FEATURE ARTICLE

Targeted Consumer Involvement

An Integral Part of Successful New Product Development

The use of targeted focus groups early in the design process allows developers to refine a new product with direct input from its targeted users.

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OVERVIEW: The use of targeted focus groups early in the design process allows new-product developers to refine specific design functions and features for a new product with direct input from the product's targeted users. Down range in the product development process, these same end users are reconvened to review functional prototypes of the product prior to its initial production run. An effective approach to new product development or product refinement allows consumers to provide the "what"—consumer wants, needs, and expectations for the new product—while product designers provide the "how," defining how the product will fill those wants and needs. This process has been employed successfully in conjunction with a university-based partner organization, with the data obtained from the targeted focus groups resulting in the successful development and transfer of new technologies into the marketplace. This paper presents a case study demonstrating how a small technology company employed the process to develop a product that was well received by its target market.

KEYWORDS: Participatory development, Focus groups, Purposive sampling

In the past, manufacturers of consumer products made product design decisions without fully factoring in the needs, wants, and expectations of the complete range of end consumers. This process leads to products that do not perform in the marketplace, new product failures, and product abandonment. Failure rates for new product introductions vary by industry, ranging from 30 percent to 90 percent (Peter 2002). In many cases, the primary cause of these failures can be traced to a point early in the design process where significant consumer or user information was not collected or analyzed prior to the initial fabrication of the device, leading to incorrect assumptions about user needs that resulted in misguided decisions regarding product design and direction (Lewis et al. 2010).

In some cases companies perform primary market research regarding a product's initial concept in the form of surveys or interviews with consumers (Blaszzyk 2000; Morgan 1997), neglecting critical steps at which consumers can add significant value to the product development process. Once this primary market research is accomplished and a prototype device fabricated, companies often do not go back to initial survey participants for input to critique or refine the device. Often, product development specialists feel that consumers have limited insight into the idea generation process. However, as shown by Poetz and Schreier (2012), "ideas created by professionals score significantly lower in terms of novelty . . . are attributed significantly lower customer benefit, [and] score significantly lower than user ideas on the overall quality index" (251). Lilien et al. (2002) also found that new product concepts developed jointly by 3M personnel and selected lead users possessed a greater degree of innovativeness and a greater sales potential than product concepts developed by 3M using their traditional product development process.

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Involving consumers in the early stages of product development can help companies identify the key design and functional features of a product from the consumer's perspective. However, as Poetz and Schreier (2012) demonstrate, "attracting the right people" is crucial in developing the type of detailed and insightful input needed by product designers (254). Having access to consumers and being able to generate quality information is essential to developing a viable partnership. It is also important that both parties to the partnership—consumers and product designers—understand the parameters of the collaboration. Consumers provide input on functions and features that will ensure a product's success in the marketplace, while product designers provide expertise in design and manufacturing.

Participatory development (PD) provides a framework for managing this crucial collaboration. PD is a logical extension of the well-established principles of participatory action research (PAR), a methodology that enables researchers to include community members and community input in research that will affect the community (Baum, MacDougall, and Smith 2006). PD takes the inclusive principles of PAR and applies them to the entire product development process, from primary market research to refinement of the alpha and beta prototypes. With PD, consumers in targeted focus groups outline the design and functional features for a new product or for the next generation of an existing product, leaving the actual design to the company. In effect, they are performing a type of "consumer engineering," a term coined in the early 1930s by Earnest Calkins, cofounder of the first modern advertising agency (Sudjic 2009, 16). Using PD, consumers can be viewed as a resource rather than a threat to the corporate design team, which retains the latitude to design a product that fits the manufacturing capabilities of the company. Consumers provide the "what" of functional requirements, while product designers and engineers provide the "how" of implementing those requirements.

Approaches to Consumer Involvement

PD can be used in a variety of areas, from policy development to school reaccreditation programs. In policy development, PD gives those most likely to be affected by a policy a say in its formulation; in an academic setting, PD can involve students in a school's reaccreditation program. In all contexts, PD involves stakeholders in all stages of development from the initiation of a project to its completion. It requires a systematic approach to identifying participants and defining their role in the development process. In new product development, the PD process begins with identification of an unmet market need; focus group participants provide insight into that need. Participants are carefully recruited and screened before focus groups convene, and they are incorporated into the entire product development process up to production.

