long asserted that the reason why firms enter add-on markets is to offset competition on the sale of base products. According to this argument, what drives the attractiveness of such “aftermarkets” are the high switching costs of people that have already committed to a specific base product (Ellison 2005; Verboven 1999), or the firm’s ability to identify and exploit consumers that naively fail to foresee the future

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need for additional functionality (Gabaix and Laibson 2006). Either way, technology improvements in the production and versioning of products are often cited as the key factor that enables firms to pursue these secondary (but lucrative) sources of revenue (Freund, König, and Roth 1997; Shapiro and Varian 1998).

Overall, while these perspectives certainly deal with some of the key issues underlying the popularity of add-ons, we believe that existing theories may not be capturing the whole story. Some researchers, for instance, have argued that large assortments can in fact overwhelm consumers and cause poor decision making (Boatwright and Nunes 2001; Iyengar and Lepper 2000; Thompson, Hamilton, and Rust 2005). Similarly, the logic of switching costs is challenged by the reality that in many situations consumers appraise products knowing only too well whether enhancement options are available. More importantly, however, recent studies have demonstrated that while people have a hard time evaluating products in absolute terms, they are often attentive to relative values and respond to a variety of contextual cues (Ariely, Loewenstein, and Prelec 2003, 2006; Bettman, Luce, and Payne 1998; Tversky and Simonson 1993). The relevance of this finding becomes apparent when one considers the possibility that information on add-ons – their type, quality, etc. – creates a context that consumers use to form or update their preferences for base products.

In the present research we develop this additional perspective. In particular, by characterizing the add-on space according to the type of augmentation supplied by the firm – vertical when the enhancement upgrades an existing attribute (e.g., extra memory for digital cameras), horizontal when the enhancement introduces a new feature (e.g., condiments for coffee) – we are able to identify two independent effects: vertical add-ons influence product evaluation by inducing a reassessment of specific features while horizontal add-ons do so by cuing inferences about overall product quality.

The objective of our studies is to demonstrate these effects and to specify conditions under which the presence of an add-on is beneficial or, more surprisingly, detrimental to product evaluation. In study 1 we show that offering an optional extension on an existing product attribute increases the participants’ reference level for that feature and, consequently, makes the base product alone seem less attractive. A separate condition establishes the opposite effect for “strip-downs,” while a follow-up experiment demonstrates that both effects disappear when sufficient external information on appropriate attribute levels is provided. In study 2 we turn our attention to horizontal add-ons and demonstrate that participants infer a positive correlation between the observed quality of the new feature and the unobserved quality of the base product, but that the effect is conditional on the perception of fit.
between the two objects. Finally, in study 3 we show that the negative effect of vertical add-ons and the positive effect of horizontal add-ons can occur on the same base product, a result which underscores the fact that not all the optional features that consumers may find inherently valuable should find their way into the marketplace. We conclude with a general discussion of the implications of our findings.

A CLASSIFICATION OF ADD-ON TYPES

The task of evaluating a product is not always easy. While it is reasonable to assume that consumers understand what features a desired good should (or should not) include, the difficulty often lies in judging in absolute terms the quality level offered by different alternatives. For example, while it is easy to distinguish coffee from other beverages, it can be hard to determine its value without some point of comparison. Similarly, for categories in which the evaluation is multi-attribute rather than holistic (digital cameras, laptop computers, etc.), consumers may know in advance what product components to expect (e.g., zoom, processor) but are often unsure about the level (e.g., zoom ratio, processor speed) these attributes should reach.

When consumers lack the necessary information or experience to make accurate judgments they are prone to using extrinsic cues as indicators of quality (Zeithaml 1988). Behavioral researchers have argued that preferences can be manipulated by normatively irrelevant factors such as choice set composition (Huber, Payne, and Puto 1982; Tversky and Simonson 1993), decision frames (Park, Jun, and MacInnis 2000), and even arbitrary anchors (Ariely et al. 2003). We draw from this body of work to argue that contextual inference can also occur across variants of the same product. Specifically, we believe that in the absence of sufficient information about product quality, add-ons act as peripheral cues that inadvertently shape the consumer's perceptions.

To test this proposition, our experiments contrast situations in which firms may or may not offer add-on features. While standard utility theory would predict that an assessment of the core offering should be independent of the availability of optional features (Keeney and Raiffa 1993), we predict instead that the mere presence of add-ons allows consumers to make additional inferences (positive or negative) about the perceived utility of the base product. Furthermore, we argue that participants make different inferences depending on the type of enhancement provided by the add-on and that these inferences have distinct implications for the way the base product itself is perceived. In our experiments we distinguish between two main types of enhancements: vertical and horizontal.
Vertical Enhancements

A vertical add-on provides consumers with the opportunity to upgrade an existing feature of the base product (memory in digital cameras, hard drive size in laptop computers, etc.). Occasionally, however, it can also provide useful information regarding the product attribute it modifies. Consider, for example, the case of a consumer that lacks the necessary information to judge whether the performance of a product attribute is sufficient or not. We suggest that when consumers face this familiar predicament the presence of a vertical add-on evokes a natural frame of reference that helps resolve this uncertainty. Specifically, we propose that consumers use the range of attribute values available to them to set a lower and upper bound to their expectations, and the attractiveness of a particular level is then a function of its relative location within this range.

