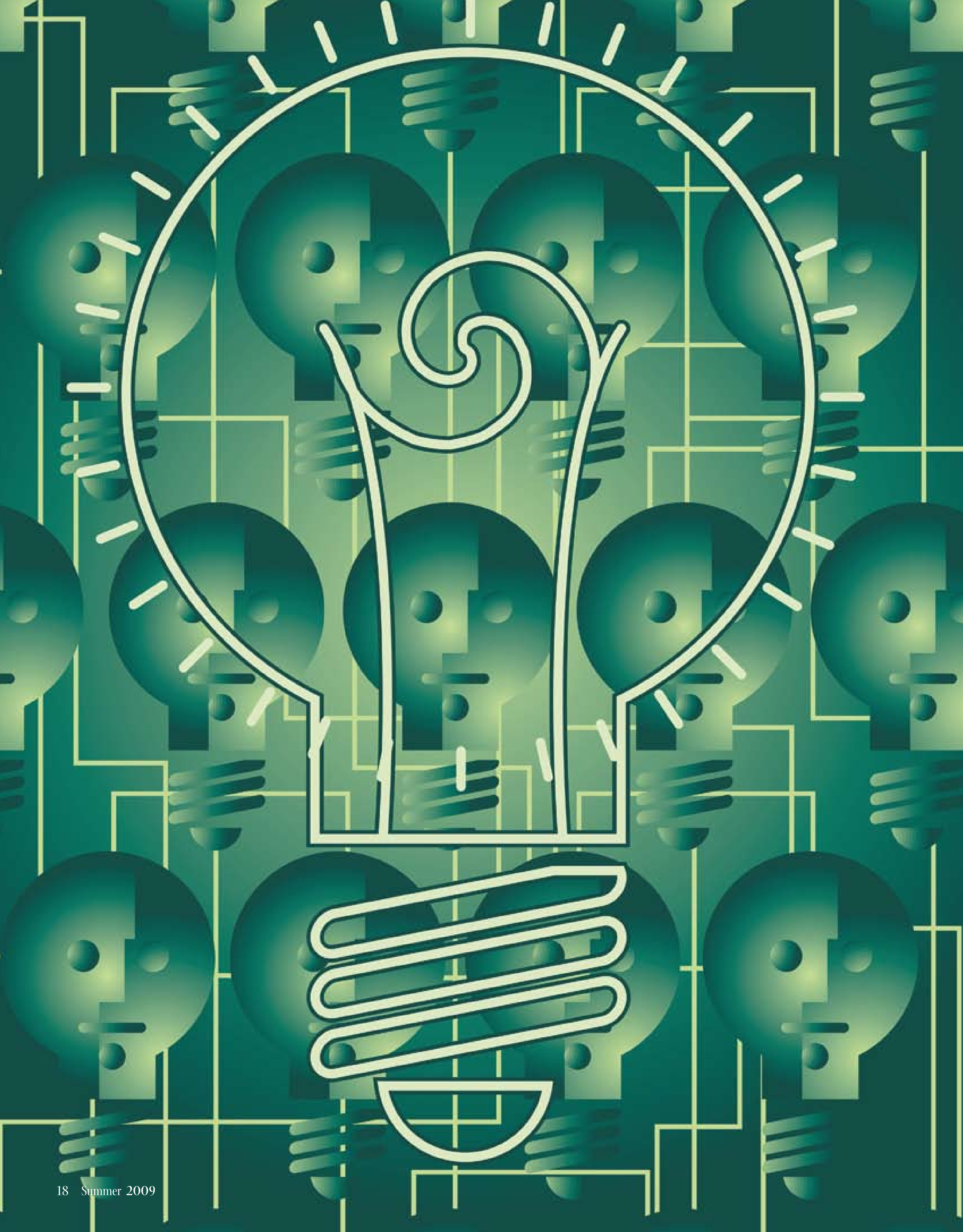


Qualitative product feature optimization gives consumers what they want.