To facilitate the adoption of the generalized concept of PD for product innovation, KT4TT developed the Need to Knowledge (NtK) new product development model (Center on Knowledge Translation for Technology Transfer 2009).

In new product development, focus group participants provide insight into an unmet market need.

This model is a guide to innovation for technology-based commercial devices focused specifically on the importance of customer wants and needs. This process has been used repeatedly by corporate partners such as Applica, White Rodgers, Kodak, and Tupperware, among others. For example, Applica used the process in developing the Black & Decker Lids Off Jar opener, which sold over 1 million units in the first year of its release.

In contrast to other approaches that include users—for instance, Quirky's[1] and Audi's community-based product development processes—the KT4TT method relies on purposive sampling, in which users with a particular profile are specifically sought to ensure participants' familiarity with and knowledge of the product or product concept field. Targeting potential participants with a baseline level of knowledge streamlines the process, as it eliminates some of the less useful inputs that may emerge from a more random sampling method and allows focus group discussion to remain more targeted to the essential questions. In addition, through the use of this form of PD, the company has already identified and verified an unmet market need for a product or a refinement of an existing product and has committed to producing the product. In Quirky's process, someone from the community submits an idea and influencers and other community members refine it before Quirky decides whether it will produce the product.

Audi AG developed its Infotainment systems using a different community-based product development process, described by Füller et al. (2006). Audi randomly recruited car bloggers and subscribers to its "Product and Technology" newsletter section, as well as potential car buyers who visited the company's website. In contrast to purposive sampling techniques, Audi's process did not screen participants based on their particular knowledge of the product field. As part of the idea generation and concept stages, these participants were asked for their opinions on infotainment visions. In the design and engineering stages, participants configured their individually desired concepts as virtual prototypes and then evaluated systems Audi proposed in response.

In the KT4TT PD model, the company uses the functions and features identified by participants to fabricate prototypes.

[1] Quirky (www.quirky.com) is a social product-development website that allows community members to submit, edit, and revise ideas for products. If the product is deemed likely to be successful by Quirky's staff, Quirky will manufacture and sell the product. To learn more about Quirky's development process, visit www.quirky.com.

