CHAPTER III
USER RESEARCH FOR DESIGN

Section 3.1 includes an overview of the historical relationship of social and behavioral research methods to the design professions. In Section 3.2, some issues associated with the adaptation of those methods to design are reviewed. A classification scheme for the findings of user research is proposed in Section 3.3.

3.1 What is User-Centered Design?

There is nothing novel in the idea of designing with the needs of an end-user in mind. Designers of all ilks have recognized, for quite some time now, the importance of understanding the human context within which the products of their design will exist. Tracing the design professions to their roots in craft, John Chris Jones, in an oft-cited account, draws attention to the form of the horse-drawn wagon – a form evolved over generations by craftsmen informed with an intimate knowledge of local topography and of their neighbors’ personal preferences and work routines. Through a slow process of trial-and-error, the craftsman achieves “an astonishingly well-balanced result and a close fit to the needs of the user.” Designers recognize in the craftsman – creating customized solutions for his neighbor and for himself – the first user-centered designer.

More formal methods for “understanding users” were considered critical in the

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education and training of designers as early as 1937. In that year, Charles Morris, Professor of Philosophy at the University of Chicago, was given responsibility for coordinating the “scientific subjects” curriculum which had become part of the fundamental course at Chicago’s New Bauhaus, then under the direction of Laszlo Moholy-Nagy. The scientific subjects curriculum comprised classes in the physical sciences and life sciences, as well as supplementary lectures in the social sciences – including a survey of “psychotechnique [or] ability testing.”17 It is hard to say, however, what effect, if any, Morris’ lectures in the social sciences had on New Bauhaus designers of that era, whose training was still very much rooted in modernism’s valorization of art and technology.

In the late 1960s, a group of architects reacting to widespread public (and professional) dissatisfaction with the living environments created by modernist designers, introduced environment-behavior studies to the design field (Mitchell, 1993). Environment-behavior studies adopted the methods of social and behavioral research in assessing the quality of the built environment and developing a deeper understanding of architectural spaces as they impact on human behavior. Those methods included pre- and post-occupancy interviews and questionnaires; observational field studies of

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individuals and groups as they interact with, and modify, elements of their environment; laboratory testing of reactions to temperature, color, sound, movement and variations in space; as well as the often politically motivated inclusion of end-users as collaborators in the design process (Rubin and Elder, 1980; Zeisel, 1984; Sanoff, 1990). Environment-behavior researchers believed that the introduction of these methods would lead to the building of environments that would better address human requirements, as architects learned to consider accumulated knowledge about human behavior in designing those environments. While advocates of environment-behavior studies have had only minimal impact within the architectural design community, their message and their research methods seem to have been met with greater appreciation by product designers and by designers and developers of computer software systems.

In the area of computer software development, the “usability” of the system, it is widely recognized, is essential to its successful adoption. Usability can be defined according to a number of different parameters and its assessment varies significantly with the type of system under development. Software products to be introduced to one-time or novice users – an information kiosk or an ATM, for example – must be self-evident, intuitive, forgiving, and easy to learn (Alben, 1996). These same characteristics may detract from product usability, however, when they deprive expert users of their learned short-cuts for operating systems they use on a daily basis. Having recognized the primary importance of understanding how users interact with their products, usability specialists turned initially to the methods of cognitive psychology to measure how people perceive, understand, remember, and learn the elements of a software interface (Preece, 1993). More recently, their role has evolved to include early support of the design
process in addition to the evaluation of its products (Karat, 1997). In this capacity, they have borrowed methods from sociology and cultural anthropology in applications similar to many of those advocated by environment-behavior researchers, including the adoption of an ethnographic approach to observing and describing the contextualized behaviors of a target user population (Bly, 1997; Simonsen and Kensing, 1997).