Building a Better Mousetrap

BY JERRY COLE

Qualitative and quantitative methods are typically presented as distinct approaches to gaining insights about consumer preferences. In practice, however, this distinction can blur. Careful survey practitioners pretest their questionnaires using qualitative techniques; open-ended probes have been a standard feature of large-sample surveys since their earliest days. For more than 20 years, large group qualitative studies in education, advertising, political consulting and media studies have incorporated perception analyzers. These are hand-held devices for dialing up (or down) perceived levels of engagement with a presentation, a test ad, a closing argument or a political debate.

Content analysis software can be used to break down and map the use of words and phrases in a qualitative discussion; multidimensional scaling and correspondence analysis have been used to map and to summarize the relationships between concepts and expressed preferences across a series of group or individual interviews. Increasingly, the results of quantitative segmentation studies are being used to generate scoring algorithms for recruiting participants for qualitative research.

For the study described here, a quantitative method—adaptive conjoint analysis—inspired the development of a qualitative approach to product feature optimization: *q*-PFO. The method was developed in 1999 to identify an optimal feature set for a new line of digital cameras.

A Rapidly Evolving Market

Viewed as a curiosity in the early 1990s, digital cameras rapidly gained in popularity as ease of use and image quality improved. During the late 1990s, the technical evolution was so rapid that new models were judged effectively obsolete within a year of their introduction. Two years after helping to create the home digital imaging category, the sponsor of this project was in need of a third generation of digital cameras—a clean-slate design offering a new set of technical specifications.

The customer base for digital cameras was evolving along with the rapid technical advancements. Quantitative research indicated that the swelling wave of prospective new buyers was less "tech savvy" than the early adopters and much less willing to pay a premium to enter the category. These digital camera intenders favored a comparatively simple, point-and-shoot style device that would be competitive on technical specs but priced at or below the $300 price point where demand was estimated to peak at that time.

Thus, the research team supporting new product development was confronting both a new target audience and three design-specific challenges. First was identifying which of the many emerging new features were most likely to drive purchase interest for members of the rapidly expanding pool of digital photography converts. Second, within that set of key features, they needed to estimate which specific options or levels would be most appealing. Finally, they had to determine which features, or feature levels, these new converts would be willing to trade-off when choosing between products priced at approximately $300.

At this point, most product development veterans probably would turn to conjoint analysis as the method of choice. Since its introduction to the marketing community in the early 1970s, conjoint analysis has evolved from a single approach, based on pair-wise comparisons of specific product attributes to a suite of approaches that emulate a broad range of con-

Executive Summary

Qualitative product feature optimization (*q*-PFO) uses a structured interview protocol resembling the build-your-own method for ordering high-tech consumer products online. The method was developed in 1999 to identify an optimal feature set for a new line of digital cameras. Though qualitative in nature, the procedure incorporates feature level choices, cost calculations and feature level trade-offs associated with adaptive conjoint analysis. Using this approach, target customers specify an optimally configured product conforming to a preset price ceiling.

sumer choice and decision-making strategies. The enormous appeal of conjoint analysis stems, in large part, from its ability to propose, and subsequently model, consumers' willingness to trade-off alternative sets of product features.

Initially, we focused on a specific form of conjoint analysis, adaptive conjoint analysis (ACA), for two reasons. First, the technique can treat up to 30 attributes (i.e., product features), and our initial list of potential features approached that number. Second, ACA's computer-assisted interview process adapts in response to respondents' answers, factoring in prior preferences as new options are formulated. This process generates choice alternatives that are maximally relevant to the respondent, enhancing respondent involvement in the task.

Shortly after our project was approved, reality began to intervene. The list of potential product features continued to evolve. Even within the set of fixed features, technical specifications shifted as project engineers dug deeper into potential costs and manufacturing capabilities. As the scope of technical options expanded, the time available for consumer research began to evaporate. Once the full product development timeline was compiled, only four weeks remained to research consumer preferences.

In the face of time constraints like these, two options are often considered: a qualitative concept assessment and/or a small sample attribute (feature) rating study. Unfortunately, neither approach unambiguously addresses preference orderings or trade-off scenarios. Our response was to develop a qualitative method, *q*-PFO, which would emulate several of ACA's most appealing characteristics: a self-adapting interview process, the ability to treat a substantial number of features and a focus on a trade-off process. To the research participant, *q*-PFO resembles the online ordering processes then being introduced by the major consumer technology companies: The core metaphor is "build your own product." Similar to online ordering, optional features are not free. Each one has an incremental cost that must be added to a fixed base price. Both to ground the process and to constrain choices, a price ceiling eventually was imposed on the final design.