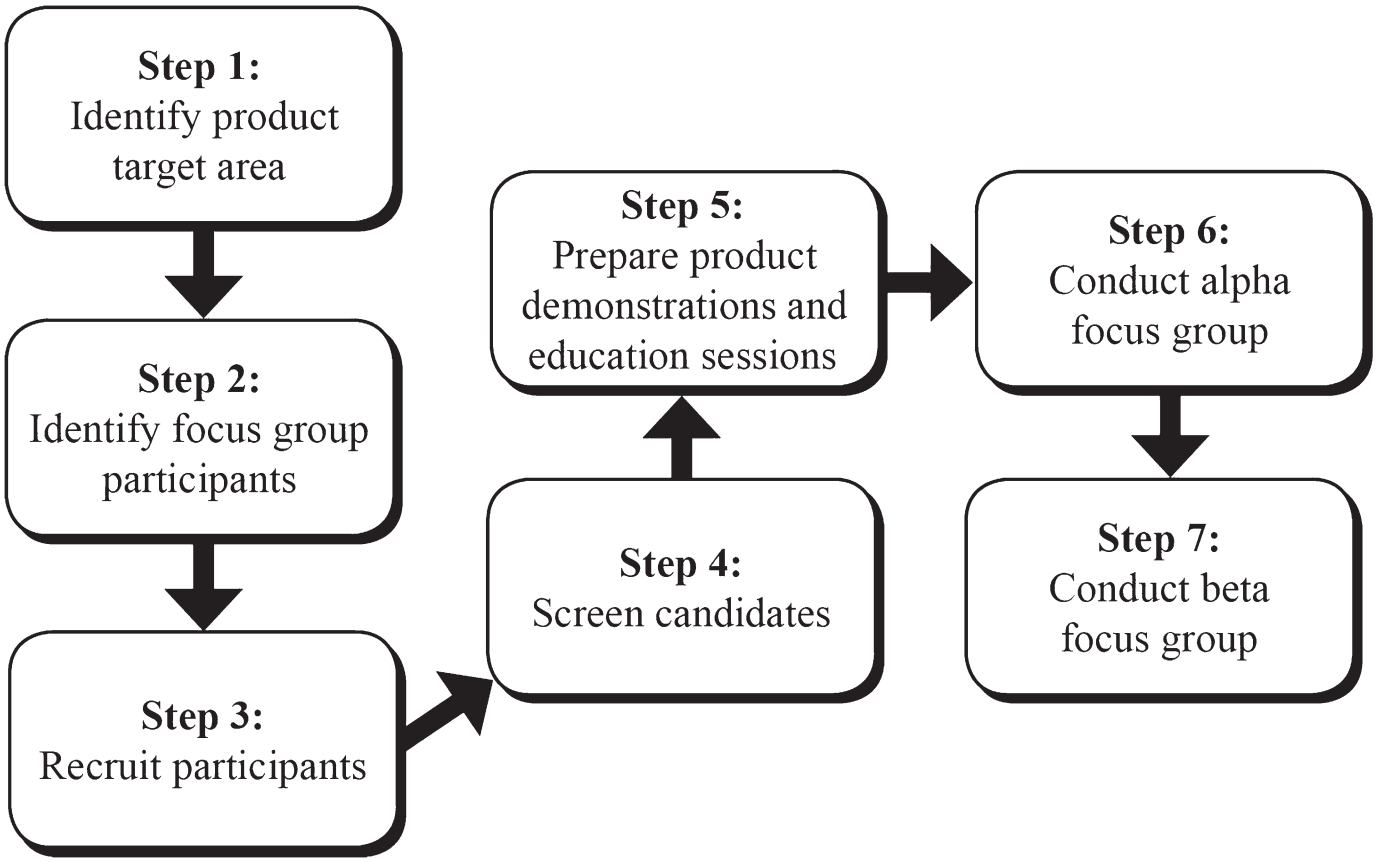

FIGURE 1. The participatory development process for new product development

These prototypes are evaluated and critiqued by the participants to verify that their needs are addressed by the prototype and to identify what might still be lacking in the prototype that could cause it to fail in the marketplace. As in the Audi case, participants are not simply evaluating proposed systems from Audi's internal experts. Unlike in the Audi case, participants remain involved through to the end of the development process, including evaluation and critique of final preproduction prototypes.

The Participatory Development Methodology

The Need to Knowledge (NtK) model is a guide to innovation for technology-based commercial devices and services. The model combines principles from the Product Development and Management Association's handbook (Kahn, Castellion, and Griffin 2005) and toolbooks (Belliveau, Griffin, and Somermeyer 2002; Belliveau, Griffin, and Somermeyer 2004; Griffin and Somermeyer 2007) for new product development with Ian Graham's knowledge-to-action concepts for knowledge translation (Graham et al. 2006). It demonstrates the activities involved in moving from conceptual discoveries to prototype inventions and out to commercially available innovations. The NtK model's most unique feature is the integration of a formal research process into the NPD stages, which enables academic researchers to see how their applied research fits into the bigger NPD picture. The model is substantiated with findings from academic and practice literature, which are stored in KT4TT's knowledge base.[2] In this work, we focus on the process for developing new product ideas in collaboration with qualified users (Figure 1).

Step 1: Identify product target area. Having identified an unmet need in the marketplace, the organization must perform an in depth "scoping review" that includes a preliminary market assessment as well as technical and business assessments of the potential product (Center on Knowledge Translation for Technology Transfer 2009). The scoping review should be comprehensive; when looking for competing products or technologies, the company must not only scan the current marketplace but also review the history of that marketplace to identify products that have failed in the past. (From time to time, someone will reinvent a product for a small, niche market need that had already failed due to insufficient demand.)

Step 2: Identify focus group participants through purposive sampling. Focus group participants should be identified using purposive sampling. Purposive sampling is a process for identifying a defined group of consumers rather than a random selection of the general population (Robinson 1998; Stewart, Shamdasani, and Rook 2007). For example, if

[2] A thorough description of the NtK model and supporting evidence for its validity, such as case studies, can be freely accessed through the KT4TT knowledge base website at http://kt4tt.buffalo.edu/knowledgebase/model.php.

the product being developed is a new Android tablet with a dynamic touchscreen, the company might seek to recruit advanced tablet and smartphone users who have experience with tactile feedback. Consumers targeted for recruitment should truly understand the technology area and be able to offer useful and insightful ideas and feedback on the new product. If the project is an improvement to an existing product, purposive sampling allows recruitment of participants who already own the existing product along with consumers in the target market demographic who do not own the current product.