Within the interdisciplinary ranks of those professionals responsible for design and development of usable software, the term “user-centered design” is applied to describe that approach in which, in contrast to traditional usability engineering or human factors, the determination of a product’s usability is considered to depend heavily on the broader context of its use (Karat, 1997). Despite the fact that user research is very often understood as an integral part of the design process in high-tech industries, even usability specialists struggle with the methodological implications of conducting user research to support early phases of design. A recent contribution to the Association for Computing Machinery’s flagship periodical reinforces the point:

> The acceptability of any software product is not dependent solely on surface interface features, but on the way a system fits within a use context. While to some this might seem obvious, I believe the community of system designers – including usability specialists – is still struggling with hard questions of how to turn this obvious fact into specific approaches for dealing with use context in design. We may know that context is important, but we still don’t know exactly what to do about it.18

While it is widely used by design professionals and academics alike, the term “user-centered” is far from an ideal descriptor. Who is this user? Of what, exactly, is he or she

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at the center? And why? To what attribute does one refer in saying that a design is “user-centered” or that a design process has been “user-centered”? What would it be were it not “user-centered”?

Design practitioners from all fields have a difficult time agreeing on what exactly is meant by “user-centered design” and on what processes and methods that includes. User observation, interviews, and questionnaires are generally recognized as available techniques for conducting user studies (Newman and Lamming, 1995), but the objectives of using those techniques are most often only vaguely defined as relating to the designer’s obligation to gain familiarity with users’ activities and needs. Some of the more thoughtful definitions of user-centered design come, again, from the software development community. In A Guide to Usability, Preece explains user-centered design as an approach whose principles include early and continuous focus on users throughout an iterative design process (Preece, 1993). Those principles are echoed in the definitions proposed by usability specialists who participated in a ACM SIGCHI conference panel organized by John Karat. User-centered design, one panelist suggests, is characterized as “a process that sets users or user data as the criteria by which a design is evaluated or as a generative source of design ideas.”

For the purposes of this study, I take inspiration from Preece and Karat in defining a “user-centered” design process as one that is informed by data from or about users, and

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19Association for Computing Machinery’s Special Interest Group on Computer Human Interaction.

20Karat, J., “User Centered Design: Quality or Quackery?” Interactions, Vol. 3, No. 4, p. 20, July/August 1996
in which that data is effectively applied.

### 3.2 User Research for Design: The Applicability Gap

Several methods commonly employed in user research for design have been mentioned above. It has been noted that many are adaptations of research methods borrowed from the social sciences: sociology, anthropology, and psychology. When applied in the context of social science research, these methods are used to understand, credibly explain, and perhaps predict human behavior. They may be applied to different ends, however, in informing design. As a contribution to that discipline’s knowledge base, an understanding of current human behaviors may, in itself, be considered a goal of social science research. The ends of design, however, inevitably entail the application of such knowledge in the form of an active intervention – some modification of the physical world of man-made artifacts. Of course, social scientists may also be concerned with modifying existing behaviors. When they are, such modifications will quite often require some form of design intervention.

Much has been written about what is very often perceived (especially by design practitioners) as the incompatibility of social research methods with the information needs of the creative design task. The failure of environment-behavior researchers to provide architectural designers with research results that they found relevant and usable in designing, led many in the design community to characterize collaborations between social research and design as doomed to fall victim to the ‘applicability gap.’

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As a new generation of designers has taken to the methods of user research, the applicability gap has reappeared. Usability specialists conducting early-phase research to support design refer to the “paradox of system design,” which recognizes that user requirements and user behaviors may be significantly altered by the introduction of a new technology, artifact or system (Button and Dourish, 1996). This paradox contributes in part to what other researchers have called “the ethnographer’s dilemma,” (Grudin and Grinter, 1995) which may be summarized as follows: Due to their concern with the analysis and description of the current situation and of current practice, ethnographic methods may be of limited value in confronting the transformational implications of introducing new technologies. Established ethnographic methods have traditionally been used as means of analysis and description, not as means of inventing the future.

It is interesting to note that the same paradox was observed as a result of attempts to apply environment-behavior research to the design of new spaces. In his very nicely written handbook for conducting and applying environment-behavior research, Zeisel pragmatically recommends, “One way to resolve this seeming paradox is to locate and study settings, users, and problems representative of future ones, generalizing from these to the probable future setting and its users.”

