

User Experience and HCI

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Introduction

The goal for this chapter is to introduce concepts and techniques that help structure the application of HCI in a real-world environment by examining the larger context in which human-computer interaction happens and by using that context as the basis for the design of user experiences.

Understanding the broader factors that influence the user experience is as important for creating successful Human Computer Interaction systems as thoroughly understanding the cognitive science behind the user's actions. Company goals, economic relationships, emotional responses and social interactions can overwhelm behavioral and perceptual responses of consumers. Although intensive research is currently investigating some of these ideas, the majority of firsthand experience of and thinking about designing experiences under such pressures has happened in the consumer marketplace as documented in popular business and marketing literature. In bringing these ideas and experiences to this volume I hope to introduce the process of Human Computer Interaction as part of a broader activity: specifically, the development and creation of user experience *in a consumer economy*.

Section 1: the boundaries of *user experience*

The definition of *user experience* (or UX) and its relationship to HCI is complex. Both fields share boundaries with a number of other fields, and each other. On one hand, either field can resemble anthropology, cognitive psychology, industrial design or computer science in practice. On the other, customer relationship management and marketing play a large role in actual day-to-day experiences with products and services. For me, consulting for a broad range of organizations on projects ranging from consumer products for broad audiences to highly-focused products for internal use has shaped my thinking about the definition of the term. *User experience* is a set of broader considerations than HCI. It aggregates and contextualizes human-computer interaction by incorporating the concerns of both end users and organizations. In other words:

The user experience consists of all of the factors that influence the relationship between the end user and an organization, especially when a product¹ mediates that relationship.

¹ I define product broadly. To me, a product represents the interface between an organization and end-users. It could be a physical object, a service, a system, software or a combination of all of them. For example, an automated teller

UX is context

From the users' perspective, their experience is continuous. The product, their immediate environment, and their life all interact and feed back on one another. On the most basic level what someone *understands* about a product affects what they find attractive about the product, and what is attractive affects his or her willingness to understand it. How much? That depends on the rest of the context, but it's a mistake to think that only the look or the functionality matter. It all matters, and research and iterative design determine to what degree.

Many seemingly stand-alone products now are merely ways to access services provided by organizations. End users' relationships to an experience and the organizations creating the experience intertwine more than ever. In the days of traditional industrial manufacturing (before 1970, roughly), end users of a product may have only had one interaction with an organization: the store from which they bought it, which may have also provided support and repair services. Packaged software included three or more: the store that sold the hardware, the store that sold the software and the provider(s) of technical support. With the introduction of web-based software interactions, the number of organizations increased, with the addition of an ISP and web site provider. Modern mobile phone based applications may involve even more: a handset manufacturer, an operating system developer, a network provider, an application developer and a content provider. All of these organizations contribute to the end-user experience, often without a lot of coordination between them.

Product	Organizations involved
Traditional technology product	Sales/Repair
Traditional desktop software	Sales, Support
Web site	Internet Service Provider, Site Provider
Mobile	Handset manufacturer, Network provider, Application provider, content provider

Human Computer Interaction is part of a technology creation process. Like any technology creation process, doing it "right" requires not just automating a certain set of tasks, but inventing tools that introduce new possibilities for both the people who are using them and the organization creating them. In such a multilayered environment, product development can go in many directions, and research can be conducted almost ad infinitum. However, in the end, limited resources require choosing one promising direction.

machine consists of three elements (the machine itself, the card used to access it, and the services that it enables access to), but it's a single product (especially from the perspective of the end user). More often, it's single definable entity, but I'm regularly surprised at how seemingly stand-alone artifacts turn out to belong to a system of interlocking, interdependent elements.

User experience design and research is a pragmatic pursuit. Its goal should be the understanding of the experience of technology users and technology-producing organizations to *manage the risks of technology creation* and increase the chances of success.

Garrett's Elements

Jesse James Garrett has developed a model [1][2] for understanding how various aspects of product design interact to create a whole user experience. I am including his diagram here in its entirety.

[ELEMENTS DIAGRAM]

Garrett focuses on Web design, but his model extends to most other kinds of user experience. It describes the dependencies connecting abstract business and user goals to visual design through a set of intermediate steps. These steps are divided between the information a product provides and how people can interact with that information. Productivity products (the lefthand column, defined as "Web as software interface") emphasize the content less than the interaction, while information products ("Web as hypertext system") emphasize the content more than the interaction.

The diagram defines stages in understanding and managing this process, and emphasizes that factors that are unrelated to ergonomics or functionality constrain end-user experience. It implies that good human-computer interaction is a subset of good product development, and inseparable from the larger context. Like a sandwich, the outer layers in Garrett's diagram hide the inner ones from both users and from the organization at large. Users only see the Visual Design layer, while organizations only see the Site Objectives layer.

However, the user experience depends on a cascading sequence of assumptions and decisions. These are constrained by economic factors imposed by the organization and psychological or sociological factors imposed by users and society. These economic, psychological, and sociological factors tell at least half the story of the complete user experience. They define the context in which decisions are made and the product actually experienced, and they should be the ones in which it's designed.

Section 2: the organizational experience

End-users aren't the only customers of a given piece of technology. Technology creation solves two sets of problems: one for the people using it, and another for the organization creating it. HCI research and design often assumes that an organization's goal is to provide optimal end-user experiences, but organizational motivations are driven by many other factors. Organizations' *needs* and *desires*² frame and prioritize product research

² Hassenzahl [11] uses *pragmatic* and *hedonic* product attributes to discuss roughly these same concepts. His terms refer to individuals' perspectives in the

and development as much as users' *abilities* and *goals*, which are the traditional realm of human-computer interaction.

An organization creates a product because it desires something from a user base. The difficulty is that the user base often desires something different. The resolution of these two disjunctive desires deeply affects the final user experience. For this reason, user experience design and research starts with organizational strategy.

Let's begin with an example from industrial design, which foreshadows many of today's HCI and user experience issues 80 years earlier.

The 1927 Ford Model T

The Ford Model T was an incredibly successful car, the first “killer app” of the 20th Century. Throughout the 19 years it was manufactured, its design remained unchanged, except for one thing: every year it was cheaper than the year before. From the perspective of Model T users, it was a great vehicle: reliable, predictable and inexpensive. However, by the mid-1920s, it was not selling well relative to many of its competitors, and Ford discontinued it in 1927. [12] Why? Henry Ford refused to value anything but efficiency (for his company and its customers) in his products. However, by the mid-20s Ford's competitors were selling more cars, and *more expensive* cars by evolving the look and feel every year (“styling” in automotive terminology). The goal went beyond making cars more efficient or cheaper, to making them look different. Having realized that people treated cars as expressions of identity, the competitors included styling as a key part of the user experience.

Ford had many options they could have pursued in response to the economic pressure put on them by the profits lost to competitors. They could have restructured their manufacturing processes to make Model Ts even cheaper. They could have lowered the quality of their product to increase their margins; they could have embarked on a research and development program to merge their car, tractor, and airplane products, so they would only produce one product. They could have laid off workers and decreased the number of cars they were producing...and so on. Each plan would have differently affected the driver experience. Ford's decision was to stop making the Model T and introduce the 1928 Model A, a car with competitive styling (available in 4 colors, none of them the black of the Model T). [13] Ford's industrial designers then updated the styling of their cars on a regular basis, like their competitors.

Beginning user experience evaluation by analyzing the sponsoring organization's motivations regularly reveals the issues that pervade the assumptions behind the product. Introducing subtle changes in core assumptions, as Henry Ford's son Edsel (then the president of Ford) did in 1927, can change the experience of the entire product without having to rethink the whole user interface (because the problem may not be in the interface at all).

abstract, but I prefer to use *needs* and *desires* because I feel these terms better frame discussions from the user's perspective, and work better when discussing the parallel between an organization's perspective and that of the user of its products.

