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USING EMPATHIC DESIGN TO TRANSFORM R&D

LEARN THE LESSONS THAT APPLE, INTEL, AND OTHER PRODUCT LEADERS USE

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ABSTRACT

Based on our work with R&D services in a medical device manufacturer, we outline a practical methodology for improving the quality of information provided during field visits. We share the critical steps for rapid adoption of empathic design (ED) techniques in R&D settings. ED techniques represent a departure from methods typically deployed by engineers and scientists engaged in R&D. Therefore, we address methods to change the culture of an organization so that ED techniques are a regular part of the tool kit used in the design process.   We conclude with recommendations for using ED techniques in R&D.

THE NEED FOR EMPATHIC DESIGN IN R&D

Research and development (R&D) units are themselves service providers either to the organization where they are housed or on a contract basis to other manufacturers and service providers (e.g., frog design, IDEO). Traditionally, R&D units have deployed voice-of-the-customer (VOC) techniques to supply input on new product development concerning sustaining innovations and incremental improvements. VOC techniques have a congruent "fit" with R&D engineers and scientists—VOC is rational, planned up front, and yields information these professionals can generally expect or anticipate. VOC focuses on customer experiences with an existing design or new version of that product or service. It collects benchmarking information on competitors' designs and customer needs. VOC tends to focus on primary customers or users of the product or service.

Empathic design (ED) addresses the customer's inability to imagine possible innovations beyond the current offerings. ED is rooted in cultural ethnography and can be used in R&D units for new product or service design. ED requires a culture change among its users: 1) different types of questions are asked of the user/informant (e.g., grand tour and native language questions), 2) all the questions cannot be anticipated and must be based on the direction the interview takes rather than using an interview script, 3) interviews and observations are ideally conducted in the informant's work space and recorded (audio and, ideally, video) for later review and analysis, and 4) the techniques demand the R&D interviewer to actively listen and watch for ED information such as unarticulated user needs, workarounds, triggers of use, and intangible

product attributes. With ED, designers can deliver redesigned or new services and products that differ significantly from current market offerings, providing a distinct advantage to organizations using ED.

Empathic design is not new. ED has its roots in cultural anthropology going back decades. James Spradley wrote two books over 30 years ago describing and demonstrating key techniques of ethnographic interview and participant observation (Spradley, 1979, 1980). Spradley demonstrated these tools and techniques thoroughly on his subjects—cocktail waitresses and homeless men, suitable topics for sociology but more difficult for R&D engineers to generalize from. We learned from Spradley's detailed interactions with these subjects and devised a methodology more tuned to today's R&D professionals.

GETTING STARTED WITH EMPATHIC DESIGN

Many organizations recognize the need to obtain better information to drive product development efforts, but don't have or won't commit vast resources toward uncertain outcomes like a larger firm such as Intel or Google might do. These organizations need a way to tap into ED techniques and outcomes with a more focused resource stream having the promise of quicker payoffs from investments in training and ED technique deployment. The following considerations are essential to effective ED in R&D settings.

High-level interest and support

Empathic design is not a natural activity for most R&D staff. They have been trained using company- and industry-specific techniques for interacting with the customer or they have learned these techniques by watching what others do and what is encouraged by upper management when reporting results. Top management support for empathic design is needed to validate its use. For example, making multiple visits to the same physician or speaking with staff in sterile processing is probably not the norm for most medical device engineers and marketing staff. And videorecording of these visits is probably frowned upon or not done. Actively involving upper management in these techniques not only shows them the technical aspects of empathic design, it also allows them to become actively involved in one or more ED techniques. Once they see the power of the techniques, they become champions for the use of ED.

Engineers teaching engineers and marketing staff

Engineering professors from a Midwestern research university's industrial and manufacturing engineering department were the instructors for the training. The instructors' engineering background provided a solid connection with the engineers in the training sessions. The innovative classroom techniques along with content that was translated into

understandable and actionable techniques appealed to the marketing professionals in the training sessions. Engineers and marketing staff were typically paired up in the initial assignment and then mixed teams (e.g., engineers and marketing staff) of 4-6 participants were assembled to use ED techniques on company projects.

Demonstrate classic cases in product development

The use of empathic design techniques in product design is not new. Intel has maintained a staff of anthropologists since the 1990s and their work is published primarily in the *Intel Technology Journal*. Intuit employed the "Follow Me Home" program in the 1990s where they followed home customers who purchased Quicken software to see how they used it. By observing people using the products in their own environments, Intel, Intuit, and other companies using ED gained rich insights into their products that they would not typically obtain from traditional market research nor from engineers and designers brainstorming in the corporate office.