Applied to this context, we believe that the presence of a vertical add-on determines a range whose endpoints are the level specified in the base product (the lower bound) and the level achievable with the base product plus add-on combination (the upper bound). As a result, the attribute level in the base product alone will be judged less favorably when there is an opportunity to enhance it and the perceived value of the product as a whole will suffer accordingly. In other words, this argument captures the simple intuition that a consumer presented with the opportunity to add, for example, 32 megabytes of memory to a digital camera may suddenly find the standard 64 megabytes inappropriate because the potential on this attribute (its upper bound) has now increased to 64 + 32 megabytes.

By analogy, we can also predict that if firms provide consumers with an option to reduce (rather than enhance) an attribute level, then the effect should be reversed. Such an outcome would be consistent with our argument because any option to “strip-down” a base product is expected to evoke a range of attribute levels that makes the original offering more (rather than less) appealing.

These accounts of the impact of vertical add-ons on product evaluation are consistent with range theory (Parducci 1968; Volkman 1951). Similar inferential processes have been studied in other marketing contexts (Janiszewski and Lichtenstein 1999; Yeung and Soman, 2005). We test our predictions for both types of product options in study 1.
Horizontal Enhancements

A horizontal add-on provides consumers with the opportunity to introduce a new feature to the core offering (condiments for coffee, pizza toppings, carry cases for laptop computers, etc.), thereby expanding its functionality. Because horizontal add-ons target features that are not normally included in the base product their availability is not expected to have a direct impact on existing beliefs about specific product attribute levels (as was the case with vertical add-ons). Instead, we argue that the presence of a horizontal add-on engenders a more generic, correlation-based inference about the overall quality of the base product it accompanies (Kardes, Posavac, and Cronley 2004).

Consumers make correlation-based inferences whenever they use given information on one object to draw conclusions about a second object. The underlying mechanism is a simple transfer of beliefs; a phenomenon that is particularly common in evaluation tasks and is well documented in the marketing literature. Just like consumers often use price (Gerstner 1985), brand (Rao and Monroe 1989), store (Dodds, Monroe, and Grewal 1991), and/or warranty (Boulding and Kirmani 1993) information as indicators of unobserved product quality and implicitly estimate a correlation between the two constructs, we argue that consumers presented with a high (low) quality horizontal add-on evaluate the base product more (less) favorably than if no such enhancement was available. We believe this positive correlation will be reflected not only in standard dependent measures (perceived quality, willingness to pay, etc.) but also in actual consumption experiences with the product (e.g., taste). Furthermore, consistent with research on brand extensions, we also predict that this inference should dissipate when the connection between add-on and base product, in terms of perceived fit, is absent (Aaker and Keller 1990). We test our predictions for both types of horizontal add-ons in study 2.

STUDY 1: VERTICAL ADD-ONS AND STRIP-DOWNS

In this first study we conducted an online experiment to determine whether the perceived utility of a base product (the control condition) could be influenced by the presence of an option to modify (up or down) the level of its attributes. Based on the argument that people use the range of attribute values available to them to form an
expectation about the performance of a base product on that specific dimension, we predicted that vertical add-ons would damage the assessment of the product, while vertical strip-downs would have the opposite effect.

Pre-Test

To run this experiment we selected two product categories – digital cameras and laptop computers – in which both vertical add-ons and strip-downs exist naturally. A pre-test \( (n = 67) \) helped us identify a set of features from each of these categories that consumers generally expect to find included in a representative product. We presented participants with a list of nine attributes per category and asked them to evaluate each on three measures (Cronbach’s \( \alpha = .97 \)): (1) “Do you expect this particular feature to be included in the base product?” (1 = definitely should be sold separately, to 10 = definitely should be part of the base product), (2) “To what extent do you feel this particular feature is a central component of the product?” (1 = definitely a peripheral feature, to 10 = definitely a central feature), and (3) “Would you be surprised if this feature is only available as an add-on?” (1 = not at all surprised, to 10 = very surprised).

From this initial list we selected the four attributes with the highest averaged score – digital camera: focus (\( M = 9.30 \)), zoom (\( M = 9.00 \)), memory size (\( M = 8.43 \)), and sensor pixels (\( M = 8.26 \)); laptop computer: processor speed (\( M = 9.81 \)), hard drive size (\( M = 9.38 \)), operating system (\( M = 9.05 \)), and disk drives (\( M = 8.88 \)) – and constructed fictional product profiles by specifying attribute levels that mirrored those currently found in the marketplace.