A children's art product manufacturer website

Let's look at a real situation: a maker of children's art products wants a new information architecture for their site. The site has three audiences (children, educators, parents, grandparents) and more than 200 different kinds of content. With such a depth of information and such a broad audience, there's no obviously canonical way to structure the content. The historical function of the website as a sales channel directed toward parents and educators guided all of the initial architecture choices. However, interviews with company executives responsible for the site revealed that these assumptions were either inaccurate or inappropriately emphasized. Most mistaken was the belief that the site had to be a revenue source. In fact, the Chief Financial Officer flatly stated that the site's goal is to spread the company's brand identity as broadly as possible among their primary audience. In its incarnation, the site neither met the goals of the original development team, not its actual goal as a brand vehicle.

Throughout the product's development lifecycle, internal expectations and assumptions guide the experience it creates in subtle ways. In this example, the information architecture for a website was distorted by the explicitly stated goal of revenue production, even though the organization's leaders had changed their goals. When expectations contain internal conflicts, they produce contradictory and confusing interaction.

Organizations have to put themselves first, even when creating products for end-users. Here's an example:

Southwest Airlines policy allows customers to apply the price of an unused ticket to another ticket. However, they profit financially if people don't take them up on the offer. Thus, it's not in the best interest of the company to make it easy to perform the transaction. Southwest.com (as of October 2005) allows the user to transfer funds from an unused ticket *only* if they have the exact confirmation number of the unused ticket *and* the exact spelling of the name associated with it -- even if they have an account on the Southwest website and the system database can pull up all of the other account information. The site interface makes transferring funds difficult because the interface ultimately serves the *company's* financial interests, not the customer's.

User experience defines the boundaries of product development through *stakeholder needs* and *end-user goals*. These needs and goals are not just management requests or customer complaints. They represent the core of how the organization defines success and what end-users expect the product will do for them.

Applying the tools of user experience research and design to the organization is tricky. Looking closely at organizational assumptions and expectations steps right into in-house politics—that aspect of collaborative work that everyone would prefer didn't exist—and can create interpersonal tension. However, unstated internal priorities often inhibit successful user experience design more than any external factor, so they are important to investigate. Fixing office politics is outside this chapter's scope and most readers' job descriptions, but explicitly clarifying an organization's priorities is well within the capability of an HCI professional. In fact, it's critical. As we've seen, confusing, conflicting, ambiguous organizational agendas produce conflicting product requirements, which in turn produce difficult-to-use interfaces. Knowing organizational needs helps balance the needs of users and organizations in design.

Section 3: the user view

As stated above, factors that affect an end user's experience are not just those that determine the efficiency of the interface in enabling task completion. Functionality is, of course, critical to the continued product viability—it needs to actually *do* something—but viability is more than functionality. We all willingly enter into experiences (buy products, use services, etc.) that are far from functionally optimal, and yet we leave satisfied. Agarwal and Karahanna [7] define the concept of *cognitive absorption*, which seems like a good way to describe the main goal of product designers and developers:

a state of deep involvement [...] exhibited through temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity

Few products regularly produce cognitive absorption. In order to understand why, it's valuable to define some other terms describing important aspects of the user experience from the user's perspective.

Don Norman, Anthony Ortony and William Revelle propose a model [3] that describes "an organism's" (eg, a person's) psychological function in the world. The model's four (continually interrelating) parts are:

- ◆ *Affect*, what the organism feels
- ◆ *Motivation*, what the organism needs and wants
- ◆ *Cognition*, what it knows, thinks, and believes
- ◆ *Behavior*, what it does

Product design implicitly takes all of these factors³ into consideration, but explicit examination of them is rare. Marketing researchers investigate motivation; interaction designers use their knowledge of cognition; usability research focuses on behavior; and visual or identity designers and advertising agencies try to influence motivation through affect. However, that's an ideal situation. In reality, the practice of understanding and structuring a unified experience is so new that design generally runs on gut level intuition, and everyone is guessing at everything. Gut-level decision making isn't necessarily bad. Humans are often good at predicting other humans' reactions -- *except* when intuition totally fails.

³ NB: I'm using these terms as a framework for the subsequent discussion and am not defining them in the same rigorous technical way that Norman, Ortony and Revelle do in their work. My definitions are the more common dictionary definitions, which are a superset of how Norman, et. al. define them.

The user experience of products

Affect

According to Norman, Ortony and Revelle, emotional response, or *affect*, is a complex interaction of immediate reactions modulated by experience with previous situations and cognitive prediction of future states, all of which happens rapidly and simultaneously. Immediate feelings, emotions and moods are all different states operating at different levels of granularity. They are also critical to people's experience of a product. When people fall "in love" at first sight with a product or a place, their successive experience will not be moderate. The emotions may lead them to overlook interaction problems or poor functionality. Later, the emotional state may wear off, the honeymoon ends, and the inadequacies of the product turns joy into disillusionment.

Davis [5] showed that "both *perceived usefulness* and *perceived ease of use* were significantly correlated with self reported indicators of system use." In other words, people's emotional relationship to a product *before* they had the opportunity to use it affected how they used it later. Zhang and Li [4] extended Davis' research by applying a more primal concept, *affective quality*. They investigated the *perceived affective quality* of software products and concluded that "a user's immediate and reflexive affective reaction to [information technology] has a positive impact on his or her consequent cognition-oriented evaluations of the [technology]."

Furthermore, Nass and Reeves [6] described in detail how people exhibited many of the same emotional responses to computers, televisions and film as they did to other humans, significantly changing their expectations and behavior toward the technology as a result.

What constitutes affective quality (which is measured in terms of valence and activation; i.e. the direction and magnitude of the emotional response) in terms of technological products is still under investigation. However, evaluating and designing the complete user experience clearly requires close consideration of the experience's affective aspects.

Value

People act for a reason. They engage with a product or an experience for some reason (or reasons), they keep using it for another, and they stop for others still. In the largest context, Abraham Maslow's hierarchy of needs [14] serves as one model of how what people value in their lives motivates their actions. Norman, Ortony and Revelle describe how one kind of motivation, curiosity, could arise from an emotional response to an environment:

Animals' motivation systems [let] the resting point of affect be slightly positive so that when there is nothing that needs to be done, the animal is led to explore the environment. [3]

However, pure curiosity rarely leads people to new experiences, or to continue well-known ones. When using a household appliance, for example, curiosity rarely drives

people's behavior. From a product developer's perspective, a good approximation of motivation is what creates *value* for the end user. Value consists of two elements:

- ◆ The product's *perceived potential* for changing a customer/user's life
- ◆ How well it satisfies that potential

Perceived potential consists of three elements: functional, economic, and psychological [15]. The functional aspect is the prospective user's expectation about whether the product will be able to solve a real-world problem the person is having. "Will the disk utility program recover my thesis?" "Will the personal video recorder let me watch *The Simpsons* at 3AM?"

The economic aspect consists of the cost-benefit analysis that a prospective buyer of a product does when considering whether purchasing the product will be worth the opportunity cost of spending money on it. This is the literal, most traditional, definition of *value*. "Will this CRM system let me shave 25% off of my expenses?"

The psychological aspect contains all of the hopes that someone has for how owning or using a thing will change their life, and is the both the most difficult to understand and the potentially most important. It holds all of the emotional attachment, all of the social pressure, and all of the personal desires that make up someone's self-image as they're contemplating buying, and then using a product. Some consumer objects, such as the Nokia 7280 phone [Figure XX], evoke much more about their value than they communicate about their functionality. Designed as fashion items, much of their functionality is the same as that for garments: they explicitly project an image of their user both to others and to the user themselves.



These same ideas, however, apply to ostensibly purely functional products. Every underused enterprise software product is the result of a perceived value that did not match the reality of the situation on the ground, often for reasons that were neither functional nor economic.

The design of the user experience is the practice of creating products that satisfy perceived value.

What brings people value changes with context, At different places and times people will have different values. There's a lifecycle to expectations dictated by habituation. As same people grow accustomed to a product's functionality, its novelty wears off. For a long time, the Model T satisfied what consumers wanted in a car. For 19 years, Henry Ford thought only the price of the car had to change, but consumers clearly thought differently. As the automobile's functionality became commonplace, people's relationship to it changed. They began to focus on the psychological needs it satisfied, and to see it less as a tool they were using and more as part of who they were. People *desire* variety [16], and the black Model T no longer satisfied. Car buyers were willing to pay extra for a different user experience, but Ford didn't recognize this until it was almost too late.

