BEYOND DUCT TAPE: AN INNOVATIVE APPROACH TO IDENTIFYING BREAKTHROUGH ENERGY PRODUCT OPPORTUNITIES*

Presentation at the 2001 International Energy Program Evaluation Conference

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IDENTIFYING NEW PRODUCT OPPORTUNITIES

Restructuring of regulated industries has often led to an explosion of novel products and services for consumers. Telephone deregulation resulted in enhanced services such as call waiting and call forwarding that created entirely new markets and positioned Telecom suppliers as more than just the company that delivers dial tone. In banking and financial services, deregulation led to product differentiation that gave customers on-line banking, discount brokerage, and automated teller machines. The entry of new competitors, and the reduction of constraints on incumbents, acts to spur innovation in product and service design. In each case, new or novel use of technology together with a deep understanding of unarticulated customer needs led to breakthrough products that created entirely new lines of business bringing significant competitive advantages for those who created them and substantially enriching their relationships with their customers.

This project was designed for EPRI to assist them in identifying unarticulated customer needs. Dozens of observations of customers in their real-world environments – a methodology that has been well documented in other industries, was conducted by Primen in order to provide EPRI with a sound methodological protocol for identifying unarticulated customer needs regarding energy-related products and services. Canon successfully introduced numerous innovations in its line of cameras based on observations of consumers at the point of sale; Xerox reinvented the operations of its machines based on carefully controlled field observations of users behaviors; Rubbermaid regularly introduces new product concepts in its category based on ethnographic research; Proctor and Gamble re-engineered the packaging of its line of laundry detergents after observing customers struggling with the pour spout; Carnation reinvented "breakfast" by observing families' handling of food items. This project will help energy service providers design those products that will break the mold of how people use energy and energy powered products.

WHY FOCUS ON ACCOMMODATIONS?

This project was designed to identify opportunities in the energy sector that go beyond customers' stated needs – which are often bounded by current technology and currently available products – to meet yet unarticulated customer needs. Unarticulated needs and opportunity gaps are not typically recognized in focus groups or surveys or traditional interviews. The purpose of this project was to develop a set of observational "protocols" to identify how customers make "accommodations" or "work-arounds" that signal that these customers have "adapted" to sub-optimal conditions – conditions that themselves are indicative of opportunities for breakthrough technology products. In this project, we focused on use of technologies that are related to

* This research project was funded by EPRI under the direction of Dr. Ahmad Faruqui, Economist and Area Manager, Retail and Power Markets, Palo Alto, California.

HVAC, lighting, powering devices, and management of noise in commercial and industrial settings, but the methodology and protocols are applicable to researchers interested in identifying unarticulated customer needs across even wider playing fields.

This process allowed us to identify new product categories that, for the most part, don't currently exist. The analogy is simple: no one knew they needed identify those areas in which a customer's life could be simplified through the use of products that, for call waiting or voice mail until they were offered. But their offering was contingent upon building a convergence of technology and marketing that reached critical mass.

OBSERVATIONAL RESEARCH: METHODOLOGICAL ISSUES

Observational research provides a challenging set of opportunities to the market researcher. Multi-disciplinary teams of researchers, working with technology experts, conducted scores of in-depth, ethnographic profiles, and the profiles were analyzed to determine where the product "gaps" resided. This project included observations in commercial office buildings, retail stores, and production facilities.

The research design called for on-site interviews, tours, and where possible, direct unobtrusive observation of energy users' accommodating behavior, i.e. "sub-optimal" energy related practices. Interviews were, photographed, and either audiotaped or videotaped where necessary, to provide empirical data. The research team analyzed the data by creating profiles, drawing out behavior chains, and examining ways in which the actions of the research participants "signaled" accommodative behavior. The range of accommodations includes how materials are used, handled, stored, talked about, purchased, transported, discarded, and so on. The team of observers noted actions, conversations, apparent interests, and queried research participants about energy use and comfort. Research participants include property managers, facility managers, building operators, tenants of all sorts (e.g., office workers, business owners), and customers of retail facilities.

OBSERVATIONAL PROTOCOLS

Preliminary research helped identify the observational protocols, and allowed the research team to better understand the field "logistics." The research team observed how people modify or adjust their local surroundings, their activities or schedules, and the settings or modifications of energy equipment and energy equipment controls. The preliminary research identified several "signals" of accommodations, including

- Clothing, including sweaters, jackets, and even blankets
- Arrangement of business materials
- Arrangement and setting of thermostats, vents, fans, dimmers and other controls
- Arrangement of work schedules, including preferences for tasks and work areas
- Specific lighting equipment accommodations such as light inserts, individual lamps, removing or covering lights, taped light switches, blinds or other objects placed over – or occasionally taped to – the windows
- Specific heating, cooling, or humidifying accommodations, such as fans, individual space heaters, taped thermostats, extra water
- Specific air quality accommodations such as air fresheners or even masks

RESULTS: CAN OBSERVATIONAL RESEARCH IDENTIFY INNOVATIVE PRODUCTS AND SERVICES

Clearly, innovative solutions come from understanding obvious, articulated customer needs as well as the less obvious, or latent, unarticulated customer needs. Observational research leads to in-depth understanding of how products are (or are supposed to be) used, how products actually function within that use pattern, and what products mean, or "symbolize" to the users.