Method

The experiment used a 3 (product options: none, vertical add-ons, vertical strip-downs) \( \times \) 2 (product: digital camera, laptop computer) between-subjects design. Participants were shown a single purchase scenario in which they had to evaluate a product of interest to them (see appendix). The text in the stimulus explained that alternatives on the market differed according to the levels of four key attributes. After a brief explanation of each feature participants were given the exact specifications of the model to be evaluated. Any mention of add-ons or strip-downs (when offered) was left to the end. The attributes affected were memory size and focus (digital camera scenario), and processor speed and hard drive size (laptop computer scenario). In the case of add-ons, it was made
clear that these were separate products to be purchased, if desired, at extra cost. Strip-downs, on the other hand, were described as opportunities to reduce the performance of specific attributes at a price reduction.

After reading the scenario, participants were asked to answer a series of outcome and process measures. First, they evaluated the base product on four separate dimensions: perceived quality (1 = very low quality, to 8 = very high quality), probability of liking the product (1 = very low, to 8 = very high), fit with personal needs (1 = strongly disagree, to 8 = strongly agree), and willingness to pay (WTP). Then, to provide evidence that the presence of add-ons or strip-downs shifted expectations regarding suitable attribute levels, we elicited numerical values that participants felt were “appropriate” for each attribute targeted by this manipulation. In addition, we also measured the amount of uncertainty surrounding the evaluation of the base product by asking participants how confident they were in their assessments (1 = not at all confident, to 8 = very confident).

Participants (n = 293) were registered members of a subject pool managed by the research center of a large US business school. The general population of 5,447 members is, on average, 39% male and 31 years of age. Eighty-seven percent of the members had completed undergraduate education or higher. Participants were selected at random and recruited via e-mail. They were informed that the poll involved hypothetical purchase decisions, that there were no right or wrong answers, and that they should only consider their own preferences. Participation was voluntary, with a $5 payment upon completion.

Results

Product Evaluation. A preliminary analysis indicated that the three scale items (perceived quality, probability of liking the product, and fit with personal needs) were highly correlated (Cronbach’s α = .87). For ease of exposition the data were collapsed into one rating capturing the overall evaluation of the base product (Nunnaly and Bernstein 1994). The data was also aggregated across the two replicates since this manipulation failed to reveal any significant effect (main effect: $F(1, 291) = .52$, ns; two-way interaction with product options: $F(2, 287) = .57$, ns). As predicted, the perceived utility of the base product varied significantly across the three product option conditions ($F(2, 290) = 18.91$, $p < .001$). Compared to the control condition in which no product option was offered ($M = 5.51$), participants rated the base product less favorably in the presence of vertical add-ons ($M = 4.79$, $t(194) = -3.71$, $p < .001$) but more favorably in the presence of vertical strip-downs ($M = 5.97$, $t(198) = 2.28$, $p < .05$).
Willingness to Pay. The WTP measure was analyzed separately but yielded a similar pattern of results. For both product categories, participants expressed a lower WTP when the product was flanked by a vertical add-on ($M_{\text{camera}} = $159.43, $M_{\text{computer}} = $714.09) than when it was offered on its own ($M_{\text{camera}} = $194.66, $t(92) = -1.86, p < .10; M_{\text{computer}} = $834.31, $t(101) = 1.88, p < .10$). This effect, however, was reversed and statistically stronger when the base product was accompanied by optional strip-downs instead ($M_{\text{camera}} = $241.94, $t(94) = 2.34, p < .05; M_{\text{computer}} = $714.09 vs. $M = $1,006.46, $t(93) = 2.31, p < .05$). In figure 1 we display the aggregate evaluations of the base product in conjunction with the participants’ stated WTP (digital camera scenario only).

Expectations Regarding Attribute Levels. According to our theory, the negative impact of a vertical add-on is credited to its influence on the attribute levels expected in the base product. In terms of the data, this prediction would be supported if, along with the inferior ratings and WTP observed above, participants expected higher levels on the attributes specifically targeted by the two add-ons. In the case of strip-downs, of course, the effect should be reversed. Consistent with this idea, expected attribute levels in both the digital camera ($M_{\text{memory}} = 171.61, M_{\text{zoom}} = 3.85$) and laptop computer ($M_{\text{processor}} = 2.58, M_{\text{hard-drive}} = 58.85$) scenario were significantly higher when a vertical add-on was offered for these attributes than when it was not ($M_{\text{memory}} = 131.21, t(89) = 1.76, p < .10; M_{\text{zoom}} = 3.32, t(92) = 2.16, p < .05; M_{\text{processor}} = 2.27, t(90) = 1.99, p < .05; M_{\text{hard-drive}} = 47.00, t(90) = 2.10, p < .05$). Conversely, when participants had the option of purchasing a stripped-down version of the base product the expected level of each of these attributes was significantly lower ($M_{\text{memory}} = 84.69, t(91) = -2.04, p < .05; M_{\text{zoom}} = 2.81, t(94) = -2.11, p < .05; M_{\text{processor}} = 1.91, t(92) = -2.17, p < .05; M_{\text{hard-drive}} = 38.70, t(92) = -2.14, p < .05$).