The Research Design

The participants recruited for the initial *q*-PFO study reflected the profile of prospective first-time digital camera buyers that had emerged from recent quantitative research. The critical variable of interest was a commitment to purchase a new digital camera at a specific price point within the coming 12 months coupled with a demonstrated effort to become informed about this rapidly evolving category. Following a brief pretest on the West Coast, the fieldwork consisted of 20 in-depth 60-minute interviews conducted in two major metro areas: 17 with individuals and three with couples who intended to make a joint purchase decision. (Each of the three couples included in the final series of interviews was treated as a single data point.)

The product design team drew from a variety of sources to compile the list of features and feature levels to be reviewed. The final list evolved through a series of internal client reviews coupled with feedback from our pretest.

The *q*-PFO discussion guide consists of four primary tasks: a warm-up discussion followed by a three-phase product design process. During the warm-up process for the initial study, participants were encouraged to physically examine and discuss a selection of digital cameras then on the market. One of the sponsor's current models was included in this review, but it was never identified as such nor was it singled out for special treatment. Our focus during this task, as throughout the subsequent *q*-PFO process, was to gauge the appeal of specific product features independent of brand halos.

Build Your Own

Following the camera review we explained that the project's sponsor (who remained anonymous) was in the process of designing a new digital camera and wanted to enlist their help. We then introduced the concept of a base camera and provided the participants with the corresponding spec sheet. We emphasized that the base camera, while relatively inexpensive, was not fully functional: Additional features, each associated with an incremental cost, would need to be selected.

The additional features were presented in individual booklets. The cover page summarizes the feature; subsequent pages present the operational benefit and incremental cost associated with each specific feature level. (See Exhibit 2 on page 23).

q-PFO is a structured interview process that intentionally elicits a combination of creative and analytic thinking. The first step is the rank ordering of the feature booklets. By sorting the feature booklets, participants reveal the relative importance of individual product features based on their reading of the cover page description.

Second is the construction of the participant's ideal product. Moving from most to least important, participants review each of the feature booklets and build their ideal product by selecting individual feature levels. The selected feature level and its incremental cost are noted, but no price ceiling is imposed.

The final stage is the specification of a price-constrained product. The total price for the design developed during the second phase almost always exceeds the unstated ceiling price. During the third stage participants are asked to re-examine their choices and make the trade-offs necessary to specify a product design that conforms to the price ceiling.

This three-phase process evolved from a series of small experiments we conducted during the pretest as well as some fine-tuning during the initial in-field interviews. The preference sort of feature booklets emulates ACA by establishing a self-directed interview process: Participants determine their own priorities and the interview protocol adjusts automatically. The initial step in this self-adapting process not only engages the participant, it also provides an overview of the building blocks to be used in the next two phases.

Phases two and three intentionally juxtapose the creativity of a play-like activity with the limiting constraint of a forced-choice task. Participants have free reign to exercise both their preferences and their imagination during phase two with the specification of their ideal product. During the final phase, however, they are required to reconsider their preferences and choose among—or trade off—feature levels to reach a price-constrained design.

Determining Feature Importance

The first of our three tasks proved to be remarkably easy. Within a matter of minutes after being handed the stack of nine feature booklets, all of the participants had reviewed and sorted them from most to least important and had moved on to the second task. The resulting sort orders were highly consistent, especially for the most and least important features. As indicated in Exhibit 1, there was near unanimous agreement that “picture sharpness” was the most important feature to these consumers when considering a new digital camera. The type of lens and the characteristics of the exposure system were ranked second and third, respectively.

This simple sorting task allowed us to address our first principal research objective: to identify which of the many potential features most likely would have the greatest impact on purchase interest for this evolving target group. For members of this expanding pool of digital photography converts, features affecting image quality were much more important than the hot topics of the day, like sound capture or a TV-out port.