Step 3: Recruit participants. General media outlets (newspaper, television or radio ads, targeted placement of recruitment flyers) should be used to recruit potential focus group participants. Here, the recruiting organization casts a narrow but focused net into a large pool of potential participants. Although the demographics of the ideal focus group participants have been decided upon, it is necessary to recruit participants from a variety of areas and groups to ensure full representation of the target audience.

Step 4: Screen candidates. Potential focus group participants are subjected to rigorous primary and secondary screens to ensure participants have an in-depth knowledge of the product areas. In addition, potential participants should fit the target population to which the product will be marketed. For the new Android tablet, for instance, a company may be targeting users who are 20–40 years old and individuals with vision impairment who use tactile interfaces. Primary screening questions could include items asking about current ownership and use of a tablet or smartphone, age, sex, and family income levels. Secondary screening questions might ask whether the candidate uses tactile interfaces, is an avid gamer, or considers him- or herself an early adopter (Stewart, Shamdasani, and Rook 2007). Here the organization can pinpoint consumers who have a deep interest in the type of product being addressed. These consumers will have considerable knowledge about the product category and about the functions and features products in that category currently possess.

Step 5: Prepare demonstrations of existing products and education sessions. If the group is working on an entirely new product, this step may be skipped. However, if the project is a product refinement, demonstrations of current state-of-the-art products and presentation of other educational materials can help ensure that all members share a baseline awareness of the field. Facilitators may also want to prepare a listing of the features currently available in the marketplace and discuss them with participants prior to the focus group discussions. Participants can then expand upon that information when considering future enhancements or added features they would like to see in a new or upgraded product.

Step 6: Conduct alpha focus groups. Alpha focus groups are early-stage sessions that involve consumers in defining product requirements and setting priorities for product design (Flagg, Bauer, and Stone 2009), providing companies with primary market research. These may also be called concept definition focus groups. These groups use targeted mixed samples, involving people with different ability and knowledge levels, instead of uniform samples, so that all participants are exposed to various relevant perspectives (Ozer 1999). For example, in a project for Kodak, we recruited both avid amateur digital photographers and professionals; these two types of users both were very familiar with the technology—fulfilling the criteria of our purposive sampling technique—but had very different perspectives and needs. This allows participants with different needs and experience levels to interact with each other and elaborate on each other's responses to the moderator's questions. Minimum standards for validity and reliability require at least 50 participants in several groups comprised of mixed samples (Krueger and Casey 2000, 2). From extensive work in the consumer product industry, KT4TT has found that four or five alpha focus groups, each consisting of 12 to 15 participants, are sufficient to identify product requirements.

Focus-group members are asked to participate in an open forum discussion led by an experienced moderator. The four primary topics of discussion include:

1. The current status of the technology area from the participants' perspective. How do consumers currently address the need being discussed? How satisfied are they with the current solutions available?
2. A description of the ideal product to perform that function. How would they like to address the need? What are the attributes and functions of the ideal solution?
3. An evaluation of static product concept designs or models. How well do conceptual designs address the need?
4. Participants' purchase intent and price point for the ideal product and for concept models. How likely are participants to purchase either the ideal product or the concepts? How much are they willing to pay?

The NtK Primary Market Research Training Module (Flagg, Bauer, and Stone 2009) offers guidelines for formulating questions and provides a generic question set from which questions may be drawn. Specifically, questions should focus on user characteristics, ease of learning and operation, acceptance, and market factors such as competing products, price points, and distribution.

Once the group sessions are finished, the data is analyzed to derive a list of specific product design and functional features. The company can then work to incorporate these features into a beta prototype.

Step 7: Conduct beta focus groups. Beta focus groups help refine a product's appearance and final features by critiquing the key design features of a functional prototype.

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Beta group participants are drawn from a representative sampling of alpha group participants; two beta groups of twelve participants each are usually sufficient.