To provide stronger evidence of the link between product options, expected attribute levels, and base product evaluation, we also conducted a mediation analysis following the three-step procedure set out by Baron and Kenny (1986). First, we regressed both mediators (i.e., the expected attribute levels for each feature targeted by an add-on
or strip-down) on the independent variable (product options). In each case the manipulation of product options significantly affected the reported attribute levels (attribute 1: $b = -.10, t = -2.16, p < .05$; attribute 2: $b = -.07, t = -2.11, p < .05$). Second, we regressed the dependent variable (base product evaluation) on the independent variable. The relationship between these two measures was also significant ($b = .13, t = 2.25, p < .05$). In the final step we regressed the dependent variable on both the independent variable and the two mediators. Here both mediators had an effect on base product evaluation (attribute 1: $b = -.40, t = -4.14, p < .001$; attribute 2: $b = -.44, t = -4.14, p < .001$), but the effect of product options was now insignificant ($b = .07, t = 1.30, ns$). Together this set of results provides evidence that the relationship between product options and base product evaluation was perfectly mediated by the participants’ expectations regarding satisfactory attribute levels.

Confidence in Evaluating the Base Product. A fundamental assumption in this research is that consumers perceive product options as relevant information that reduces the feeling of uncertainty experienced during the evaluation task. To try and capture this process we measured uncertainty by asking participants how confident they were in their assessment of perceived quality, expecting that confidence would increase when product options of either type were made available. An initial analysis of variance (ANOVA) revealed no significant effect involving product category, which led us to collapse the data across replicates (main effect: $F(1, 291) = .20, ns$; two-way interaction with product options: $F(2, 287) = .07, ns$). The main effect of product options, on the other hand, was significant ($F(2, 290) = 3.95, p < .05$). Specifically, compared with the control condition ($M = 4.71$) participants rated their evaluation of base product quality with greater confidence when either add-ons ($M = 5.29, t(194) = 2.18, p < .05$) or strip-downs ($M = 5.46, t(188) = 2.67, p < .01$) were provided. These results jointly support our prediction.

Discussion

2 Memory size was measured in megabytes, zoom in magnification ratio, processor speed in gigahertz, and hard drive size in gigabytes.

3 The first and second attributes were memory size and zoom (digital camera) or processor speed and hard drive size (laptop computer), respectively. Throughout the analysis we included product category as an additional explanatory variable.
The purpose of this experiment was to show that a consumer’s evaluation of a product can be affected by the opportunity to modify one of its attributes. Overall, our findings support this proposition, while also demonstrating that the effect is contingent on the type of modification offered by the firm (negative for add-ons, positive for strip-downs) and is mediated by expectations regarding what attribute levels are appropriate.

To account for this pattern of results we proposed that consumer evaluations are sensitive to range effects, and that the provision of vertical add-ons or strip-downs evokes a range of feasible attribute values that the individual then uses to form a judgment. An important characteristic of range effects, however, is that they should only be present when consumers need to use contextual information to add meaning to or interpret the value of a stimulus (Parducci 1968). In turn, this constraint suggests that if people receive sufficient information regarding attribute levels, then add-ons or strip-downs may have a reduced or null effect on evaluations.

To explore this possibility we conducted a follow up experiment in which we added market data on attribute levels to the stimuli. These data matched the specifications of the product. For example, the digital camera scenario included the following paragraph:

Consumer Reports, which provides independent reviews and ratings for many consumer products, recently compiled a list of attribute levels typically found in the digital camera models currently available. For memory size and digital zoom these levels are 64 MB and a 3.0\times magnification ratio, respectively.

Every other aspect of the stimuli, as well as the experimental procedure, remained unchanged. The results were consistent with the notion that range effects disappear in the presence of sufficient information. The participants’ \( n = 259 \) overall evaluation of the base product (Cronbach’s \( \alpha = .86 \)) was no longer affected by the manipulation of product options \( F(2, 256) = 1.15, \text{ ns} \). A similar null result was also observed for WTP \( F(2, 256) = 1.49, \text{ ns} \), expected attribute levels \( F_{\text{attribute 1}}(2, 256) = .33, \text{ ns}; F_{\text{attribute 2}}(2, 256) = 1.03, \text{ ns} \), and confidence in the evaluation of the base product \( F(2, 256) = .30, \text{ ns} \).

**STUDY 2: HORIZONTAL ADD-ONS**

\(^4\) The ANOVA for each of these measures included product category as a second independent variable. The interaction between product category and product options was never significant. As expected, a main effect of product category was observed for WTP estimates and for each of the reported expected attribute levels.
For study 2 we turned our attention to horizontal add-ons. In this field experiment we staged an actual coffee tasting to examine whether the mere presence of various condiments affected the participants’ evaluation of the beverage. One of the reasons why we chose this setting was because we wanted to test add-ons in a situation that involved actual experiences. Specifically, we were interested in finding out whether the effect of add-ons generalizes from inferences before consumption to impressions after consumption; surviving, so to speak, the feedback (good or bad) that participants received from tasting the beverage.