Blindness to the larger user experience also exists in the development of software products. The business press regularly describes the struggle between well-established companies and their younger competitors. Such stories typically describe a company with an older product whose target audience no longer wants sees value in the user experience their product provides. The older company clearly produced good user value at one point, or else they wouldn't have had the success that allowed them to be in a threatened leadership position. Their product changed their audience's expectations, but then the company failed to notice when expectations moved on. For example, Yahoo!'s search technology was seen to be lagging in the early 2000s, when compared to Google's. At one point Yahoo! was a dominant player in the search market, but by 2005 they had gotten to the point where "The company is doing everything that the fertile imaginations of their software engineers can muster in order to persuade people to search with them first." [17]

Likewise, organizations also often produce products for which the market "isn't ready yet." In 2005 a number of large organizations have invested in "entertainment PCs" that look like stereo equipment, and associated products, such as media servers, but there has been a lack of widespread adoption of such services in the past [18], to the puzzlement of the companies making them. These products' unpopularity may have nothing to do with the feature set or its presentation. The makers of these products should not necessarily have been doing any more usability testing or focus groups. The interface for the TiVo personal video recorder was widely praised by both interaction designers and users, but it took the company 8 years to achieve profitability [19]. It may be that patience is an ingredient in the user experience of these products before they appear worthwhile to a broad audience.

As Sawhney describes in [15], the process of creating customer value in technology products requires understanding the interaction of all the elements that make the product desirable:

According to HP, the benefits of the iPaq are its powerful processor, bright screen, expandability and flexibility—a statement of functional value. But to close a sale, HP must also demonstrate economic value with quantified estimates of improved

productivity for end users as well as application developers. And HP must convince customers of the emotional benefits of choosing a device platform that is backed by reputable and financially solid companies such as HP and Microsoft.

Creating a user experience requires understanding this entanglement of ideas as well as HP did in creating the iPaq.

The user experience of organizations

Brand

Brand identity generally refers to the combination of all the implicit values an organization communicates about itself, as understood by the consumers of that organization's products or services. Symbols such as logos and slogans *evoke* brand identity, but the actual identity is the set of values that people project onto an organization, and by extension, onto its products based on personal experiences with that organization and its advertising. In terms of the user experience, brand identity creates expectations for the value that an organization's products will provide to the end user. As such, it's an important component in setting people's expectations for how to approach a product, and what it will do for them economically, functionally or psychologically.

Brands live in the minds and expectations of the buyers and users of an organization's products and services. A logo can evoke a set of feelings and expectations for the value that a product will give someone, but it is not the actual value. The product still has to provide the value, although often that value is not in terms of the actual functionality, but rather in the emotional satisfaction that owning, using or being seen with a product brings. This *aspirational* component of a brand is the emotional value the audience perceives the product will deliver. In that sense, it is the perceived affective quality of *all* of the products produced by an organization.

Products that don't meet brand expectations can either disappoint or confuse users. During the dotcom boom of the late 90s many companies attempted business models that took their brands well outside of people's existing expectations for them.

For example, when Intel, a chipmaker, partnered with toy manufacturer Mattel, it seemed like a good way to merge cutting edge technology with toy manufacturing. The partnership produced several products under the Intel Play brand. However, sales of the toys not meet expectations and the partnership was dissolved. Why? As with any enterprise, the circumstances were complex, but one of the potential problems may have been that the Intel brand strongly connoted an entirely different set of values than was appropriate for the sale of toys. As manufactured and sold by Digital Blue, an educational toy company founded to market and develop the products from the failed venture, the products developed by Intel Play are seeing financial success. This shows that the entire hierarchy of Garrett's Elements can be satisfied on a functional level, but if the total user experience does not fulfill the user's larger expectations, products can still fail.



Intel Play Digital Movie Creator

Good experiences while using a product will affect people's perceptions of the organization that produced it, which in turn affects their expectations for the functionality of other products that the company produces. Bad experiences with a service (such as documented in [9]) can lead to a wholesale dissatisfaction with other products that the organization produces, irrespective of those products' immediate user experience.

From an HCI perspective, understanding and incorporating brand identity into the experience is important. As Dan Saffer puts it,

Navigation, nomenclature, and content presentation must also reflect the company's brand. The most elegant visual design in the world isn't going to overcome inappropriate interaction design. [20]

For example, knowing the children's art product manufacturer (mentioned above) was more interested in communicating the company brand than producing revenue changed the direction of the user experience dramatically. Websites intended to efficiently sell products are designed to be purely functional, whereas one intended to evoke a sense of playfulness, whimsy and creativity (the psychological values the company in question tried to communicate) is much different. Compare the following screenshots of the McMaster-Carr website, which has been a very successful sales site [21], to the site for the Lego toy company.



The interaction design, the organization of the content, the kind of content presented, and the visual design of individual interface elements of the two sites differ not just because the audience differs or the products differ (though those differences are undeniably important) but also because the message they want to communicate is different. Or compare the Carhartt clothing company's Web sites in the US and Europe. In the US, Carhartt is branded primarily as a workwear manufacturer, while in Europe, it's a fashion brand for urban youth.

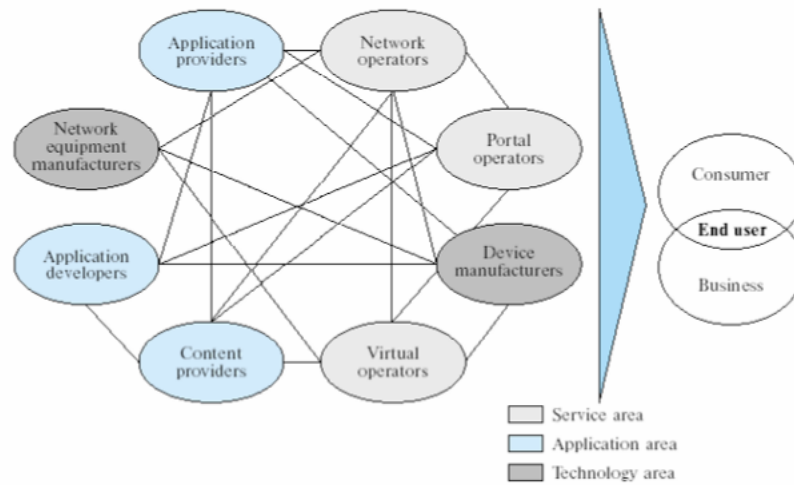


Relationships

In today's world, we rarely just interact with an organization just once. The process of buying, owning, using, and maintaining a product, whether software or an appliance, consists of many interactions with an organization. Customer Relationship Management [24] and Customer Experience Management [25] practices define these interactions as *contact points* or *touchpoints* [23]. These practices aim to analyze and design positive experiences during these interactions. Some theories [26], in fact, claim these interactions are even more important than the products that spark them.

The mobile phone is an example of the numerous customer relationships involved in owning and using a contemporary product. Although technically a computer, a mobile phone is not just a computational tool. Its functionality as a tool and as a communication medium completely depends on the services accessible through a handset. In a sense, it is the physical manifestation of a set of virtual, continually shifting services (as evidenced by the complexity of subscription plans). Without the services, a phone handset is

useless. However, the network doesn't just provide transparent connectivity; the ecology of organizations involved in delivering the mobile user experience is fragmented, and none of the players is wholly responsible for the human computer interaction:



Source: EITO [27] REDRAW

Mobile user experience design processes requires an understanding of the relationship between various organizations and how users will interact with them. Knowing these contact points can focus and prioritize the HCI research and design. A case study [28] by Timo Arnall cites constraints imposed network performance, billing and hardware limitations in creating an SMS-based service. Creating a satisfying user experience required determining both user's experience with each of those contact points and the integration of all of them. For example, the design of the service had to include both interaction and financial incentives for people to sign up for the service (the signup process was made to be quick *and* the service was initially free).