By undertaking a number of ranking activities, beta groups allow a company to determine how well a prototype meets consumer expectations and gauge consumer interest in the product. Beta group participants rank the importance of the function and design features identified in previous groups, provide an evaluation of how well the prototype meets those requirements, rate their preferences with regard to specific design features and additional product models shown, and comment on their experience with the beta prototype.

Beta group activity is captured, analyzed, and relayed to product designers to guide product changes prior to the initial production run.

Case Study

The following case study provides an example of a company using internal expertise to identify an unmet need in the marketplace and developing a product to address that need, all without systematic, informed end-user input into the new product development process. Following the initial prototype development, the company was introduced to the NtK PD process. Employing the process resulted in development of a different product at a significantly reduced retail price.

The company is an assistive technology research company that has received 20 federal and state grants, which they have used to challenge the status quo in assistive technology by blending new ideas with existing technologies to help people bridge the gap between their abilities and their goals. The company has conducted research and development in areas such as electronic ear technology to help people who are deaf identify critical sounds in their environment, way-finding technology to help people who are blind navigate indoors (where GPS is not available), and technology to help seniors safely age in place. The company's research-based approach, which involves individual users in each step of the development process, has proven to be its competitive advantage. The development team currently includes four full-time employees and seven outside consultants.

Phase 1

In 2007 the company received a Phase 1 Small Business Innovation Research (SBIR) grant from the National Institute on Disability and Rehabilitation Research (NIDRR) to develop a prototype for a standalone portable device capable of recognizing distinguishable sounds in the environment—such as emergency vehicle sirens or backing vehicle alerts—and communicating this information to the user via imagery, vibration, and text. The goal for this project was to establish the device's technical merit and feasibility and the efficacy of the required functional features. The project comprised three major tasks: requirements identification; prototype design, construction, and testing; and usability evaluation.

For the requirements analysis, the company conducted some activities to learn more about the strategies people with hearing aids use to detect and identify sounds at home or work. These activities included face-to-face meetings with potential consumers and phone interviews with audiologists, speech professionals, and potential distributors. The company conducted field interviews and a small focus group comprised of individuals who were hard of hearing or deaf and who identified adaptive strategies and preferences with regard to the interface. Focus group participants validated the strategies currently used by persons who are deaf and hard of hearing for receiving alerts about environmental sounds. The focus group participants also identified the features that an alerting device would need to have in order to be acceptable.

However, the data from these activities were not well integrated with the development process, as the engineers, marketers, and product designers at the company largely felt that they already possessed the experience and expertise to develop a new product for the deaf and hard of hearing population. Those beliefs were apparently confirmed by initial focus group findings, but the participants in those initial focus groups represented only a small, affluent subset of their target population. Once a literature review demonstrated that the company possessed a sufficient foundation of research knowledge to support the planned project, no additional time or resources were allocated to a research phase. At this juncture, the project moved directly into the development phase, during which the company developed initial system requirements, surveyed available techniques and approaches to real-time digital signal processing, identified Bluetooth as the best wireless communication approach, and selected Linux for prototyping the embedded environment.

The input from consumers combined with the technology survey permitted the company to identify both the desired benefits for the targeted end users and the system requirements that would deliver these benefits. From here, the company designed and built a working prototype of the device and performed a usability evaluation to ensure that the prototype achieved the expected benefits for targeted customers. Phase 1 of the project yielded a functional, tested prototype device. The company applied for and received a Phase 2 SBIR funding award for further development and testing of the device.

Phase 2

After the company completed the initial development of the device, it was awarded a Phase 2 SBIR grant for further development of the concept. As a matter of course, KT4TT contacts all new NIDDR Phase 2 grantees to offer free technical, marketing, and commercialization assistance. It was at this time that the company was introduced to the NtK model of product development, and the KT4TT team performed an initial scoping review that identified flaws in the company's Phase 1 work.

Although the company did engage with a few consumers in the early stages, that engagement was not systematic and key questions were not asked. The company did not utilize an extensive screening process for the focus group

participants, and as a result, the group did not represent a true cross section of the target market for the device. Key portions of the sample were skewed toward a higher income level and a younger user. Therefore, the price point information acquired from the focus group was not truly representative of the entire target market.