In a separate pre-test (n = 77) we surveyed coffee drinkers about their drinking habits. In particular, one section of the questionnaire listed 14 different condiments and asked respondents to indicate whether they had tried them with coffee before and, if not, whether they would consider doing so in the future. A key concern in this experiment was to hold the taste of the product constant across experimental conditions. For this reason we used the responses to select six condiments – cloves, nutmeg, orange peel, anise, sweet paprika, and cardamom – that rated poorly on prior usage (to minimize the likelihood that they would actually be used) but highly on trial intention (to maintain a strong perception of fit).

Method

The experiment was conducted on three separate days, one for each experimental condition. On the first day the coffee was offered on its own, without add-ons. For the second and third sessions, however, participants were presented with the opportunity to add one or more of the selected condiments to their beverage. We manipulated the perceived quality of the condiments by changing the display format: we used elegant crystal spice holders in the high quality condition and broken Styrofoam cups in the low quality condition. In each session a table was stationed outside the cafeteria of a large local business school and individuals (students, professors, and administrative staff) were approached to participate in a free coffee tasting and provide feedback on their experience. Participants were told that the cafeteria was looking to expand its coffee selection and that management valued the opinion of the school community. All measures were collected via a feedback form that participants filled out after sampling the coffee. The key dependent variables used to evaluate the product were self-rated perceptions of enjoyment, quality,
and taste (using 10-point scales where higher scores indicate better performance), plus willingness to pay (WTP). We excluded the responses of those that took part in multiple sessions, leaving us with 153 participants.

Results

**Manipulation Check.** Participants rated the overall quality of the six condiments on a one (poor) to 10 (excellent) scale. On average, participants that saw the condiments in the high-quality spice holder reported greater perceived add-on quality ($M = 7.42$) than those that saw the condiments in the low-quality Styrofoam cups ($M = 5.43$, $t(98) = 4.92$, $p < .001$).

**Dependent Measures.** The data support the predicted effect of add-on availability and add-on quality on the evaluation of the base product (figure 2). First, compared to the baseline case in which no condiments were provided, participants that were offered, but did not use “high quality” condiments rated the coffee as more enjoyable ($M = 7.48$ vs. $M = 6.17$, $t(87) = 3.82$, $p < .001$) and of a higher quality ($M = 7.57$ vs. $M = 5.91$, $t(87) = 5.03$, $p < .001$). Importantly, these beliefs extended not only to the participants’ WTP for the beverage ($M = $1.33 vs. $M = $1.17, $t(87) = 3.51$, $p < .001$) but also to their evaluation of actual taste ($M = 7.69$ vs. $M = 6.30$, $t(87) = 3.47$, $p < .001$), a result which is consistent with recent research on the effect of marketing actions on actual experiences (Shiv, Carmon, and Ariely 2005). Second, in the opposite situation, participants that were offered “low quality” condiments reported lower scores on every measure ($M_{\text{enjoyment}} = 5.36$, $t(84) = -2.37$, $p < .05$; $M_{\text{quality}} = 5.28$, $t(84) = -1.89$, $p < .10$; $M_{\text{taste}} = 5.33$, $t(84) = -2.35$, $p < .05$) apart from WTP ($M_{\text{WTP}} = $1.18, $t(84) = .09$, $p > .10$).

Discussion

The results of the coffee tasting and those of study 1 are analogous in that both provide evidence that the mere presence of an enhancement option is sufficient to influence the evaluation of a base product. Importantly, however, these two experiments differ on the inferential process that underlies the pattern of results we observed. In
this particular study we focused on horizontal (rather than vertical) add-ons in order to test the prediction that consumers infer a positive correlation between the observed quality of the add-on (which we manipulated) and the unobserved quality of the base product. Consistent with our expectations, participants rated the coffee more (less) favorably when they had the option of adding condiments they perceived to be of a high (low) quality.

In study 1 we showed that people’s reliance on the information provided by vertical add-ons or strip-downs was rendered useless once we supplied additional information on the products’ attributes. In similar fashion, one can imagine that if horizontal add-ons provided consumers with information that they did not really need in their evaluations of the base product, then their influence would diminish or disappear entirely. One factor that may determine this “usefulness” of add-on information is the perceived fit between the two items. The literature on brand extensions suggests that perceived fit is a key variable moderating the transfer of beliefs between two products (Aaker and Keller 1990). Similarly, a lack of fit between the base product and a horizontal add-on may be sufficient to cancel out any inference that would otherwise occur.