In the mid-1990s, Intel performed a study of computing in the home (Mateas et al., 1996). Although Intel does not sell computers, the knowledge of how people perform computing tasks provides input to the design of the chips inside. Two Intel researchers arrived around dinnertime to a participating family's home. They brought pizza and shared dinner with them, unobtrusively gathering information. They received a tour of the home and learned the types of activities that take place in various parts of the home. The key conclusion from this study was that most activities—eating, watching TV, doing homework—were done in groups of two or more. However, using the computer meant going off to the corner where "the computer" was set up. Using the computer was a one-person activity. Later publications by Intel point to this type of study as leading them to develop the Centrino wireless chip, which enables computer use throughout the home (or other environment), thereby integrating the computer into the other home activities that are typically more social.

Empathic design can provide new types of information

Although originating in cultural anthropology, empathic design had a more visible epiphany for corporate use when Leonard and Rayport (1997) published their article "Spark Innovation Using Empathic Design." This article highlighted five types of information that can be surfaced using ED techniques: 1) triggers of use—there are various events that trigger the use of a product and these are not always what the designers intended; 2) interaction with the user's environment—when you observe how the customer actually uses your product, you can learn more about what is needed or desired in future products; 3) user customization—users often

find that the designed product doesn't quite meet their needs, so they make the modifications themselves; 4) intangible attributes—this is the emotional "hook" that uniquely defines your product because of the emotions invoked—think Coke, Wheaties, and iPhone; and 5) unarticulated user needs—one of traditional market research's failings is the low ability to predict future customer needs, other than an incremental improvement. Quite often, the user cannot articulate their needs. The classic example is Henry Ford saying that if he had gone to his customers to see what they needed for transportation, they would have said "A faster horse." Instead, he helped make the automobile a mainstream product. Empathic design seeks to observe the customer using the product in their natural settings.

Investigate the life cycle of use

In the medical device firm, VOC techniques typically put the R&D staff in contact with the primary user—usually a surgeon. Our implementation of ED techniques encouraged the R&D staff to talk with people throughout the cycle of use (See. Fig. 1). This resulted in several key insights about product use gained during the preparation, sterilization, and transportation processes—key processes that were typically subordinated in a field visit focusing on the surgeon.
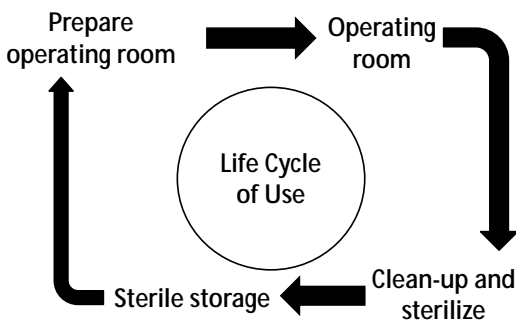

Figure 1. ED techniques span the cycle of use in a medical device.

A METHODOLOGY FOR RAPID ADOPTION OF ED

Empathic design is ordinarily an involved process requiring extensive (and expensive) professional time. ED can also resemble basic research in terms of the process output. For example, when Intel visited people's homes to see how they used computing devices, they learned the sociology of using computers in the home (Mateas et al., 1996). Therefore, the work of the Intel anthropologists fed more basic product

development that then had to be integrated into their customers' products for the ED efforts to show a payoff.

Two Primary Techniques Used in ED

Empathic design relies on several key tools to gather information from users and their settings. Spradley has devoted a book to each of the primary tools—*ethnographic interviewing* (EI) (Spradley, 1979) and *participant observation* (PO) (Spradley, 1980). EI focuses on interviewing techniques designed to surface product information from the user perspective. PO goes beyond standard observation techniques; the observer takes the role of participant. We use the acronym CAMP-N to describe the different levels of participation: complete, active, moderate, passive, and nonparticipation.

The types of questions used in EI and PO come from the same framework. These questions are designed to elicit details about the product or experience from the user, downplaying what the interviewer expects to find out. For example, the *grand tour* question asks the user to take us through a typical usage of the product, from start to finish. *Mini-tour* questions are used as follow-up, focusing on a more detailed aspect of the grand tour. For example, if a grand tour involves how a person sets up a bank account, the mini-tour question may focus on how to use an ATM.