The exact nature of contact points will vary based on the details of the service or product under consideration, but it typically involves

- ◆ customer service
- ◆ billing
- ◆ sales
- ◆ account management
- ◆ marketing

To some extent, this has always been true in all HCI development, but it has not been a prime focus of the research and design process. In an ecology of many interacting services, such as described above, ignoring the other players in the environment is no longer optional. When such a service provides a solution to an end user, the solution cannot just be evaluated through the completion of a narrow set of tasks. It needs to be analyzed in the improvement it makes in the life of the person who uses it. People must find value throughout their interaction with it, whether through the "out of box

experience" [29] in unpacking the product, or how they feel as they're using it , or their interaction with the product and the organization during a technical support call.

Industrial designers and architects have addressed these issues for a long time, recognizing the evolving roles their products play in people's lives are not always possible to predict or design to the last detail. They have focused on creating user experiences that offer multiple channels of value (rarely in monetary terms, but by a combination of affective and functional ideas). Salespeople and marketers have approached the experience from the other direction. They try to identify the interactions people have with an organization, understand the value (in monetary terms) of those interactions and to maximize their monetary value, or minimize their expense.

Computer interfaces straddle both sides of the equation, providing immediate value for end-users and—especially in a dynamic networked environment such as that provided by mobile phones, ubiquitous computing or the Web—value for organizations (whether monetary or, as in case of governments or nonprofit organizations, other through other metrics that include social goods). Integrating an analysis of the relationship between people and organizations as mediated by the interface is a key component to providing value to both groups.

Section 4: Examining the user experience

Approaching the investigation of such difficult-to-quantify ideas as affect and value is no small task. Organizations may be unable to articulate their intentions or values. Differentiating end-users' needs from their desires and their actual behavior from hopeful visions is difficult. Further, the ambiguous nature of the collected data makes interpretations vary across interpreters. Extracting quantitative information about a broad group of people takes an investment of extraordinary resources.

However, the difficulty of collecting this information should not discourage you from trying to collect it. In order to reduce the risk of failure (though, sadly, probably not increase the risk of success), a model—even if imperfect—of the whole user experience is valuable.

Garrett's diagram can serve as the basis of a model of a more complete user experience. The two sections at the bottom layer define the basic needs of both the user and the organization (which, in his diagram, is a Web site, though it can be nearly any kind of product).

[MORE ON HOW THEY DIVIDE]

This section describes in detail several techniques for understanding the organizational and user needs for the user experience. They are by no means exhaustive, but they are included as examples of how to approach a user experience research project, rather than focusing on fragmented tasks, and how to pragmatically apply the theory of the previous sections.

Identifying organizational goals

There are three steps to understanding organizational goals for a product:

1. Identifying stakeholders
2. Collecting stakeholder goals
3. Prioritizing among the goals

Identify stakeholders

Start by identifying the groups that own the product the most (or who care the most). Make a list of all of the departments who affected by the product's success or failure, and who in each department is most responsible for it. If there isn't a single person who's responsible for the product in a given department, find the person who dealt with it most recently. Odds are that this person regularly deals with it or can tell you who does. Product managers generally know which groups and individuals have the biggest stake in the project and the list will likely contain:

- ◆ Engineering⁴
- ◆ Design
- ◆ Marketing

Other groups can have stakes in the process, depending on the size/structure of the organization in the product's success. There could also be a significant managerial presence in a product that's a major moneymaker (or loser) or if it's brand new. Each of these groups has a different perspective on the product.

For example, here's a fictitious list of stakeholders for a Web-based data warehousing application:

Alison, VP of Product Development
Erik, Interaction Design
Michel, Marketing
Claire, Database Administration
Ed, Customer Support
Leif, QA
Joan, Identity Design

⁴ I'm using these terms broadly. *Engineering* typically consists of programmers in a software or Web environment, but can include electrical and mechanical engineers in a hardware development project. Likewise, *Design* can include information architects, industrial designers, interaction designers and visual designers.

Collect stakeholder goals

Once you have your list of stakeholders, find out what they consider the most important issues. You can do this either by getting all the stakeholders together and spending an afternoon setting organization-wide priorities for the product or by speaking to each person independently. Individual interviews are often necessary with executives and it's critical that they are involved in this process. Ask each person (or department):

1. In terms of what you do on a day-to-day basis, what are the goals of this product?
2. Are there ways that it's not meeting those goals? If so, what are they?
3. Are there questions you want to have answered about it? If so, what are they?

Every group will have different goals and will measure success differently. Programmers may measure success by the number of bugs per thousand lines of code. Identity design may have internal reviews that evaluate how well the product integrates with the corporate brand. Customer support will want to minimize the number of questions they have to field. Sales will always want to bring in more revenue.

Once you've spoken to the departmental representatives, make a list of the goals and desires. At this point, you'll probably see that some of the goals are contradictory. It's too early to attempt to resolve the contradictions, but investigating the relationship between them may be an important near-term goal for the project.

Who	Goals and Questions
Alison, VP Product Development	Fewer complaints from major clients Match data retrieval features offered by competitor
Erik, Interaction Design	Help construct more sophisticated reports, since the current interface doesn't reveal full report engine Why do so many people start and then abandon the query wizard?
Michel, Marketing	To show tight integration of the new report generator with the query system
Claire, Database Administration	Is there a way to keep people from clicking the "search all" button? It hammers the database every time.
Ed, Customer Support	Reduce support calls about report generator Shift more support from the phone to email
Leif, QA	Identify query wizard JavaScript errors to address user complaints
Joan, Identity Design	Make the look and feel of the acquired report generator match that of the query interface

Prioritize organizational goals

Based on your interviews, you will have some idea of the corporate priorities with respect to the goals you've defined. Some things are important because the organization believes

they prevent people from using a key feature. Others may be important because they differentiate the product from its competitors. Still others might be less important because they create a drain on resources or are currently a hot topic of debate within the company.

There are many prioritization methods. Sometimes, just making a list is sufficient, but using a technique that abstracts key factors can be useful. Here's one adapted from Total Quality Management [REF]:

1. Make a column next to your list of questions and label it "Desire." Go down the list and negotiate with the group a rating for each item on a scale of 1 to 5. Five means the feature affected is a "must have," critical to the success of the product, and one means it's a "nice to have," but not essential.
2. Next, make a second column and label it "Risk." This will reflect how bad the problem is. Write a number on a 1 to 5 scale here, too. Five represents bad problems (ones that either directly affect the bottom line *right now* or represent major malfunctions), and one refers to problems that are annoyances or information that would be good to know.
3. Finally, make a column and label it "Ease." This is how easy your team feels it will be to address the problem. Five means that it's easy to do, and one means that it's very difficult.
4. *Multiply* the three entries in the columns, and write the result next to them in a third column called "Priority." This combines and amplifies the factors. Ordering the list by the last column gives you a starting order in which to investigate the product's user experience.

Here's how some of the questions from the list above fared:

Goal	Desire	Risk	Ease	Total
Match data retrieval features offered by competitor	4	3	2	24
Why do so many people start and then abandon the query wizard?	4	5	4	80
To show tight integration of the new report generator with the query system	3	3	4	36
Is there a way to keep people from clicking the "search all" button? It hammers the database every time.	5	5	3	75
Reduce support calls about report generator	2	4	2	16
Identify query wizard JavaScript errors to address user complaints	3	2	5	30
Make the look and feel of the report generator match the query interface	5	2	4	40

When prioritized systematically, it's often easy to see why product development happens in the way it does. The lists show unstated company priorities come out and agendas that

are orthogonal to the organization's actual needs. In retrospect, it's possible to see how decisions that go against the product and organization's needs, and teams' abilities produce the conditions that generate bad user experiences. Most importantly, tables such as these allow you to prioritize what you learn about user needs.

A rapid technique: project history

It's not always possible to perform a rigorous investigation of an organization's needs. A fast way to understand the organization's goals is to create a quick history of the project. The sequence of events that lead to the current situation reveals a set of problems and solutions, which in turn reveal what the organization's needs and values. The process is straightforward in principle, although the answers to basic questions can reveal complexities in priority and interest that a simple narrative explanation of the current situation does not. Getting a project history can be as simple as asking the following questions of the key stakeholders responsible for a project. The goal is to encourage them to describe the sequence that led to the current situation.