To test this proposition we conducted a follow-up experiment in which 218 participants were asked to rate the perceived quality of the pizza from an Italian restaurant (1 = very low quality, to 8 = very high quality). The experiment employed a single factor, “add-on type,” with five levels: none, high-quality/fit, high-quality/no fit, low-quality/fit, low-quality/no fit. In the appropriate conditions the stimulus included a list of four toppings that the restaurant offered at extra cost. In the “fit” conditions participants were offered olives, feta cheese, mushrooms, and sausage. In the “no fit” conditions the toppings were chocolate, lemon peel, caramel syrup, and peanut butter. The perceived quality was manipulated by varying the origin and freshness. As a manipulation check, participants were asked to evaluate how well the selection of toppings fit with the pizza ($M_F = 5.82$ vs. $M_{NF} = 2.66$ on an 8-point scale where 8 = excellent fit, $t(172) = 10.02, p < .001$) and to rate their overall quality ($M_{HQ} = 6.34$ vs. $M_{LQ} = 4.39$ on a 9-point scale where 9 = very high quality, $t(172) = 6.29, p < .001$).

When participants perceived a fit between the base product and the add-ons the results replicated those of the coffee tasting (figure 3). Compared to when the pizza was presented on its own ($M = 5.93$), evaluations were significantly higher when high quality toppings were offered ($M = 6.70, t(86) = 2.12, p < .05$) and significantly lower when the toppings were of a low quality ($M = 4.77, t(81) = -3.09, p < .01$). When the perception of fit was absent, on the other hand, these results “disappeared” and, as predicted, both high quality ($M = 6.00, t(92) = .19, \text{ ns}$) and low quality ($M = 5.37, t(83) = -1.53, \text{ ns}$) toppings no longer had an effect on the assessment of the product.
STUDY 3: VERTICAL AND HORIZONTAL ADD-ONS

In study 1 and 2 we examined the psychological processes that underlie the inferences that individuals make when add-on features are offered to them. In the interest of parsimony, we purposely looked at a wide variety of add-ons, including some that consumers may clearly find displeasing (in the case of low quality) or peculiar (in the case of low fit). While this analysis was interesting from a theoretical perspective, in reality firms strive to market add-ons that the buying public would actually find attractive and useful. With that in mind, the main objective of this final study was to concentrate on these “positive” add-ons and to consider cases when both vertical and horizontal add-ons are offered on the same product. We predicted that while participants may draw inferences from both types of add-ons, the outcomes would be markedly different. Specifically, we expected that participants would perceive a higher (lower) utility from the base product when horizontal (vertical) add-ons were made available to them. From a managerial perspective, such a result is important because it would reinforce the fact that firms should look beyond the inherent value of add-ons and consider their impact on how the base products themselves are evaluated.

Method

For this experiment we decided to use the same two product categories (digital cameras and laptop computers) featured in study 1. We relied on the pre-test conducted for that study to identify features that would be included in the base products and/or targeted for add-ons. For the digital camera scenario the core attributes were: focus, sensor pixels, memory size, and zoom. Vertical add-ons were offered on memory size and zoom while the horizontal add-ons were a mini printer and tripod. For the laptop computer scenario, on the other hand, the core attributes were: operating system, disk drives, processor speed, and hard drive size. Vertical add-ons were offered on processor speed and hard drive size while the horizontal add-ons were portable speakers and a carry case.
The experiment used a 3 (product options: none, vertical add-ons, horizontal add-ons) × 2 (product: digital camera, laptop computer) between-subjects design. It was carried out online, using the same subject pool and following the same recruitment procedure as described in study 1. People that had already participated in study 1 were excluded from consideration. Participants (n = 264) were shown a single purchase scenario in which they had to evaluate a product of interest to them. The scenarios and dependent variables (both outcome and process measures) were identical to the one used in study 1 except for the following changes. First, we replaced the paragraph describing vertical strip-downs with one describing horizontal add-ons. The digital camera scenario, for example, included the following text:

In addition, with this model you also have the option of buying accessories at extra cost. Specifically, the manufacturer provides an 8-color photo printer and a tripod that has 6 different positions, each sold separately.

Second, to measure expectations regarding suitable attribute levels we elicited numerical values at four (rather than one) different levels: bad, insufficient, sufficient, and good. We made this change hoping that the more elaborate task would result in robust estimates. Responses were examined using ANOVA and planned contrasts. Table 1 summarizes the results for the main dependent variables, including the relevant values for each statistical test.

Results

Product Evaluation. Given that the three scales measuring perceived utility (perceived quality, probability of liking the product, and fit with personal needs) were highly correlated we once again analyzed the data using an aggregate evaluation (Cronbach’s α = .88). The ANOVA revealed a main effect of product options (F(2, 261) = 24.13, p < .001) and product category (F(1, 262) = 6.18, p < .05) but no significant interaction between the two variables (F(2, 258) = .47, ns). The contrast between the baseline (no enhancement) and vertical add-on conditions replicated the main result of study 1: the same product was evaluated less favorably when flanked by vertical add-ons (M_{camera} = 4.74, M_{computer} = 4.53) than when presented on its own (M_{camera} = 5.56, p < .05; M_{computer} = 5.15, p < .05). The contrast between the baseline and horizontal add-on conditions, however, had the opposite effect on
evaluation \(M_{\text{camera}} = 6.33, p < .01; M_{\text{computer}} = 5.73, p < .05\), which was consistent with the outcome observed in study 2.