Compounding that distortion, questions about purchase intent at the price level identified were not asked. In addition, no questions were asked regarding the feasibility of carrying a standalone device for the sole purpose of identifying and warning users of sounds in the environment. The focus of the questions that were asked was too narrow and did not allow participants to provide innovative suggestions. The absence of detailed questions about purchase intent, price point, and usability, combined with the lack of opportunity for creative input from participants mean that the research process did not provide the company's product designers with all the relevant information they needed.

At this point, the KT4TT team introduced the company to the NtK model for PD. The initial scoping review using the NtK model showed that the device being developed should be combined with a device that consumers were already carrying, such as a cell phone, and that the purchase price for the technology would have to be under $100 for it to be viable in the marketplace. This model was at odds with one developed by the company, which suggested a standalone device that would have to sell at a retail price in excess of $500. An extensive current product search showed that there was not a device currently available capable of alerting a deaf or hard of hearing individual to sounds of environmental threats to their well-being. The scoping review also revealed that people with hearing impairments were more susceptible than others to collisions with sound-producing moving objects, such as trucks backing up.

After verifying the findings of the scoping review with an outside consulting firm, the company accepted the findings and moved to reconceptualize the product, identifying the Nokia N900 cell phone as an appropriate platform for an app to perform the same function as the originally proposed standalone device. Alpha focus groups with audiologists and consumers from the deaf and hard of hearing community were held in late 2009. These groups provided the company with detailed design functions and features, verification of price point and reliability needs, and aspects of the application that would influence purchase decisions. Building on this information, the company developed a unique approach to the problem that packaged a variety of methodologies and techniques in a portable "electronic ear" that works in concert with the user's mobile technology to convert sounds to pictures, captions, and vibration patterns.

The company then produced a device app and loaded it onto a Nokia N900 cell phone for beta focus group testing in 2010. Beta focus groups were held with a subset of participants from the initial alpha focus groups. The app was demonstrated to participants, who evaluated and critiqued it based on the functions and features identified in the alpha focus group discussions. The app was extremely well received by the beta group. The group's evaluation and critique of the app was passed onto the company's engineers for final product refinement. The app is currently available in beta format on the Android market, with full release scheduled for spring 2013.

Discussion

The case study illustrates the need for purposive sampling and targeted focus groups to correctly identify vital consumer-generated information. It also illustrates the need to involve consumers early on and throughout the product development process. Without purposive sampling and the involvement of educated consumers, the case company would have brought an unsuccessful product to market; indeed, the company's initial design effort failed because its focus group was not representative of the product's target audience and was not sufficiently familiar with the technology proposed. Educated consumer involvement ensures that the product being developed is useful, needed, and wanted by consumers at a price they are willing to pay. Consumer focus groups identify not only the end users of the device but also the buyers. For example, adult children of the elderly may be the purchasers of a product for use by their elderly parents. In that case, the company may adjust marketing strategy accordingly, with particular emphasis on gift-giving holidays if the product is purchased as a gift.

It is not sufficient to perform routine primary market research. A great deal of time and effort must be expended during the initial phase of consumer research to ensure that the right people are recruited and the right questions are asked. With both small and large companies, it is also imperative that the members of the product development team be aware of what is transpiring in industry, of what technologies are being developed into commercial products, and of regulatory perspectives. For example, in the assistive technology market, some companies are removing functions and features from existing products to allow the products to sell at prices that fit reduced third-party payer reimbursement scales. This feature reduction reduces the company's overall product cost and allows it to remain competitive in the marketplace.

Conclusion

Failure rates for new product introductions vary by industry but range from 30 percent to 90 percent (Peter 2002). In many instances, the main cause of these failures can be traced back to a point early in the product design process at which important consumer or device user information was

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not collected and analyzed prior to the initial design of the device. After a new product failure, many product developers realize that the consumer and marketing assessments they performed were cursory at best. Had they performed more rigorous and detailed consumer and marketing assessments, they might have identified missing features earlier in the product development process.

If it is rigorously executed, the NtK model can help conserve resources by minimizing product development failures. Integrating qualified lead consumers into the product development team early in the development process can lead to enduring success in the marketplace, as the resulting products respond directly to consumer needs. The NtK model and the PD process described in this paper relates strictly to new product development. In the very near future, the center will be expanding its work to include the service sector.

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