Designing the “Ideal”

Once participants had sorted the feature booklets from most to least important, they were instructed to review each booklet in sequence, read over the feature level descriptions and then choose the level they found most appealing—in view of its incremental cost. The selected feature level was noted on a check sheet, and the associated cost was captured with a specially prepared spreadsheet. A running tally of the total cost was always available for review.

Once all feature level choices had been made, the participants were encouraged to review their new camera and present it to the moderator, identifying its most compelling features or its potential weaknesses. Finally they were asked how likely they would be to purchase the camera they had designed if it were available at the calculated price (Exhibit 3).

The stated purchase intent for the ideal camera was strong, even though the median cost of this design was $375—well in excess of our targeted ceiling price. Behind the enthusiasm for this design was the belief that the camera would deliver excellent picture quality while offering a few extras—such as rechargeable batteries or a short picture-to-picture delay—to enhance purchase interest. Consequently, most participants were surprised when told they would have to reconsider their initial design and come back with one that added up to approximately $300.

Trade-Offs

The modal selections for the cost-constrained design are presented in Exhibit 4. Though not reported here for space reasons, zero-cost options were available for all of the top-ranked features: They were not selected for the cost-constrained design. The few participants who initially had selected the super zoom option switched to the standard zoom to achieve a savings of $40—but a zoom option was retained over the free fixed-focal-length lens for the modal design. Several participants pulled back on picture sharpness or the enhanced exposure system, but the majority avoided making trade-offs they felt would adversely affect picture quality.

The greatest impacts on total cost were shifts within the lower-ranked features. For example, rechargeable batteries were dropped in favor of free standard AA batteries. When probed on the guiding logic behind these trade-off choices, most stated that they were working to preserve excellent image quality while attempting to reach the new price limit.

Note that, throughout this exercise, the participants were being asked to imagine—or visualize—a product that doesn’t really exist at a price that fluctuates with the choices being made. Though this is a qualitative exercise, we feel that it directly parallels the task that participants in most conjoint measurement studies are asked to undertake.

Exhibit 1 Ranking digital camera features

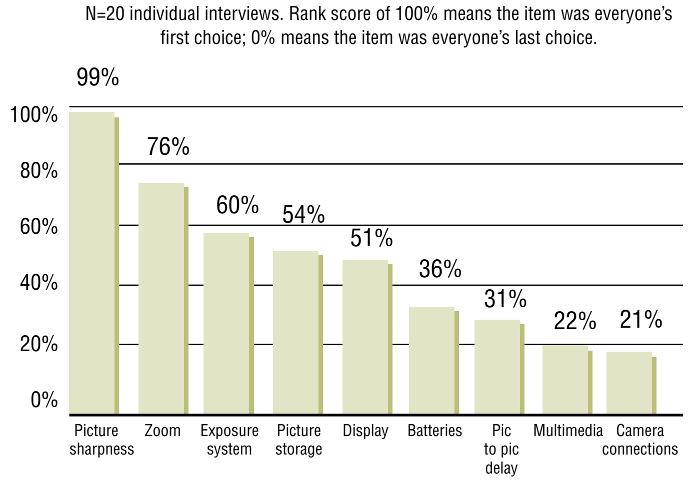
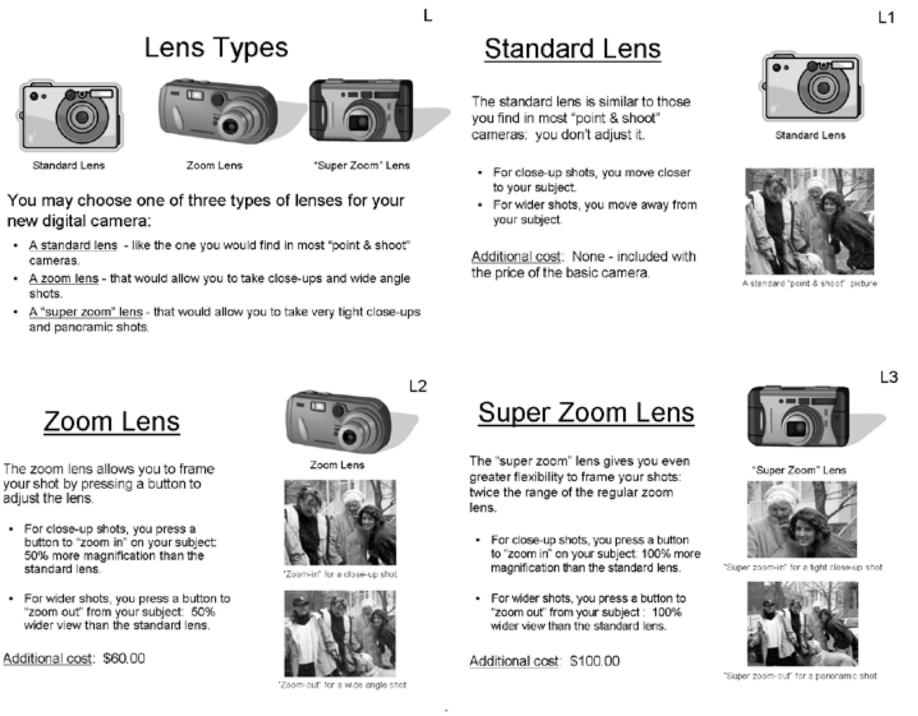


