

# The Case for User-Centered Design

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The need for user-centered design in this era of rapid technological change is reviewed, and key ingredients of a user-centered design process are described: (1) involvement of users, structured by rigorous user input and feedback methodologies, (2) multidisciplinary teamwork, from developing the initial concepts and approach to evaluating and refining the product after its introduction in the marketplace, and (3) focus on competitiveness, on state-of-the-art user interfaces and technology. Data supporting the economic value of user-centered design processes is also reviewed.

## THE NEED FOR USER-CENTERED DESIGN

In highly-developed nations of the world today, the average citizen is required to interact with technology to a far greater extent than even a few years ago. As technical communicators, graphic designers, human factors engineers, or any other member of a technology-producing organization, we carry a responsibility to impact the comfort and control that human beings experience when interacting with technology. This comfort and control affects productivity, frustration level, and the quality of service humans are able to achieve through using technology.

Technical communicators in general know that few people want to read a manual before using a new possession (did you read the accompanying user manual before using your new VCR, car, clock radio, telephone, microwave oven, etc.?). Doing so not only delays gratification, but divorces the context at learning from the context at doing, which negatively affects recall abilities (1). Doing so also requires passive assimilation from the written page to long-term memory, and we know that human beings are not optimally passive receivers, but rather learn best through active exploration (2,3). In fact, even rats learn the structure of a maze more quickly if they actively traverse it in order to reach a morsel of food than if they are guided through it by the hand of their trainer (4).

With this in mind, the goal for technology-producers is to make the user interface to products simple to understand and as self-documenting as possible. To approach this goal, communication expertise must be applied early and continuously in the design and development process to

create a user interface that communicates clearly, minimizes the need for additional printed documentation, and maximizes users' success in learning. For these reasons, technical communicators and human factors engineers have been at the forefront in supporting "user-centeredness" in the development processes of organizations in which they work.

## ORIGIN OF THE TERM "USER-CENTERED DESIGN"

STC's Honorary Fellow for 1996, Dr. Donald Norman, is generally acknowledged to have coined the term "user-centered design", and the book he co-edited with Stephen Draper in 1986 offers a seminal collection of articles in this area (5). Since that time, many organizations have taken to heart the generic principles offered in the book to put the user at the center of the design process, to develop products and technologies that fit the needs, limitations, conceptual models, and abilities of the human beings to whom they are offered. Norman concludes the chapter he wrote for this book (chapter 3) with the following 4 prescriptions:

- Create a science of user-centered design.
- Take interface design seriously as an independent and important problem.
- Separate the design of the interface from the design of the system.
- Do user-centered system design: Start with the needs of the user.

In his words, "From the point of view of the user, the interface IS the system. Concern for the nature of the interaction and for the user -- these are the things that should force the design. Let the requirements for the interaction drive the design of the interface, let ideas about the interface drive the technology. The final design is a collaborative effort among many different disciplines, trading off the virtues and deficits of many different design approaches. But user-centered design emphasizes that the purpose of the system is to serve the user, not to use a specific technology, not to be an elegant piece of programming. The needs of the interface should dominate the design of the rest of the system." (p.61)

## KEY INGREDIENTS OF A USER-CENTERED DESIGN PROCESS

User-centered design is characterized by early and continuous application of the following key ingredients:

- Involvement of users, structured by rigorous user input and feedback methodologies.
- Multidisciplinary teamwork, from developing the initial concepts and approach all the way through to evaluating and refining the product after its introduction in the marketplace.
- Focus on competitiveness, on state-of-the-art user interfaces and technology.

**Involvement of Users.** Dumas and Redish (6) cite five reasons why many user interfaces are poorly-designed, among those are reasons related to lack of involvement of users: “There has been a pervasive emphasis on the functionality of the system but not on the users of that system. This is based on the assumption that flexible users can adapt themselves to the system. But, as many of us have realized, building a function into a product is no guarantee that the user can find it or will use it.”

The key to user-centered design is, as the term indicates, putting the users at the center of the design process. Very simply, this method involves users in concept definition and iteratively throughout the development process, to mold the design of a product or solution. In Norman’s and Draper’s terms (5) “...human-computer interface design is not one small aspect of the main business of software design, nor will it be illuminated (let alone ‘solved’) by a single methodology or technical innovation. To begin with, we do not wish to ask how to improve upon an interface to a program whose function and even implementation has already been decided. We wish to attempt User Centered System Design, to ask what the goals and needs of the users are, what tools they need, what kind of tasks they wish to perform, and what methods they would prefer to use. We would like to start with the users, and to work from there.” In other words, “Usability is not a surface gloss that can be applied at the last minute” (6).