None of the social science research methods come to design without their philosophical baggage, and their use in informing and supporting design activity raises a host of thorny issues and important questions: Will simple observation suffice if it cannot allow us to get at understandings of users’ mental models, comprehension levels,

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motivations, etc.? Are classifications (or segmentations) too narrowly limited in
descriptive, prescriptive and predictive value by the established parameters and
perspective of the research? And, more importantly, do the resulting generalized
categories give us genuinely useful insights into user behaviors? In conversation, are
people likely to tell you only what they think you want to hear? Or will they tell you
they do one thing while they actually do another? Is the description of any particular
domain or context of use at all relevant to the design of a product or system that is likely
to radically transform that context? Does effective participation in the design process
require a certain level of expertise or experience with design that would limit the value of
contributions from domain experts or end-users?

All of these concerns – common concerns from a designer’s perspective – call into
question the applicability of user research to design. They do so with respect to how user
research is conducted and how its results are presented. A more fundamental question is
posed here; I seek to understand, not the inadequacies of user research, but how the data
collected through user research are used by designers in their creative problem-solving
processes.

3.3 Proposal for a Classification Scheme of User Research Data

As explained in Section 1.3, one of the objectives of this study is to understand how
design teams apply different types of user research in creative problem solving. Toward
that end, it is necessary that some classificatory scheme be found or developed that will
allow for the description of different types of user research in a way that is meaningful to
the purposes of this study. A means of distinguishing various types of user research that
will shed some light on how design teams incorporate those different types of research as operational elements of a creative problem solving process must be identified.

3.3.1 Alternative Classification Schemes. Despite the long history of behavioral research in design, there has been little done in the way of classifying research methods most commonly used to inform design processes or identifying those most suitable to the task. A 1980, government-sponsored survey of behavioral research methods used in architecture is one of the most complete catalogs (Rubin and Elder, 1980). Its presentation of environment-behavior research methods is structured according to the senses through which “the users of buildings experience th[o]se environments…”:23 hearing, vision, and the olfactory sense, as well as tactile perceptions of temperature and movement.

A concise booklet prepared at the Royal College of Art in London (in conjunction with a conference on designing for the special needs of the elderly) categorizes user research methods according to the resources each requires for implementation. In addition, methods are grouped according to their applicability to design projects in which research may be included toward different ends: those projects concerned with influencing the physical or purely visual qualities of a design, as compared with projects in which user research may play a part in determining a product’s functional specifications (Aldersey-Williams, Bound, and Coleman, 1999).

In a 1992 article written for the Design Management Journal, Liz Sanders

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characterizes the currently fashionable product development research methodologies as falling into five general categories: observation, classification, conversation, description, and participation (Sanders, 1992). Sanders stresses that these approaches or “perspectives” are, in practice, complementary, and that designers (or design teams) should use them together in combination in order to arrive at a truly well-rounded view of the context of use. While her classification scheme is insightful and helps her to make her point – a well warranted warning against relying too heavily on one approach to understanding users, its categories are too muddy for the purposes of this study.

Observation and conversation are data gathering techniques. Observations, for example, are typically recorded for later reference and analysis through either extensive note-taking, still photography or videotaping. Classification and description, on the other hand, suggest analytical models. They describe the form in which one might choose to present the results of user research. And participation is an altogether different approach to involving users in the design process.