Part of being a good interviewer is to learn about the context, language, and practices of the user and his/her environment. When the user mentions a term that is unfamiliar to the interviewer, we don't ask for a definition, we ask for use. For example, if a surgeon tells us that the device is not very effective for patients with a history of ACL, we don't ask: What do you mean by ACL? A better way to address this is: *Why isn't the device effective in patients with a history of ACL?* This keeps the conversation at the level of the surgeon. Once the surgeon starts translating for us, we start losing information. We want to keep the user in his or her native language. If we find the user is translating for us, we can ask a *native language* question to get the user back on track: *How would you describe this procedure to one of your colleagues in your medical practice?* One of the key techniques to remember in ethnographic interviewing is: *Don't ask for meaning, ask for use.*

As stated earlier, PO uses the same questioning framework, but the observer has a certain level of competence in the domain being studied. At the high end, the observer has skills that are on par with the person being observed. This has the advantage of similar vocabulary, but does not give the observer much conceptual distance from the observation setting—the observer may fill in what he or she expects should happen or may make incorrect simplifying assumptions. Observers at the active or

moderate level tend to ask more questions because they have a lesser understanding of what they are observing. Passive observation is essentially the classical industrial engineering approach—time study is a perfect example. In a time study, the IE typically just observes the task being performed with very little interaction with the operator. The IE may have a higher skill level (e.g., moderate or active), but works at the passive level to obtain the data for the time study.

The two instructors (also the authors of this paper) role-played the EI and PO techniques. Mallak interviewed Lyth on the topic of fly fishing. The interview was scripted to ensure the right types of ethnographic questions and answers were provided. "Good questions" demonstrated what to do (e.g., "How do you refer to your fly fishing friends?"). "Bad" questions were also used (e.g., What is a "honey hole?") to see if the participants would identify them as questions not to ask. The interview was videorecorded and uploaded to a secure web location for participants to view as they worked on their assignments. We also conducted a PO demonstration session on fly-tying. This was also videorecorded and uploaded for participants to view.

Practice with the ED techniques

Participants in the ED training first conducted a "fun" ethnographic interview. Pairs were assigned and they were free to pick a topic of their own, usually a hobby like furniture making or weightlifting. They were instructed to produce a five-minute EI and to record it—either audio only or audio and video. One person would interview and the other would be the user. Their goal was to practice using EI questions and to avoid "bad" questions such as "What do you mean by _____?" These interviews were delivered to the authors. We analyzed each interview using a tool we designed based on Spradley's work. Instead of providing written feedback or informal verbal feedback, we employed a "talk show" approach. Both authors, who were also the training instructors, went into an office ("the studio") where we played back the recording ("gameday replay"). We talked over the interview, stopping it at various points, to provide feedback ("color commentary") on the questions, responses, and the overall process. We recorded this process for each submitted interview and evaluated the questions asked by the interviewer. These audio files were then sent to the respective interview pairs and the manager who arranged for the training.

In the next training session, we debriefed the interviews. We shared what they did well and where improvement was needed. We supported this debriefing with actual clips from the interviews to demonstrate the techniques to all the participants. This ended up being an interesting and informative learning session. Further content on EI, PO, and working with these techniques in the field was shared with participants.

Conduct field work on real projects

Once the participants had conducted their practice EI and we had debriefed those as a group, the participants were placed into teams for actual projects at their employer by their manager (recall they were all from the same company). These teams were charged with going into the field to conduct EI and/or PO, record these interactions, conduct a preliminary analysis of the EI/PO, and present their methods and results in the final training session. The authors provided on-site "office hours" for the participants. In these meetings, participants shared their plan for the field work. We critiqued and coached them on the use of empathic design techniques and on the integration with VOC techniques. Often, these groups would wheel in a prototype or show a short video clip to offer greater tangible detail on their projects.

Upon completion of their field visits, project teams met with us for assistance in analyzing what they found. In many cases, team members would view recordings and go over them in fine detail to identify specifics of customer use focusing on empathic design elements of the product. Organization leadership members were invited and attended the final training session. In this session, all project teams shared their field work and offered their analysis of the data obtained from these efforts. Teams identified specific aspects of the field work that contributed to their recommendations on product development. They identified the empathic design techniques and questions that produced the best insights for their projects. Sound and video clips were used to share specific details on their projects.

Although the company findings regarding the use of empathic design techniques are proprietary, several of these findings were significant in their contribution to new ideas for product development and design. A senior company manager commented on one specific development idea for a particular medical device that essentially paid for the entire training experience for all attendees. Some of the product ideas that surfaced in the field work led to immediate product innovations and shed light on new products that could beat the competition to market. A supportive organizational culture is key to harvesting the benefits of empathic design.