- ◆ Why did you decide to *this*?
- ◆ Why did you decide to do it *now*?
- ◆ Who initiated the project?
- ◆ What was the organizational pressure that suggested it?

The idea is to ask these questions (which are just a variant on the standard who/what/when/why interrogatives) *recursively*. In other words, for every answer, it's possible to ask the same questions to get an even older, and maybe deeper, set of motivations. Some techniques recommend doing a certain number of times (four seems to be common), but going deeply on a couple of key ideas is usually enough to understand the deeper motivations and constraints underlying the current situation. One variant that has proved useful is to ask to include anyone mentioned into the conversation. "Oh, so Lucie suggested that PCB designers weren't using the spec sheets, which is why we're trying to make them more prominent. Could we talk to her about how she determined that they weren't using them enough?" It could be that Lucie has stacks of emails from Customer Service in which people ask for information that's readily available, or maybe she just has a hunch. In the former case, the information in the email could be valuable in determining users' expectations from the service; in the latter case, understanding Lucie's motivations provides information about how she measures success or envisions the purpose of the service.

Field observation

The goal is to make the people who are being observed become participants in the discovery process of learning just what their real needs are--not the artificial needs proscribed by the way they do things today, but what the goals are, what they are striving for. This is the role of rapid ethnography. [30]

A highly effective and increasingly popular method of exploring the user experience comes from field-research techniques based on methods pioneered by anthropology,

ethnography and ethnomethodology. Examining work and life context produces a richer understanding of the relationships between preference, behavior, problems and values. Laboratory and survey methods *extract* people from their environments to focus on individual tasks or perspectives or aggregate responses from many people. Field observation's goal is to gain insight into the total relationship between the elements of the user experience as experienced and understood in the context of use.

Rather than trying to validate theories in a controlled setting, these ethnography-derived methods (including contextual inquiry [34]) derive insight through direct observation of people in their actual environment with (ideally) little presumption about their behavior and needs.

Direct observation removes much of the bias that creeps into research when people or tasks are isolated. Outside the environment that triggers them, our explanations of desires, values, reactions and behaviors, especially in routine events, lose critical details by our tendency to simplify, idealize and project. Exploring the context of activities can identify people's larger goals through the small details. For example, when someone leaves a note on a kitchen counter, the goal isn't to just to leave the message, but rather to communicate something specific to a member of the household (even him/herself). The message may be a to-do list, a reminder or an alert [32] and its location communicates how to interpret the message. When discussing domestic communications outside the context of their daily routine, critical details such as spatial placement, time of day, materials used, or triggering event can be lost.

Direct observation identifies emotional reactions that would be otherwise difficult to capture. For example, in [33] Vrendenburg, Righi and Isensee describe a situation where a t-shirt included in the packing material of an IBM RS/6000 computer led to surprise and delight from users—signs of a good user experience—just unpacking the box:

Users opened the product box to find a t-shirt, a mouse pad, a copy of Wired magazine, and games that showcased the 3D graphics capabilities of the system such as Quake. This approach to design worked beautifully. It became cool to have an RS/6000. One of the most common questions asked by customers in the feedback survey was "Where can I get another t-shirt?"

This was an unexpected observation that wasn't part of a focused program of focused ethnographic observation of people's experiences unpacking RS/6000 computers, but it is representative of the kinds of things such observation produces. In another instance, Berg, Taylor and Harper [35] observed the following relationships between UK teenagers and their mobile phones:

[The] text messages that were exchanged were sometimes described as objects that evoked particular memories. The messages were the embodiment of something personal that could be stored, retrieved, re-read and shared, becoming tangible mementos for individuals and groups. Thus, the phone appeared to provide a means to participate in social exchange in so far as it enabled particular objects to take on symbolic meaning and for the objects to be seen as meaningful between people.

Such insights map directly to user experience design (as the authors then proceed to do). They allow technology to enable specific, observed behaviors in the context they occur, rather than hypothetical behaviors and assumed needs.

That said, field research methods for user experience design are typically neither as detailed, data-heavy, or analytically rigorous as formal ethnography [37]. These techniques focus on pragmatic on-the-ground observation and interpretation within the context of a development and production process. They use standardized methods and seeking to identify contact points, activity sequences, artifacts, and values in the context of work practices. Karen Holzblatt and Hugh Beyer's *contextual inquiry* [34] is probably the most prevalent of these techniques. Generalized from David Millen's *rapid ethnography* [36], here's a set of steps for conducting field research:

1. Find key informants
2. Narrow the focus
3. Use interactive observation
4. Use multiple researchers and analyze collaboratively
5. Validate conclusions

Find key informants, schedule research

Millen's recommends identifying *informants* and asking them to serve as guides through a field observation. He suggests that guides should be "people with access to a broad range of people and activities and be able to discuss in advance where interesting behaviors are most likely to be observed or where activities that reveal social tension are most likely to be found." [36] For example, when observing technology in a hospital, it pays to talk to a nurse who works there, or if investigating hobbyist PC case modification (aka casemod) culture, it's valuable to have a member of a club of "modders" introduce you to the hobby and the players in it.

When choosing informants, you should pick at least five people or groups who resemble the people who will use your product or who will provide key insights. Overall they should have the same profile as the eventual target audience, though fringe members of a group may be good informants and provide information or exhibit behavior that typical group members will have internalized.

The breadth and depth of research will determine the extent of the study undertaken: long-term planning generally requires deeper insight and thus more and longer observation than short-term problem-solving, for example. A typical month-long research schedule generally involves 2-5 hours per observation or interview period, followed by 2-3 hours of group analysis per hour of observation.

Timing	Activity
$t - 2$ weeks	Organize and schedule participants.
t	Begin observation. Begin analysis scheduling process for development team.

$t + 1$ week	Complete observation. Review videotapes and notes. Complete analysis scheduling.
$t + 2$ weeks	Begin analysis.
$t + 3$ weeks	Complete analysis.

Narrow the focus

The goal of traditional ethnographies is to understand as much as possible about the entire context in which a group of individuals acts, without judgment. In contrast, most commercial research projects begin with an idea about what problems need solving and an idea about how to solve them. Field observation clarifies and focuses these ideas by discovering the situations in which these problems occur and how people deal with them. In addition, unlike an evaluative technique such as usability testing, it's observational and typically uncovers unexpected directions. Thus, it's best done before the process of creating solutions has begun, when there's still time to iterate on research. This is usually at the beginning of the development cycle.

However, in the interest of maximizing immediate results, the project typically concentrates on the fields of activity that will likely produce results that designers can incorporate into the user experience. Narrowing focus means identifying the important aspects of your audience's work- or life-practice, while leaving open the option to challenge assumptions. One technique is for researchers to closely familiarize themselves with the terminology, tools, and techniques their audience is likely to use. An informant can walk the researchers through some concepts before formalizing the research goals. The "sportscaster" method where one informant explains what another one is doing is another useful technique. For example, walking through a shopping district with a fashion-conscious teenage commentator can reveal a lot about where to look for interesting behaviors, rather than starting from scratch.

With this information in mind, it's possible to narrowly define the aspect of the practice that you can ask questions about and observe.

User interactive observation

This is the key to the technique and it requires going to where people are engaged in the kind of activity the experience for which you're designing, and asking them to teach you about their activities. Most of the time should be spent observing what the participants are doing, what tools they are using, and how they are using them. One effective technique is to take on the role of an apprentice and asking them to give a running description of what they're doing. As in an expert-apprentice relationship, this should be enough to describe the practice to the apprentice, but not enough to interrupt the flow of the work. As an apprentice, you may occasionally ask for explanations, clarifications, or walkthroughs of actions, but don't let it drive the discussion.

Observations can be in the form of structured interviews, with prewritten discussion guides. This is useful in answering specific questions, but risks missing key challenges to

assumptions. Other kinds of tools can elicit specific kinds of information [34] [36], or aid in the constructing models later [39]. An informant can use a paper model of a shop floor, for example to describe activity in a factory than would be possible in the loud environment of the factory itself.