The task of classifying user research methods is complicated by a tendency on the parts of design consultants to “invent” their own proprietary research methods which, in some cases, they refuse to discuss at all (Karat, 1997). While one could try to list the many user research methods that design firms claim to have incorporated into their work processes, a good number of those methods would employ similar techniques toward very similar ends. Contextual Design, for example, is often cited as an example of a popular, user-focused research method. Developed by a research consulting firm, Contextual Design is actually a collection of techniques (including open-ended interviews, task analysis, bottom-up diagramming and project management techniques)
that are used in understanding and modeling the work processes of individuals and
organizations (Beyer, H., and Holtzblatt, 1998). It is therefore a loosely prescribed
procedure as opposed to a distinct research method. (Its originators, in fairness, refer to
it as an “approach” to product design.) On other lists of user research methods we find
references to techniques such as: “guerrilla ethnography,” “physical trails,” “beeper
studies,” “cultural inventories,” “live in the future,” “co-designing,” and “shadowing” –
all new names for idiosyncratic adaptations of standard methods.24

For the purposes of this study, I need a classification scheme of user research that will
provide categories which are more discrete than those proposed by Sanders, and that will
allow me to characterize user research more generically than I could through an
inventory of existing methods. All user research methods, at some level, share the same
essential ends. They are employed for the purpose of gathering information about a
subject or population (in the case of research for design, a “user group”) so that an
improved understanding of that individual or group can be achieved. And while the
means toward those ends may vary significantly, they vary in only a limited number of
dimensions. Here I propose a few significant dimensions.

### 3.3.2 Dimensions of Classification

- Analytic Perspective: Conceptual, Procedural

24These “methods” were collected from the promotional materials of a number of
design and research consulting firms and from: Aldersey-Williams, H., Bound, J., and
Coleman, R., eds., *The Methods Lab: User Research for Design*, Royal College of Art,
London, 1999.]
From the designer’s perspective, an important distinction in types of user research can be made in the analytic perspective that the researcher may take toward his subjects. In what sense, that is, is the researcher attempting to understand users and their behaviors? He may be most interested in studying users’ actions, reactions, and interactions in a particular physical setting. In adopting this perspective, as designers are well aware, the researcher may learn about users’ physical and cognitive limitations and capabilities, and may come to understand how a setting, tool, or other artifact can be best constructed to adapt to those capabilities. Alternatively, researchers may feel they need to concentrate on understanding more about users’ beliefs about, and attitudes toward a product or situation in order to uncover the motivations and expectations behind behaviors that users display.

The analytic perspective adopted in user research may be reflected in the mode of data collection (see below); for example, it would probably be easier to understand a subject’s attitude about biking by interviewing him or her than it would through purely observational research. Conversely, an understanding of how bikers mount, ride, store and care for their bicycles would be better gotten by observing bikers interacting with

25 There are other means, besides interviews, of studying users’ perceptions of existing products. Pinch and Bijker present an interesting socio-historical account of the meanings ascribed to bicycles and cycling by different social groups and of the influence that those perceptions had on the bicycle’s formal evolution. (Pinch, T. J., and Bijker, W. E., “The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other,” The Social Construction of Technological Systems, eds. W. E. Bijker, T. Hughes, and T. J. Pinch, pp. 19–50, MIT Press, Cambridge, MA, 1987.) Designers are familiar with similar methods for understanding what a product or behavior currently means to users; those methods often involve a survey of how products, behaviors, or “lifestyles” are represented in popular media.
their bikes.

The distinction in analytic perspective is most clearly manifested in the different models of users and user behaviors that researchers construct. In the conceptual category, linguistic and cognitive models represent users’ internalized representations of a task, behavior or system, while cultural models emphasize the values of a work group as well as the organizational spheres of influence that determine user behaviors. More procedurally-oriented models of user behavior include physical and device models, which may represent users’ interactions with elements of their physical environment and their procedures or sequence of actions in performing a task.²⁶ Of course, user-behavior models may include both procedural and conceptual perspectives; most task models represent a user’s intent in behavior as well as the sequence of operations that the user performs toward realizing that intent.