**Willingness to Pay.** The maximum price participants were willing to pay for the base product was similarly affected by the presence of add-ons \(F(2, 261) = 11.53, p < .001\). In the laptop computer scenario participants expressed a significantly higher WTP when the product was flanked by horizontal add-ons \(M = $1,128.54\) than when it was offered on its own \(M = $925.42, p < .05\). This effect, however, was reversed when the add-ons provided a vertical enhancement \(M = $730.53, p < .05\). For the digital cameras category the pattern of results was directionally consistent with our hypotheses \((M_{\text{none}} = $246.84, M_{\text{horizontal}} = $267.34, \text{and } M_{\text{vertical}} = $175.73\), but neither contrast reached statistical significance.

**Expectations Regarding Attribute Levels.** To test whether the presence of vertical add-ons induced an upward shift in the attribute levels expected to be found in the base product we relied on the average of the numerical values for the insufficient and sufficient levels indicated by participants. As predicted by a range theory account of inference-making, participants reported expected attribute levels in both the digital camera \((M_{\text{memory}} = 78.38, M_{\text{zoom}} = 3.67)\) and laptop computer \((M_{\text{processor}} = 1.59, M_{\text{hard-drive}} = 37.79)\) scenarios that were significantly higher when vertical enhancements were offered on these attributes than when they were not \((M_{\text{memory}} = 57.49, p < .05; M_{\text{zoom}} = 3.00, p < .05; M_{\text{processor}} = 1.37, p < .05; M_{\text{hard-drive}} = 26.61, p < .05)\). Importantly, this effect was not replicated when we compared the baseline and horizontal add-on conditions (table 1).

Confidence in Evaluating the Base Product. In study 1 we reported that participants felt more confident in their evaluation of the base product when vertical add-ons or strip-downs were made available to them. In this experiment we wanted to extend this result to the case of horizontal add-ons in order to show that using add-on presence as relevant information occurs irrespective of type. The ANOVA provided initial evidence of an effect of product options \(F(2, 261) = 7.24, p < .01\). The main and interaction effects of replicates, on the other hand, were
insignificant. Consistent with our prediction, participants rated their assessment of the quality of both base products with greater confidence when either vertical ($M = 5.47$, $t(177) = 3.36$, $p < .01$) or horizontal ($M = 5.46$, $t(176) = 3.33$, $p < .01$) add-ons were provided than when the product was presented on its own ($M = 4.62$).

Discussion

In this study we set out to demonstrate that not all the add-ons that consumers may find inherently valuable should find their way into the marketplace. As predicted, the effects of horizontal and vertical add-ons on product evaluation are independent, appear to be generated by different inferential processes, and lead to opposite outcomes. Specifically, we found that while base products will normally benefit from the presence of horizontal add-ons, the same cannot be said for vertical add-ons. Thus, the key lesson of this study is that the type of add-on sold to consumers definitely matters, and that firms should be exercise care when deciding what collection of enhancements to offer.

GENERAL DISCUSSION

The research presented in this paper makes the case that add-on features influence consumer behavior beyond what their inherent value would indicate. The key idea we proposed is that consumers incorporate information on add-ons – their type, quality, etc. – when evaluating the perceived utility of a base product and that the ultimate impact of such inferences is a function of the type of augmentation provided by the firm. Central to our argument is a simple classification that distinguishes between vertical add-ons (those that improve existing attributes) and horizontal add-ons (those that introduce new features). The objective of our studies was to test this framework and some of the related implications.

In the first study we focused exclusively on vertical add-ons and strip-downs. We predicted that an option to modify the level of an attribute would help participants determine the competence of the base product on that

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5 Main effect: $F(1, 262) = .01$, ns. Two-way interaction with product options: $F(2, 258) = .62$, ns.
particular feature. Specifically, while we expected base product evaluations to benefit from the presence of vertical strip-downs, we anticipated an opposite effect in the case of vertical add-ons. This intuition was confirmed by the data. For study 2 we turned our attention to horizontal add-ons. Here we staged an actual coffee tasting to test whether the mere presence of various condiments was sufficient to change the participants’ overall perceptions (quality, enjoyment, taste, etc.) of the beverage. We found support for this second prediction as well. Furthermore, we also confirmed that this effect endured even after participants had the chance to consume the product and revisit their original impressions. Finally, in study 3 we considered cases when both vertical and horizontal add-ons were offered on the same product to emphasize the point that the type of enhancement matters and that firms should look beyond the inherent value of add-ons when deciding what optional features to offer.