CREATING THE CULTURE OF EMPATHIC DESIGN

Where do new product ideas come from? Traditional techniques like VOC put the R&D staff in the driver's seat—their engineers and marketers prepare for visits by identifying what they want to learn from the customer even before they set foot outside the corporate office. VOC was required, but ED is where the action is—where they found more valuable information. ED began to be integrated into the R&D culture.

Empathic design (ED) requires a visit plan, as well, but the underlying values are different. In contrast to a traditional visit, using ED techniques means asking different questions and asking questions differently. ED requires more listening and observation to the point of audio- and videorecording the field interactions for later review and analysis by those who visited the customer and by others in the organization.

Once the participants in the ED training sessions had completed their "fun" interviews and one set of field interviews, the R&D culture started shifting toward ED. R&D professionals readily used these techniques, became enthused about their value, built stronger relationships with users and built new relationships with other users (maintenance, pharmacists, nurses, sterile techs). They returned to the office with new insights, processes they wanted others to see, ideas they hadn't thought of before (and neither had their customers). When employees who were not selected for this training begin asking, "When will I be able to learn empathic design?" we have begun to change the culture of the R&D organization. The R&D staff changed the way they viewed the process of product development. No longer was it:

1. Create an idea in the R&D office.
2. Go to the field to validate it.
3. Tweak the idea, document the visit, and implement.

Rather, using ED, the process went like this:

1. Realize a product needs updating or that a competitor may take an action to reduce the organization's market share.
2. Design an ED plan to investigate the product, the functionality, and the life cycle of use.
3. Go to the field to collect data (e.g., EI & PO).
4. Analyze the data, discern findings, share with others.
5. Revisit the field as necessary.
6. Analyze, etc.
7. Identify insights that may lead to new products, new product enhancements, or ideas that feed other divisions or suppliers.

The use of ED techniques requires that the organization change its culture. The use of these techniques works to change the culture, as well. And, an ED culture emphasizes the value of building longer-term relationships with users (all along the product life cycle of use) and carefully listening to those users. Initially, the engineers especially, found the ED techniques pushed them out of their comfort zone. What brought them back was the fact that 1) engineers were teaching them these techniques, which validated that they can do this, too; 2) R&D staff started small, with a hobby as a topic for the first ethnographic interview; 3) the use of ED techniques was encouraged by top management; and 4)

presentations of ED field visits were shared among the groups involved in the ED training together, along with representatives of upper management. This last point provided a platform to see how others used the techniques, to quiz others on their techniques, to allow the training instructors to provide feedback and counsel on the field visits, and to visibly demonstrate the value of ED techniques in surfacing new information for product development.

RECOMMENDATIONS FOR USING ED IN R&D

Using ED in R&D is not for all organizations, even though most organizations stand to benefit from these techniques. The culture and the organization must be supportive of empathic design. Leadership must support and understand how ED differs from traditional approaches. Ideally, leadership will take part in ED training so they understand the techniques, how they are used, how they differ from traditional approaches, and how the results can be used in product development efforts.

Based on the literature and the authors' experience in conducting empathic design training in R&D, we offer some recommendations.

1. Ensure high-level support for ED. Make sure leadership knows what ED is and what it can do (and what it has done for others).
2. Ensure your use of ED techniques is tuned to your industry and function. The training on which this article is based was tuned to R&D engineers and marketing staff in the medical device industry.
3. Do a practice run on the ED techniques. We had engineers and marketing staff do a "fun" ethnographic interview. Then, we shared highlights from those. Each pair received detailed recorded feedback on their interviews. Highlight in a group setting what was done well and what needs work. Make your mistakes here before going out into the field.
4. Go into the field and conduct interviews and observations. Analyze, debrief, and share in a conference setting with company managers and other decision makers. Identify information that you believe ED methods surfaced that you likely would not have received with traditional VOC methods. Identify next steps or product development items that can be addressed now.
5. Be consistent. Integrate the new techniques into all field visits, where relevant. The consistent use of ED techniques should work to improve the quality of information gathered during field visits with customers. Using these techniques every time further embeds ED into your organization's culture.

You can't always predict what will work best for the customer. In fact, the customer can't predict or envision what will work best for themselves,

either. Empathic design techniques surface new types of information to feed innovative product developments that truly meet the changing needs of your customers.

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