• Degree of Abstraction: Raw, Abstract

At some level, all user research shares the same end: it aims at constructing (or providing the raw material with which to construct) an explanatory and, most often, predictive model of a particular behavior or class of behaviors. The degree of abstraction refers to the extent to which the raw data gathered through research have been processed by the researcher(s). At the raw end of the spectrum, we would find the direct expression

of a user behavior or concept. In the research process, that expression is inevitably recorded by some means. A researcher’s account or description of a user behavior or of a conversation with a user is at least one shade more abstract. The data are further abstracted in generalized models of behavior, as an individual’s expression of behavior or belief may be aggregated with those of a larger population of prospective users and/or correlated with other behaviors or user characteristics (e.g., demographics). In terms of research methods, we can locate what Sanders refers to as “classification” on the more abstract end of the spectrum; its opposite in this dimension might be immersion – when, for a short period of time, a researcher adopts the behaviors of his subject or user group.

More raw data can also be thought of as corresponding to what Geertz calls “thick description” (Geertz, 1973). As we move toward abstract models or generalizations about behavior, those descriptions get progressively “thinner.” The degree of abstraction is also reflected in the distinction made between substantive and formal sociological theory (Glaser and Strauss, 1967). Substantive theory is grounded in a particular domain of activity (a specific office environment, for instance, or “the banking industry”) and claims only to apply to that domain; while formal theory may be grounded in the same data, its conceptual elements are abstracted and posited as more generally applicable (to, for instance, people’s conceptions of work).

- Degree of Generalization: Individual, Social/Organizational, Cultural

The degree of generalization (or generalizability) is closely related to the degree of abstraction. This characteristic is defined primarily by the scope of the research or its sample size. It is the distinction between the particular and the general, between
characterization of an instance and that of the class. Research focused on the behavior of an individual user should, of course, inform an understanding of behaviors typical to any social or organizational groups to which that individual belongs. Together with studies of many users associated with the same community, insights about user behaviors may be generalized to describe cultural norms.

The degree of generalization has been equated with the level of the researcher’s analysis. On the individual level, he may understand user’s behaviors and interactions in light of that individual’s situationally appropriate interpretative framework; on the social/organizational level, those behaviors are understood as influenced by interpretative communities to which the user may belong; and at the highest level of analysis, behaviors are seen as reflecting cultural systems or structures (Robinson, 1993). If, for instance, we consider the degree of generalization together with the researcher’s analytic perspective, we find conceptually-oriented (and, in this example, linguistically-oriented) research may be focused at the level of idiolect (individual), dialect (social/organizational), or language (cultural). Procedurally-oriented research conducted as different levels may report on individuals’ routines, organizational practices, or cultural customs.

- Mode of Collection: Observing, Listening/Discussing, Participating

Behavioral researchers employ a host of methods, tools and techniques in gathering user data. Depending on their training and philosophical stance, they may prefer one mode of data collection over another. The mode of data collection is a direct result of the chosen research technique. While there are many specific techniques, they can be
grouped by the predominant mode of data collection: observing, listening and discussing, and participating. In this fairly straightforward distinction, I borrow from Sanders’ categories of user research methods (Sanders, 1992).

- Media of Delivery: Verbal, Visual, Tactile

The media of delivery refers to the form in which data are presented, and it is likely to reflect the mode in which the data were collected. If the predominant mode of data collection were observational, and research were conducted using video or still photography, for example, then that data would likely be delivered – presented or “handed-off” – in a highly visual format. Of course, that direct relationship in form is not necessarily retained. As research data are analyzed and interpreted, they may be transformed as well. Data for the present study, for instance, were gathered using audio/video recording equipment; design teams were observed in the process of designing. Those recorded design sessions were transcribed for analysis, and in the final delivery, data are presented in a purely verbal format.

User data, like other data, are most commonly presented in verbal and diagrammatic formats. More richly visual delivery might include video or photographic imagery, or impressions captured in a researcher’s sketchbook. Tactile presentation can involve the use of prototypes constructed by subjects (Sanders, 1992), or deliverables enhanced with the inclusion of artifacts collected in the research process. Researchers may collect artifacts that users buy or create to facilitate a task or work process (Beyer and Holtzblatt, 1998) – for example, their personal calendars, notebooks, or standard forms they use.
• Position of Privilege: Privileges the Subject, Privileges the Researcher