In the introduction to this paper we discussed a number of explanations for the widespread popularity of add-ons. While each of these perspectives clearly has its merits, our intention was to draw attention to one additional aspect: consumer inference. Past research has shown that the impact of inferential beliefs on product evaluation can be significant (Huber and McCann 1982). The evidence provided in this research extends this line of work and makes a compelling case that firms should be cognizant of the potential repercussions of add-ons on the evaluation of base products. We argued that marketers should exercise care when deciding what types of add-ons to offer the buying public. Of course this point becomes even more relevant if one considers the fact that add-ons are increasingly supplied by third-party providers and issues of control or autonomy may come up with more frequency.
Imagine a scenario in which you are deciding whether to buy a digital camera. From what you have learned about digital cameras, you know that models typically vary according to four key attributes:

- **Focus**: This function, which can be manual or automatic, allows the user to focus on the subject in the viewfinder and take a clearer picture.
- **Sensor Pixels**: A pixel is the smallest picture element that software can use to create an image (the higher the number of pixels in the camera, the better the screen resolution and image quality).
- **Memory Size**: Measured in megabytes (MB), larger memory sizes allow users to store more images and take pictures of higher-resolution.
- **Zoom**: This is the magnification ratio, that is, the difference between the minimum and maximum focal lengths of the lens. A larger zoom ratio allows greater flexibility when taking pictures.

The model you are currently considering has the following specifications:

<table>
<thead>
<tr>
<th>Attribute Type</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>7.4-point Auto</td>
</tr>
<tr>
<td>Sensor Pixels</td>
<td>4.5 Million</td>
</tr>
<tr>
<td>Memory Size</td>
<td>64 MB</td>
</tr>
<tr>
<td>Zoom</td>
<td>3.0× Digital</td>
</tr>
</tbody>
</table>

[In addition, with this model you also have the option of buying accessories at extra cost. Specifically, the manufacturer provides a 32MB memory expansion and a 1.5× digital zoom enhancement, each sold separately.]

[In addition, with this model you also have the option of buying a stripped-down version of the product, which lowers the final price you pay. Specifically, the manufacturer separately provides the option for a reduction in memory size of 32MB and in digital zoom of 1.5×.]

Please answer the following questions regarding the digital camera described in the table:

1. I think this digital camera should be of … (1 = very low quality, 8 = very high quality)
2. The probability that I like this digital camera is … (1 = very low, 8 = very high)
3. This digital camera seems perfect for my needs. (1 = strongly disagree, 8 = strongly agree)
4. What is the MAXIMUM price you would be willing to pay to buy this digital camera?
5. What memory size (in MB) would you consider to be appropriate for a digital camera?
6. What zoom magnification ratio would you consider to be appropriate for a digital camera?
7. Imagine that, given the information above, you were asked to rate the quality of this digital camera. How confident would you be of your answer? (1 = not at all confident, 8 = very confident)
REFERENCES


<table>
<thead>
<tr>
<th>Product options</th>
<th>Planned contrasts</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Horizontal add-ons</td>
<td>Vertical add-ons</td>
<td>$M_{\text{horizontal}} - M_{\text{none}}$</td>
</tr>
<tr>
<td><strong>Digital camera scenario</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall evaluation (1-8)</td>
<td>5.56</td>
<td>6.33</td>
<td>4.74</td>
</tr>
<tr>
<td>WTP ($)</td>
<td>246.84</td>
<td>267.34</td>
<td>175.73</td>
</tr>
<tr>
<td>Reference levels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory size (Mb)</td>
<td>57.49</td>
<td>61.77</td>
<td>78.38</td>
</tr>
<tr>
<td>Zoom (×)</td>
<td>3.00</td>
<td>2.60</td>
<td>3.67</td>
</tr>
<tr>
<td><strong>Laptop computer scenario</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall evaluation (1-8)</td>
<td>5.15</td>
<td>5.73</td>
<td>4.53</td>
</tr>
<tr>
<td>WTP ($)</td>
<td>925.42</td>
<td>1,128.54</td>
<td>730.53</td>
</tr>
<tr>
<td>Reference levels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processor speed (GHz)</td>
<td>1.37</td>
<td>1.26</td>
<td>1.59</td>
</tr>
<tr>
<td>Hard drive size (Gb)</td>
<td>26.61</td>
<td>28.55</td>
<td>37.79</td>
</tr>
</tbody>
</table>

**TABLE 1**

STUDY 3: SELECTED RESULTS AND STATISTICAL TESTS
FIGURE 1

STUDY 1: EVALUATION OF BASE PRODUCT AND WTP.
FIGURE 2

STUDY 2: EVALUATIONS OF BASE PRODUCT AND WTP.
FIGURE 3

STUDY 2: EVALUATION OF BASE PRODUCT.

The bar chart illustrates the perceived fit of base product options with or without add-ons. The options include:

- "LOW QLY" Add-ons
- "HIGH QLY" Add-ons
- None
- "LOW QLY" Add-ons
- "HIGH QLY" Add-ons

The y-axis represents the base product evaluation score, ranging from 4 to 7, while the x-axis lists the product options.

There are two bars for each option, indicating perceived fit and no perceived fit.

The chart shows that options with "HIGH QLY" add-ons generally receive higher evaluations compared to those with "LOW QLY" add-ons and the option with no add-ons.