Exhibit 2 Example of feature booklet



The camera design outlined in Exhibit 4 costs $320; the median cost for designs generated by all 20 interviews was $303. Stated purchase intent for the $300 camera remained positive, but slightly less so than for the initial, unconstrained design. When asked about the softening in purchase interest, participants remarked that they had been forced to give up their extras to retain the promise of excellent image quality.

Evaluating the Process

As indicated earlier, the primary motivation for developing the *q*-PFO method was necessity (i.e., an extremely tight timeline for new product development). That being said, it's reasonable to ask how well the *q*-PFO performed as a substitute for ACA. Based on our experience, we feel that *q*-PFO has several relative strengths.

Relatively quick turnaround time. Speed of execution was the initial motivation for developing this technique, and it remains a key comparative strength when considering the quantitative alternatives. For the initial camera design study, the entire consumer research phase, including the development of the stimulus materials and the pretest, was completed within the allotted four weeks. Furthermore, the members of the design team, several of whom observed the interviews, felt so confident with the results that they completed their technical design specs ahead of schedule.

Strong participant involvement in the process. With appropriately designed stimulus materials, the participants in a *q*-PFO structured interview remain fully engaged in the multistep process of balancing their preferences against costs. The obvious benefit to the sponsor is a product design with inherent consumer appeal.

Serendipitous learning. This is a generic benefit, but an important one, for most types of qualitative research. For example, without access to the "think aloud" qualitative commentary that accompanies the choice process, we would not have understood the vanishing interest in the TV-out port in this study; the inability to manipulate a feature in a subsequent study; or the negative reaction to a photo enhancement feature in a third.

Personal involvement by the design team. The members of the design team not only help with the development of the stimulus materials, they also can see and hear consumers discuss the feature options and their resulting choices: This contextual immersion is extremely valuable.

Immediately actionable results. By the close of the last interview, the product development team came to understand the target consumers' preferences among potential product features and their willingness to consider trade-offs.

When a formal conjoint analysis is infeasible, we feel that *q*-PFO yields substantially better insights than a qualitative concept assessment or a small sample attribute rating study, two of the more frequently used fallback options.

The ultimate goal for any project of this type is to anticipate the feature set of a successful new product. As measured by the client's internal tracking procedures, sales figures for the resulting line of cameras substantially exceeded product planning objectives. These cameras ranked among the category's top-10 sellers during the next holiday season.

The *q*-PFO interview protocol has been employed in a variety of product development projects following the initial camera design study. Some of these efforts have been more successful than others, allowing us to develop a checklist of things to do and things to avoid.

***q*-PFO works best at the earliest stages of a design effort.** The *q*-PFO method yields the greatest returns during the earliest phases of product design when virtually all of the product's potential features are up for consideration. At this initial stage, the target consumer is being invited to engage in a truly creative process with the potential for meaningful personal involvement and reward. If the feature level choices are marginal or are simply incremental, less complex research methods are available.