Collect as much documentation of the practice as possible. Digital and video cameras, liberally used, provide both material for analysis and illustrations for presentation. Collect physical artifacts, when possible. For example, a group of researchers studying patterns of technology use in urban German areas took 400 photographs in a span of 3 hours and brought back posters, local handicrafts and a pipe from a construction site.

Use multiple researchers and analyze collaboratively

Collecting and analyzing data simultaneously can provide efficiency, though it introduces more potential biases to the interpretation of the observations (always a concern in observational methodologies [41]). Techniques for group qualitative data analysis range from traditional transcript coding methods [40] to contextual inquiry's formal methods [34] for constructing multi-faceted models of users work practices. *Affinity diagrams* are a particularly popular (and also described in detail [34]) method. The construction of them is quite straightforward and takes a day:

1. Extract 50–100 notes from each interview. Notes are singular observations about tools, sequences, interactions—anything. Randomize them.
2. Get a group of people together in a room with a blank wall or a big whiteboard. Have them block out the whole day for the work.
3. Divide the group into pairs of analysts. Give each pair an equal number of notes.
4. Write one note on a Post-it and put it on the wall/window/board.
5. Tell the group to put notes that relate to that note around it one at a time. It doesn't matter *how* the notes relate, just as long as the group feels they relate.
6. If no more notes relate to a given note cluster, write a label summarizing and naming the cluster (use a different color so it's easy to identify the labels).
7. Repeat the process with the other notes, labeling groups as they occur.
8. Generally it's useful to break up groups of more than four notes into smaller clusters. However, there's no upper bound on how many notes may be in a group if there's no obvious way to break it up.
9. As the groups accumulate, Beyer and Holzblatt recommend using pink notes to label groups of blue notes, and green notes to label groups of pink notes.

This rather mechanistic process yields good first-cut results about the breadth of the user experience, and frames subsequent investigation.

Validation

A key part of modeling is to evaluate the quality of the model with the people whose lives it models. An immediate follow-up interview with in-depth questions can clarify a lot. Certain situations may not have been appropriate to interrupt (if you're observing a surgeon or a stock trader, that may apply to the whole observation period), whereas others may have brought up questions that would have interrupted the task flow.

Conducting this interview while the participant's memory of the event is still fresh will produce best results. Victoria Bellotti, Senior Scientist at PARC, "You'll never understand what's really going on until you've talked to people about what they are doing. The [follow-up] interview ... gives you the rationale to make sense of things that might otherwise seem odd or insignificant." [38]

Focus groups⁵

People's affective responses and values are hard to observe objectively, and getting a subjective read is often all that's possible. Focus groups are structured group interviews that quickly and inexpensively reveal a target audience's desires, experiences, priorities and values. Sometimes vilified by their association with dishonest marketing, they do not deserve their notoriety. They are neither the panacea for curing bad products nor pseudo-scientific voodoo to justify irrational decision-making. When moderated well, carefully analyzed and appropriately presented, they are an excellent technique for uncovering what people think about a given topic and, especially, *how* they think about it. A focus group reveals people's perceptions of their values: what they feel right now and how they see that in relation to themselves. Those are crucial in understanding how an experience will affect them.

In product development, focus groups are most useful early in the development cycle, when they generate ideas, prioritize features and provide insight into people's values and expectations. They can reveal the features people value highest and why they value them (though not whether they'll actually use them). As a competitive research tool, they uncover what people value in competitors' products and where those products fail. As Richard A. Krueger puts it:

The purpose of focus groups is not to infer, but to understand, not to generalize but to determine a range, not to make statements about the population but to provide insights about how people perceive a situation. [22].

A focus group series is a sequence of tightly moderated group discussions among people taken from a thin slice of a product's target audience. The goal is to encourage the participants to feel comfortable revealing their thoughts and feelings by putting them in a group of people who are like them, or share an interest or an experience that directly relates to a product or an idea.

Prepare

Focus group preparation consists of having several things:

- ◆ *A schedule.* The best results come from situations where there's been enough time to examine the contingencies. A good schedule provides sufficient time for

⁵ Much of this chapter is adapted from Kuniavsky, M., *Observing the User Experience: A practitioner's guide to user research*, Morgan Kaufmann:San Francisco, 2003

everything, especially recruiting and guide writing, and enough slop to be able to make a mistake or two.

- ◆ *The target audience.* Who will be to invite to participate. Specifically, you need to know the subset of the target audience that is likely to give you the best feedback.
- ◆ *The research scope.* Focus group series can have a few groups of a handful of people or as many as a dozen groups with ten or more participants apiece. The number of groups and people will depend on the complexity of your questions, the depth to which you want to explore the answers and the certainty with which you want to know these answers. More than four groups per audience is rarely necessary, but two is generally not enough.
- ◆ *Specific research topics.* Not all groups feel equally comfortable talking about all subjects and not all subjects lend themselves to group discussion. Carefully chosen topics and a thought-through discussion guide yield the most information without sacrificing the depth of research or the clarity of the results.

Make a schedule

A typical schedule for a focus group series takes about three weeks from beginning to end and should provide sufficient time for recruiting and writing the discussion guide. Here's how long the steps in the process typically take:

Timing	Activity
$t - 2$ weeks	Determine audience and scope, start recruiting immediately
$t - 2$ weeks	Determine broad topics to be investigated, start writing guide
$t - 1$ week	Write first version of discussion guide, discuss exact topic wording with development team, check on recruiting
$t - 3$ days	Write second version of discussion guide with timing, discuss with development team, recruiting should be completed
$t - 2$ days	Complete guide, schedule run-through, set up and check all equipment
$t - 1$ days	Run-through in the morning, check times and adjust guide questions as appropriate Do final recruiting check
t	Conduct groups (usually 1-3 days, depending on scheduling) Discuss with observers, collect copies of all notes
$t + 1$ days	Relax. Do something else.
$t + 3$ days	Watch all tapes, take notes
$t + 1$ week	Combine notes, write analysis

Pick an audience

From your ideal target audience you should choose a subset or several subsets that are likely to give you the most useful feedback. The right group will vary from situation to situation. First you need a solid profile of your target audience, complete with a thorough understanding of their demographic/technological makeup. For example, if you're just looking to find out what existing users value about your service, you want to pick the people who represent the largest subset of your actual audience. If you're looking to find whether a new audience will be interested in what you're developing, a clear specification of who are the potential users will be necessary and what factors will uniquely differentiate them from others. For example, when introducing a new product for use after a car accident, it's hard to get people to predict what they're going to need; however, talking to people who were in car accidents recently may get an evaluation of what could have been useful. Such a profile could look like this:

Age: 20-55

Gender: separate groups for men and women

Income: Household income over \$70,000/year

Computer use: Computer at home or work

Internet use: Internet at home or work. 1+ years' experience. 5-10 hours per week for personal use (shopping, reading news, banking, etc.)

Mobile use: Own a mobile phone, used non-voice mobile services (played a game, SMS, etc.) 1+ times in previous 6 months

Behavior: Were in a non-injury auto accident in the previous 9-12 months, as driver

The perspective of the members of the subgroups defines similarity. A group of audiophiles will likely be comfortable together regardless of age, whereas 20 year-old and 35 year-old urban restaurant-goers probably have perspectives that differ enough to require multiple groups. If you feel that certain groups of people would not feel comfortable with each other, then don't put them together. Income, race, sex, class, age, job and computer experience all can play a role in how people interact in a group situation and how they react to a given user experience.

Develop discussion topics

For an average focus group, you should have three to five main topics to investigate. You should phrase topics in terms of the project as a whole. "Understanding the mental model people use when researching insurance" could be a goal for an insurance brokerage site, while a service that recommended home building contractors could be interested in "Knowing at which point people turn to an external service when doing home repair".

Focus these objectives enough that a group could adequately discuss each one in about 10 minutes. Don't phrase them as questions or issues that other methods (such as a survey) can better answer. A survey could make "A list of our competitors" better than focus groups, whereas "The factors that make Sony's cameraphone experience more compelling than ours" is more appropriate.