**Multidisciplinary Teamwork.** Among Dumas and Redish’s (6) reasons for poorly-designed user interfaces, are those related to skills mix of the design teams: “Over the years, the user base for many products has changed. Users today may be quite novice at using computers as opposed to the user/programmer of the past. The developers of software are no longer typical users of most applications ... and therefore typically do not possess the domain, usage knowledge, and preferences of their user population (e.g. lawyers, physicians, statisticians). These users do not want to manage their computers; they want the system to assist them in doing their tasks.” Also, “...different teams will

design separate components of a system, which are then put together only at the end of the development cycle. This approach typically leads to poorly-integrated components and a product with a schizophrenic look-and-feel.”

Key to good design is pulling together the many disciplines to bring the relevant perspectives together in order to build the best composite picture . . . rather like the story of the blind men and the elephant. This includes the relevant representatives from marketing, programming, writing, training, advertising, and servicing units. This small multi-disciplinary team defines, orchestrates, and uses the data yielded from the user-centered design activities and stays in place throughout the development cycle.

**Focus on Competitiveness.** In order to know whether or not a design is worth investing in, both from the producing organization’s perspective and from the potential customer’s perspective, you must know if will offer significant advantages over alternative solutions. This focus on comparison is key throughout all the user-centered design activities, which we discuss in the next paper.

## THE ECONOMIC VALUE OF USER-CENTERED DESIGN

The potential gains from a usability engineering approach can be significant, and have been documented by several sources. Nielsen (7), for example, says that usability engineering can double a system’s learnability, give a 25% increase in its efficiency, reduce the error rates by 500%, and double the user’s satisfaction. Many companies now use this type of process and a few are driven by it from their very core. However, others do not, and cite the following reasons (8):

- Management does not support usability.
- Functionality or technology of the product, rather than usability, drives development decision-making.
- Deadline pressures.
- Aesthetics are considered more important than usability.
- Lack of knowledge about usability.
- Usability considered an unknown, inexact concept.
- Usability addressed too late in the development lifecycle.

Most organizations need to see that there are economic reasons to put the user at the center of the design and development process (9). The following data may help in deliberations on this topic.

### Reduced Development Time and Costs

- Usability engineering has demonstrated reductions in the product-development cycle by 33-50% (10)
- 63% of software projects overran their estimates, with the top 4 reasons related to usability (11)
- The percentage of software code devoted to the interface has been rising over the years, and is currently averaging 47-60% (12)
- According to Nielsen, typically the return on investment for usability engineering is 50-100 times the cost. Other benefits are also important, such as the immediate ability to use a product to perform a task in an emergency situation (7).

#### Decreased Training and Support Costs

- According to a Gartner Group study large companies are finding the cost of end-user computing to be higher than expected; they spend an average of \$48.4k per workstation over a 5 year period. The significant issue, however, is that 40.8% of this is spent on end-user labor to install, learn to use, troubleshoot, get help using, etc., etc. Most of which could be reduced if S/W were better engineered for users and intended uses (13).
- One company released a product with confusing and misleading error messages, which accounted for almost 40% of the support calls, at a cost of \$100.00 per call (14).
- In a 90-day help desk study by IBM™ 87% of all calls were usability-related issues (8).
- Design changes from one usability study at Ford Motor Company reduced the number of calls to the help line from an average of 3 calls to none, saving the company an estimated \$100,000 (15).

#### Reduced Maintenance Costs

- 80% of maintenance is due to unmet or unforeseen user requirements; only 20% is due to bugs or reliability problems (9)
- 80% of software lifecycle costs occur during the maintenance phase (15)
- The cost of change is 1 unit in the definition phase, 1.5-6 units during the development phase, and 60-100 units after release (16)

#### Increased Sales and Revenues

- An increased average of 11.2 usability-related comments per software review article (17)
- InfoWorld assigns between 18-30% of its software review articles on usability factors: ease of use, ease of learning, and quality of the documentation(18)
- 'Ease of Use' is now equivalent to 'Function & Performance' as the primary reason for selecting software (19).

#### Increased Productivity

- Design changes due to usability work at IBM resulted in an average reduction of 9.6 minutes per task, with a projected internal savings at IBM of \$6,800,000 in 1991 alone (20).
- Design changes due to usability work on one project at IDS/American Express resulted in estimated savings of \$7,300,000 to clients (21).

What is becoming more and more apparent, is that good design of everything users see and touch is crucial to success in today's marketplace. We project that the long-term players will share a few critical attributes, including an affinity with Norman's prescriptions, repeated below:

- Create a science of user-centered design.
- Take interface design seriously as an independent and important problem.
- Separate the design of the interface from the design of the system.
- Do user-centered system design: Start with the needs of the user.

What we know is that technology products get usability tested, whether the developing company does it or whether it is done after sale by users in the marketplace. With over half the code in a typical application now being user interface related, it makes business sense to concentrate on improving the user interface. However, the best usability engineering efforts will have little lasting impact on an organization if the culture prevents recognition of the intrinsic value of them.

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