The research design must incorporate all of the key product features. Success depends on allowing potential consumers to manipulate all of the features that significantly affect

Exhibit 3 Initial design results

Feature	Level selected	Number choosing	Cost
Picture sharpness	Extra sharp	17	$ 50
Exposure system	Enhanced for bright/dim light	17	$ 30
Lens type	Standard zoom	10	$ 60
Picture storage	Removable memory cards	17	$ 40
Image display	Small LCD	13	$ 55
Power source	Rechargeable batteries	10	$ 35
Picture-to-picture delay	2-5 second delay (Level 2)	8	$ 20
Multimedia	Still pictures only	12	$ –
Camera connections	Memory card reader	14	$ 15
Base camera cost			$ 70
Total cost for modal camera			**$375**
Summary of camera cost information for 20 interviews:		Median	$375
		Minimum	$225
		Maximum	$445

their choice process. For example, if product choice is driven in part by product size and shape, but the stimulus materials do not include models of differing sizes and shapes, then the *q*-PFO interview protocol will fail to capture the importance of this driver. Also, even if some feature alternatives may not be immediately implementable, inclusion of potential features based on evolving technologies will help to better calibrate the appeal of the available options while also providing direction for future development.

A pretest is strongly recommended. In the current climate of "I need it yesterday," coupled with severe budget limitations, there are powerful temptations to pull the stimulus materials together as quickly as possible and go directly into the field. These temptations should be resisted. The investment in the pretest is usually marginal with respect to the total project cost, but rewards in terms of communication clarity are enormous. Deletion of this step carries project integrity risks.

Appropriate, well-tested stimulus materials are essential to success. This assertion follows directly from the previous recommendation. The design team must be able to provide clear examples of the consequences that will flow from changes in feature levels in order for the target consumer to accurately weigh the functional benefit against the incremental cost. Text descriptions of technical specifications or performance capabilities are generally inadequate when trying to communicate a functional benefit, especially when the impacts of level changes are visual, aural or tactile. Realistic illustrations—including color pictures, video clips and model demonstrations—are strongly recommended.

Prices should be reasonable and realistic. The incremental prices associated with changes in various feature levels all should be reasonably scaled with respect to each other and with respect to the total price of the end product. For example, in one study we conducted, nearly everyone selected a feature that added approximately $5 to a product with a ceiling price of approximately $250. On probing, we discovered that this price differential was so small relative to most of the other choices that the feature was viewed as a "freebie."

At the other extreme, not one participant in the camera design project opted for the $100 super zoom once the $300 price ceiling was introduced. The super zoom was the most expensive option and represented fully one-third of the total allowable product price. Even though this feature level was described as highly appealing, its price—relative to other choices being made—was viewed as wildly out of context. It is extremely difficult to determine the relative importance of feature levels whose incremental costs are in effect outliers.

***q*-PFO does not capture the value of good industrial design.** If the design team is looking for a rough measure of consumer interest in (and willingness to pay for) broadly sketched design options—and has alternative models that adequately represent these options—then q-PFO is a candidate methodology. If, however, the aesthetic qualities of the product are intended to provide a significant portion of the total consumer appeal, *q*-PFO would not be the method of choice; there are other techniques that address this issue.

Small samples are generally adequate. As with any qualitative process, the objective is to continue interviewing until one reaches a point of consistent response. For the projects we have conducted, approximately 20 to 24 individual interviews per target segment have proven sufficient with the last four to six interviews providing assurance that convergence on key issues has been achieved. ●

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Exhibit 4 Cost-constrained design

Feature	Level selected	Number choosing	Cost
Picture sharpness	***Extra sharp***	***12*** ↘	$ 50
Exposure system	Enhanced for bright/dim light	14	$ 30
Lens type	***Standard zoom***	***14*** ↗	$ 60
Picture storage	Removable memory cards	17	$ 40
Image display	Small LCD	13	$ 55
Power source	***Standard AA batteries***	***13*** ↗	$ –
Picture-to-picture delay	***6-8 second delay (Level 1)***	***11*** ↗	$ –
Multimedia	***Still pictures only***	***19*** ↗	$ –
Camera connections	Memory card reader	13	$ 15
Base camera cost			$ 70
Total cost for modal camera			**$320**
Summary of camera cost information for 20 interviews:		Median	$303
		Minimum	$225
		Maximum	$360