Write a discussion guide

The discussion guide is a script for the moderator to follow. It creates a consistent framework for the focus group series by asking the same questions in the same order with much the same context. This allows a discussion to bring out the subtleties of the participants' views without shortchanging any of the topics.

Focus group discussion questions should be:

- ◆ *Carefully ordered.* Questions get the participants thinking about certain issues and remembering certain events. A careful sequence of questions takes advantage of their frame of mind to make the flow of the group discussion feel more "natural," which in turn helps the participants to maintain a creative flow of ideas and produce better insights. In general, questions should flow from the most general to the most specific, with each question narrowing the discussion a bit. There should be planned transitions between topics unless introducing a brand new topic.
- ◆ *Nondirected.* Questions should not imply an answer or present a value judgment. They should allow participants to fill in their own thoughts and values. For example, asking "Which do you think is a better search service, Google or Yahoo?" assumes that the participant feels there are advantages of one over the other. Instead, framed questions neutrally, "Are there any things you like about using the Google search service? Are there things you like about Yahoo? What are they? Are there any ways in which you can compare them? How do they compare?"
- ◆ *Open-ended.* Avoid constraining answers to fixed responses. Longer, more open, responses tell a greater part of the story and tend to be less ambiguous than shorter responses. Rather than phrasing a question in the form "Which of these camera functions are most important to you" you could ask "Which functions do you use? How often?"
- ◆ *Focused on specifics.* Conversely, encourage participants to be specific in their answers. Krueger [22] recommends breaking down "why" questions into multiple "what" questions, explicitly asking for the influences that informed their decision and the attributes of their decision. For example, "How did you decide to go shopping for a new phone plan?" and "What factors went into picking this carrier?" will provide better insight than "Why did you pick Cingular?"
- ◆ *Personal.* Out of politeness people attempt tend to generalize their experiences to the public at large or to some hypothetical audience which they are not part of. Since you want to know individual views, values and experiences, emphasize individual experiences. Formulate question so that they concentrate on people's current and past behavior and opinions, without presenting the option to project. Thus, "If you had to redo your kitchen right now, which of these features would you use to find a home contractor?" is preferable to "Which of these features do you think are useful?"

Granted, fulfilling all of these criteria with all questions is often difficult (writing questions that are simultaneously specific and open-ended is a particularly tricky

challenge), but they should be kept in mind as guidelines that should be followed whenever possible.

Analyze results

There are as many ways of analyzing focus group information as there are analysts. Since the information is, by definition, qualitative and contextual, the focus of the analysis will depend on the purpose of the group.

One method consists of the following steps:

- ◆ *Quickly capture initial hypotheses.* Immediately after the end of the focus groups, walk through the discussion guide section by section and ask the moderator and observers to recall their thoughts about it: what was unexpected? What was expected, but didn't happen? What attitudes did people display? What values did they espouse? What interesting statements did they make (and why were they interesting)? What trends did they observe? Which participants provided interesting feedback? What were the problems with the group?
- ◆ *Record the groups, and watch the recordings to verify hypotheses.* Merely remembering a situation can miss subtle behaviors. Words are misquoted. Observers fall into group think. Reviewing the discussions clarifies ambiguities and reveals shades of meaning.

Section 5: Manage with user experience

When introducing a new technology into a marketplace, there's a risk of failure, of losing money and time on the investment in developing, marketing and distributing the technology. It's of course possible to create successful technology without having a model of the end user's or organization's needs and desires. However, such successes are essentially the product of lucky accidents. When such success happens the organization has to identify the elements that led to it. By this point, however, the product's success has permanently changed the market and the organization, and identifying what made it successful is difficult. This "supply--first" model depends on predictable markets, and is passing. In the current environment, as Stephen H. Haeckel says, "business [needs to be] an adaptive system for responding to unanticipated requests in unpredictable environments." [41],

Working from the user experience is essentially a "demand-first" philosophy, continually redefining product scope to reduce the chances of failure and increase the chances of repeated successes. In other words, in an adaptive organization, the organization adapts to the user experience.

Organizations make technology for *some* reason, so user experience is implicitly included in all technology creation. However, explicitly basing *every* stage of technology development on user experience models is a relatively new concept. Though many organizations claim to be customer-centered, in practice few product management practices actually make it center of all their activities. Most concentrate the examination

of user and organizational needs at the beginning of a project (often called the "requirements gathering" phase) or at the end (the "evaluation" phase). Those are not the only options. Projects starting from scratch, where the technology is new and the development team is flexible, can use *agile software development* methods that introduce user experience knowledge throughout the development process. However, mature products with long-established processes, attitudes, and methods often make starting from scratch impossible. This situation requires a different mix of techniques.

Agile user experience development

Let's return to Henry Ford for a minute. Ford called his 1907 car the "Model T" because there was a model S before it, and a model R before that, all the way back to the first Model A, in 1903 (the 1928 Model A was a conscious rebranding to evoke a new philosophy of building cars). In other words, Henry Ford failed 20 times, over the course of four years, at making a successful passenger car. He iterated, based on feedback, on the idea until he found the correct combination of factors.

Iteration based on feedback is the core philosophy behind a family of software management practices called *agile software development*. Agile development does not require detailed research and design specifications up front or paper trails and signoffs throughout. Instead, agile methods focus on extensive communication, rapid iteration, and continuously collecting information and adjusting to it, rather than trying to plan the entire process.

As Jim Highsmith describes in *Agile Software Development Ecosystems* [46]:

Agility isn't a one-shot deal that can be checked off the organizational initiative list. Agility is a way of life, a constantly emerging and changing response to business turbulence. Critics may counter, "Agility is merely waiting for bad things to happen, then responding. It is a fancy name for lack of planning and ad hoc-ism." But Agile organizations still plan; they just understand the limits of planning.

Agile methodologies, which include Extreme Programming [43], Scrum [44], and Crystal Clear [45], do not explicitly incorporate collecting and interpreting user experience knowledge; rather, they continuously adapt to all new information.

Craig Larman defines core agile practices in *Agile and Iterative Development: A Manager's Guide* [47]:

- ◆ Iterative development
- ◆ Risk-driven and client-driven
- ◆ Timeboxing
- ◆ Adaptive development
- ◆ Evolutionary requirements

Iterative development

An approach to building software (or anything) in which the overall lifecycle is composed of several iterations in sequence. Each iteration is a self-contained mini-project composed of activities such as requirements analysis, design, programming, and test. [47]

Iterations are typically from one to four weeks, with the goal of delivering "a stable, integrated and tested partially complete system" with every iteration. In other words, an always-functioning system acquires functionality, in contrast to a collection of parts assembled at the end. The user experience frames the scope of each activity and sets priorities between them. The increments of functionality come from knowing the organization's goals for the product, from knowing the needs and values of the end-user audience, and from a negotiated balance between the two.

The elements that are most important to end users and which satisfy long-term goals of the organization can be focused-on first. For example, one project's first iteration focused on the interface for letting users retrieve information, even though there was no back-end database. That interface was the core to meeting the user and business goals, and had to be right.

Iteration doesn't need to start with functionality. Before programmers write any code or interface designers create screen designs, initial iterations can explore the audience's values and reactions with lightweight prototypes. For example, industrial design as practiced by design firm IDEO [55] is highly iterative. Key interactions (as determined by research into end-user and company goals) are prototyped, evaluated and refined repeatedly before engineering technology begins. At the Rhode Island School of Design, "looks-like" and "works-like" prototypes differentiate the user experience from technological capabilities [56]. Returning to an earlier example: exploratory iterations on the children's art product site with end-user participation could have revealed that content meant for educators confused parents and children, or they could have revealed that educator content gave the site added authority.