For example, in one of the case studies (described below) the lighting system was upgraded with unfortunate overall results. While inefficient T-12 ballasts were replaced with more efficient T-8s, the HVAC system was not concomitantly redesigned to adjust to the heating differentials. The result: a number of inefficient accommodations, an increase in heating costs (that far outweigh the cost savings from the lighting retrofit), and a huge increase in tenant complaints.

The analysis suggests that tenants and buildings operators need a way to adjust to such shifts in building operations, and suggest a set of products and services that will provide "intelligent" building comfort control.

CONCLUSIONS

Observational research provides a mechanism through which the unarticulated needs of all of the participants, or actors, in a building system can be considered. Each of the actors – building operators, facility managers, tenants, building owners – can identify needs that they can "name" and for which products, services, or answers of some sort currently exist. However, this research suggests that on-sight observational research can guide energy service providers in identifying energy-related accommodations that can lead to the development of new and exciting energy management technology platforms.

This paper has focused on the methodological aspects and potential outcomes of a new research methodology. Based on this work, EPRI is developing a slate of new energy technologies designed to spark discovery and innovation in the energy industry. The methodology and research protocols are available and provide a new window into the minds of energy using consumers.

2 CASE STUDIES: IT'S MORE THAN A MATTER OF AGE

The ***Miner Building*** (c. 1884) had a variety of energy problems. The greatest problem was not being able to maintain a comfortable temperature for the tenants. Both the building superintendent and all of the tenants we spoke with said that the offices were cold. The building was run on steam heat and the super, Tom, believed the heat was escaping through poorly sealed windows. He set the building thermostat to 73^0 (which was $1^0 - 2^0$ higher than most) and readings taken with a hand held thermometer in the tenant spaces registered consistently at 71^0 and 72^0.

One tenant in the building, Tanya, Office Manager at Sherman Law Firm, expressed that, "being comfortable isn't the norm." The day we visited her, she was feeling a cold draft from the heating vent above. Tom took a temperature reading and her space was 71^0. Because this fell between Stevens Associates (leasing company for the Miner Building) temperature standards, $71^0 - 74^0$, the super said there was nothing he could do about it. He did turn the thermostat in her office up from 72^0 to 73^0. The law agency has only been in the building for 4 months. Tina said they were happy with the building overall. Her only complaint was with the heating, but she said she expected some problems because it was so old. To compensate she and her coworkers "dress in layers" and have "just learned to accept it." One of the lawyers has a space heater in his office.

The ***Crescent Plaza*** (c. 1971) has up to date heating and cooling systems and is currently up-grading these systems to Direct Digital Control to allow greater manipulation of airflow. Both the tenants and the operator revealed that there were problems with the heat in the building. And, unlike the Miner Building, this hermetically sealed building was not losing heat to the outside. The root of this problem, it turns out, was much different. In 1995, the Crescent Plaza was audited and it was discovered that retrofitting the light bulbs would save energy. Summit Co. (leasing company for the Crescent Plaza), with the help of contracted engineers, decided to upgrade from T-12 bulbs with magnetic ballasts, to the newer T-8 bulbs equipped with electronic ballasts. The retrofit was done in early summer, and by winter they had already noticed a drop in their energy usage. In winter they also noticed a drop, a drastic drop, in the temperature within the building. The building was too cold and the building engineer was unable to make it any warmer. It turns out that when the retrofit was approved no one considered how the improvement would affect other operating systems within the building. When the building was constructed, it was efficient to use the heat generated from the light bulbs to warm the building. The original T-12 bulbs produced 1, 000,200 BTUs of heat. And because it takes about 5 million BTUs to heat the building, it was only necessary to have a boiler that produced roughly 3 1/2 million BTUs and use the 1 million produced by the lights to do the rest. The new electronic T-8s produce less than one-eighth of the heat produced by the T-12s. Therefore, they do not have the capacity to heat the building. Ed, the building engineer at the Crescent Plaza, said, "if it gets colder than 37^0 outside, there's no way to heat the building. The heat slowly starts creeping away, and there's nothing I can do about it. At some point I just have to shut off my phone and my pager and go hide somewhere, because there's nothing I can do."