The position of privilege can also be thought of as the degree of subject participation. All user-centered design can be considered a partnership between the user and the designer; the balance of power and influence in that partnership can vary significantly. If the subject is unaware that he or she is the subject of research, then he or she has very little power in the equation. In the other extreme, we find truly participatory research techniques in which subjects play an active role in describing, and helping researchers to interpret, their behaviors and their needs (see Sanoff, 1990; Schuler and Namioka, 1993). The position of privilege is related to the mode of collection (e.g., observational research tends to privilege the observer over the subject) and to the degree to which the framework through which findings are analyzed and modeled pre-exists contact with the subjects or grows out of the researcher’s interaction with them.

3.3.3 Significant Dimensions for the Study. There are any number of attributes, in addition to those mentioned above, according to which one might characterize user research methods and the findings they produce. The factors that are significant to this study, however, are only those that may be directly reflected in the research data. It would be difficult to determine, after all, whether the conditions under which user research data were gathered had any influence on how design teams use the data if members of the design teams were unaware of those conditions. The dimensions of significance to this study include the analytic perspective, characterized as primarily conceptual or primarily procedural, and the degree of abstraction, characterized for the purposes of this study as falling somewhere on a spectrum whose extremes are described
by the raw expression of behavior on one end, and a highly abstracted model on the other. User research data as presented to subjects in this study will obviously display their mode of delivery as well. The distinction between verbally and visually presented data (as there are no tactilely presented user research data in the study) will be considered in analyzing how design teams use those data, but it will not constitute a focus of this study.

In the empirical study, design teams are presented with a design brief outlining a problem situation or opportunity for design intervention and a packet of information cards that present research relevant to the design problem. Included in this information packet are several different cards and sets of cards representing user research data. The design brief for these experimental sessions describes the City of Chicago’s desire to increase the amount of solid waste diverted from landfills through its recycling system, and the user research data all pertain to the recycling behaviors of that system’s users.27

Conceptually-oriented user research data are those which describe users’ attitudes, beliefs and perceptions of the behavior in question. For our recycling example, this includes data on whether or not users identify themselves as recyclers and/or as environmentally-conscious, on how they perceive and understand the current recycling program (i.e., their conceptual model of the program), and on what recycling “means” to them – in general and/or as part of the City of Chicago’s current residential recycling program.

27 The complete packet of information cards – one of which was provided to each subject who participated in this study – is reproduced in Appendix C. More information on the coding of information cards, including a note listing all the sources from which data on recycling behaviors was collected, is presented in Section 4.3.3.
On the raw end of the spectrum, subjects receive a series of users’ statements of their positions on recycling – short responses to these “man-on-the-street”-style interview questions: Do you recycle in your home? What are your reasons for recycling / not recycling? What would encourage you to recycle (if not currently recycling)? What is the most difficult aspect of recycling?

While more abstracted than the personalized statement of an individual’s position on recycling, the summarized responses of 2,600 residents to the same questions serve as additional examples of raw, conceptually-oriented data still clearly linked to their grounding in the expressions of individual respondents. These are results from a 1994 survey “focused on resident recycling knowledge, attitudes, and behavior.”

Representing a more abstracted class of conceptually-oriented data are a behavioral segmentation and a psychographic profile. In the behavioral segmentation, users are clustered into five groups according to their reported recycling behaviors in correlation with other ‘environmentally-friendly’ practices in which they engage. The psychographic profile correlates value orientation, attitudes and beliefs, and personality traits with recycling and other pro-environmental behaviors.


The procedurally-oriented data include a collection of visual narratives – three photo essays describing three individuals’ home-recycling routines, and documenting where they store their recyclable trash, how and when they sort it, and how they dispose of it. The visual narratives represent raw data. The more abstracted procedural data include a task breakdown, which lists the operations involved with recycling, and a procedural model or flowchart of the same recycling task which introduces sequential and hierarchical ordering to the presentation of operational components (see Fig. 3.1).

Figure 3.1  Relational Map of User Research Data Types in Two Dimensions of Significance to This Study