Risk-driven and client-driven

Risk-driven iterative development chooses the riskiest, most difficult elements for the early iterations [and] the choice of features for the next iteration comes from the client—whatever they perceive as the highest business value to them. [47]

Treating both the end user experience of products and the user experience of organizations as parts of the same idea helps select among potential technological solutions. For example, a company making software for transportation logistics spent a calendar year, many developer-years and millions of dollars developing a complex feature that allows the system to send signal when cargo enters or leaves a certain geographic area. It sounds like a good idea, but it took much longer than initially estimated and several years after its launch customers have not broadly adopted it. User research with prototypes would have revealed that the technology did not fit work practices and that the business relationships did not support the information in the form provided. In other

words, it doesn't solve a problem that people feel they have, and their business systems (including their business software) can't use the information. Although organizational desire was high, for customers the risk of *not* doing it was low, thus the choice was neither risk-driven nor client-driven.

Timeboxing

Agile methodologies depend on being able to query a "customer" who interprets the user experience for the developers and makes priority tradeoffs (for example, when something turns out to be harder than previously imagined). "Fixing the iteration end date and not allowing it to change" [47] allows *scheduled* user research and organizational priority review. A regular research and release plan allows for much easier integration of the results of user research into development process. Such *timeboxing* allows the customer to plan for user research so that the results of the research become available when questions arise. For example, an internet search engine with one week iterations had a three week research cycle. The research answered user experience questions posed by the developers, and upcoming features were prototyped and tested before any programming resources were expended.

Adaptive development and evolutionary requirements

All Of these practices boil down to two key concepts: development practices should be structured to adapt to new information, and requirements for the product change as knowledge about the user experience increases.

Introducing user experience into an existing process

"We have to return to our entrepreneurial roots." [quoted in 46]

There had been a growing sense among the Directors of the Product Management Group that there was a diminishing atmosphere of innovation within the group. [50]

[To launch a brand new product] every mindset, timeline, and assumption had to be challenged. [51]

Organizations regularly have crises where their leadership feels they've lost the ability to innovate. Rediscovering innovation is not impossible, merely difficult. Understanding the user experience *is* returning to an organization's entrepreneurial, innovative roots. Once, the organization had insight into the end-user needs and was able to balance those with its needs to be come successful. It lost the ability to be innovative when it lost that perspective.

That said, no existing organization can change all its practices overnight. People need to be convinced at both the organizational *and* individual levels that there is value in change. On a new project, it's easier to introduce new ways of creating, but everyone hates change when there's momentum. Forcing people to change in that situation almost

never works, but introducing practices that make people's lives better *and* move the overall practice in the right direction *sometimes* works (there are, sadly, no guarantees).

Development practices that expose the organization to user experience ideas lay the foundation for a gradual shift in perspective. The following practices are not in any order. They are ideas that seem to help organizations change from the inside out.

Get a senior manager champion

The preconditions to a successful change are the recognition of a need to change and the authority to make changes. Those with ultimate responsibility for the success of a product need to know that user experience research is a key business process. Embracing the idea that the members of an organization are not representative of its audience has to start from the top, with the recognition by someone in a high-level position that they cannot manage by merely extrapolating from their experience. Make senior managers watch end user research is an effective and dramatic exercise that demonstrates the difference between the perception of a product inside and outside an organization. Watching someone struggle with a flagship application wins people over to the idea that maybe they don't know everything about how their end users view the world and the product. However, even without this, enlightened managers realize there's value (both for the organization as a whole and for their careers) in researching and codifying the user experience. Such managers make excellent champions within the organization. They are experts in the organization's needs, and can serve as guides and translators, communicating issues to other managers, framing ways to justifying a practice that has no immediate return on investment, providing a voice of authority, and making resources available for the pursuit of such research. Few projects document their reliance on this relationship, but it's critical in nearly every successful organizational change:

We requested management buy-in early on to be able to treat user experience defects the same as any other product defects.

[...] This explicit support from a senior manager on the project was critical to our success in this area. [48]

Work within existing processes

It's easy to dismiss new ideas as unworkable within the structure of an existing practice. Contextualize new practices in terms of the existing development process. For example, one UI design team first introduced a new practice—the keeping of user experience scorecards—but when the practice's value became clear, the traditional process owners took over:

Although the design team produced the scorecards, the release management team eventually took over "enforcement", pushing teams to turn their yellow and red bubbles to green. This "mainstreaming" of the reviews resulting in significantly more user experience bugs being fixed. [48]

This allowed the team to gradually introduce the practice while simultaneously showing its value. As the user experience spans technical and organizational practices, integrating

it into both of those worlds produces the broadest effects. It can start by involving representatives from business units in the HCI research process:

You have to allot time and budget for the Business Analysts to attend user interviews and usability testing. [quoted in 49]

Later, it can progress to a more integrated approach:

Getting the entire marketing, engineering, and quality assurance team to watch customer-interview tapes and call the customers themselves was a wonderful achievement. All teams now require this to be part of a new product process. [51]

Another way is to use familiar tools to represent user experience ideas. For example, Oracle treated unmet user experience needs as "bugs" and used the internal bugtracking system to keep track of them [48].

Make small, but well-publicized changes

Persistent internal marketing is crucial to wide-scale adoption of user experience ideas. Beginning with small projects, such as usability tests of existing projects, every report, presentation and discussion can highlight insights gleaned from user experience research and analysis, linked to organizational goals. For example, one group chose to share their findings with the executive staff:

The scorecards were presented to vice presidents in the development organization at release status meetings, adding legitimacy to user experience being an integral part of release quality decisions. [48]

Internal marketing should be an integral part of a plan for changing a development culture. In the following plan, developed by Allianz [49], most of the effort is devoted to marketing *within* the company, using a number of methods (listed below as "Dog & Pony shows," "1st & 3d Thursdays", "UX Training", etc.):

Year	Process	Number of projects involved
2001	Personas Dog & pony shows	4
2002	Usability testing UX Training 1st & 3d Thursdays Dog & pony shows	10
2003	Usability testing JSP Benchmarking Case studies Prototyping UX Training	15

	JSP Training 1st & 3d Thursdays	
2004	Contextual inquiry Usability testing UX Training UX Thursdays SIG Presentations	17
2005	Contributions to Software Development Lifecycle Governance standards Accountability of enterprise usability and brand standards UX Thursdays	19

Source: [49]

Such an extended effort takes patience, persistence and resources, as acknowledged by Allianz:

The "sales" effort by way of "dog and pony shows" absorbed as much of our time as defining standards, building elements and designing our web site! [49]

However, internal marketing is inexpensive relative to failed products, and the potential benefits of these methods can be justified by comparing to one failed product launch, six months of delayed adoption, or another appropriate metric.

Make developers' lives easier with user experience

Technology development always happens under severe time constraints, and time-pressured developers resist additional work. It's one thing to communicate that user experience research and analysis increases chances of long-term success, but demonstrating how it reduces work is even better.

One effective way to win over developers is to give them more freedom and reduce the amount of paperwork in their lives. Replacing documents with tools that embody good practices in code means that developers don't feel pressured to memorize complex standards or reinvent techniques. Apple Computer successfully enables developers to create consistent interfaces by backing up rules with a toolbox of interface elements and development tools that make it easier to follow the rules than to break them [52]. Similarly, PBS created a set of "widgets" that make it easier for member stations to conform to a uniform organizational standard [53]. Allianz [49] and Qualcomm [54] created a set of templates that included the code to generate interaction elements that conformed to end-user and organizational goals:

A UI Library with 9 templates and 40 elements, a high level methodology, and a guide for how to use our system. [...] For both templates and elements we provided the HTML code and an HTML-rendered version of the item. [49]

Conclusion

When an organization creates technology, it embodies in a product its idea for a solution to an end-user problem, with the goal that this will ultimately help the organization itself. Human Computer Interaction is how the end-user interacts with the product, but this symbiotic relationship between the end users and the organization lies at the core of how that interaction is structured. Understanding the user experience, therefore, is the process of understanding the end-user needs *and* the organization needs with the goal of maximizing the benefit to both.

This is true regardless of whether the product is destined for a broad consumer market or an internal tool. Unfortunately, most methods still treat the interaction of humans with computers and the interaction of the product with the organization as different. In fact developing the user experience is *the whole* of technology creation. Emotional, social and organizational needs make up the fabric in which HCI exists. Without them there would be no computers and no reason for humans to interact with them.

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