PIIMRESEARCH

USABILITY AND HEURISTICS PRACTICE—METHODS FOR USER-CENTRIC SOFTWARE DEVELOPMENT

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ABSTRACT

A wide variety of methods used to create interactive products exist, but the most successful have two key aspects in common: an understanding of user needs, and clemency in the event of user error. To date, very few of even the best present a balanced and unbiased approach that puts all parties—clients, designers, engineers, managers, usability experts, users, and more—on equal footing. This document outlines one specific combination of usability activities used at the Parsons Institute for Information Mapping (PIIM) found particularly effective in leveraging available resources toward the successful design and development of interactive products and tools.

1. INTRODUCTION

Usability is a word that exists in many contexts. in some industries we call it ergonomics, in some we call it human factors, and in others still we call it usability engineering. But regardless of the varying terminology or specific implementations, the underlying principle of usability is one of empathy: making products that people want to use by understanding what makes people tick (or ticked).

The importance of usability, while overlooked in many[1] notable[2] locations[3], is difficult to overstate. aside from the obvious egalitarian impact, this importance can be expressed in economic terms: something that is usable is likely to be more efficient and enjoyable; something that is efficient and enjoyable is likely to increase revenue and worker productivity; and increased revenue and worker productivity are likely to improve a company's bottom line.

Software designers have the good fortune of easily quantifiable user tasks and execution times that make measurements of such efficiency relatively straightforward. However, any discussion of usability is incomplete without addressing a user's emotional state while using the product. This is something that is openly overlooked by many methods of usability measurement (see 2.5 for more discussion), but not such a gray area as its absence from those techniques might imply. Compared to the quantitative nature of engineering models, the study of a user's emotional state can in many cases reveal much more powerful insights. But as important as both types of measurements are, usability plays a much larger role in the creation of successful software than simply hindsight. At its most effective, it is something that is integrated with every step of the development process. This combination of activities, the quantitative and qualitative user research along with forward-thinking usability considerations, is the strongest approach we have in the creation of successful software today.

1.1 THE IMPORTANCE OF METHODOLOGY

Software that is successful is characterized not by the elegance or efficiency of its code, the layout of its interface, or even the number of its users. Rather it is defined by a deep understanding of user needs and goals and an ability to facilitate completion of tasks in a way that is advantageous to the user. All successful software is created with a process capable of answering the following questions:

1. What are the user's goals?
2. How are the goals currently addressed?
3. How can we improve on these methods?
4. By how much have they been improved?

The placement of ergonomics and human factors at the forefront of the design process yields a quantifiable improvement in usability[4], but examples of this being put into effect are often the exception rather than the rule. In many cases programmers develop technical specs and write code, an art team is brought in to address the look and feel, and with any luck at the end of the process Q&A is performed with actual users[5]. Unfortunately for those users, there are few better ways to ensure the failure of a software project, and for one simple reason: this process facilitates the goals of programmers, not of users. Contrary to the prevalence of this structure in much of the software industry, it has been the experience of PIIM that successful software is created by doing precisely the opposite: users must inform design, and design must inform development.

People don't try to build software that no one wants to use, just as they don't try to throw parties that no one wants to attend. But bad software exists nonetheless, and such an outcome is almost universally the result of an ill-conceived approach to design and development. A user-centered, goal-oriented design methodology is the single best way to ensure the attendance—and satisfaction—of our "guests."

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2. MEASURING USABILITY

Just there are specific methods for engineers to use as a baseline for determining the success of software code, so too are there specific methods for determining the success of software design. Our thinking about these baselines is constantly evolving in academia and elsewhere, but there are in general two strains available: that of a qualitative nature (heuristics and ethnographic research), and that of a quantitative (engineering models). Deciding when to use each will depend on the stage of the project, but all may be used both to make design decisions and to analyze their effectiveness.

2.1 HEURISTICS

Heuristics are simple truths that we hold to be self-evident and do not require rigorous testing in order to verify. They are useful for both decision making and usability analysis. Because of their intrinsic truth, we are able to use them to make quick decisions without going through the time and expense of more rigorous testing using engineering models. And although the universality of heuristics allows us to use them during high-level analysis of what is and is not working within a tool, they are at their most effective during the outset of the design process rather than at the end. Ideally, when usability heuristics are given proper consideration during the initial phases of design, a heuristics analysis at the end of a project will find very little wrong. A heuristics analysis performed at the end of a development cycle that finds numerous violations is a clear sign of an ineffective design process.

2.2 EXAMPLES OF HEURISTICS

Heuristics come in all shapes and sizes, but a number of the most influential are those distributed by Jakob nielsen of the nielsen norman Group. Ten such examples, distilled from a variety of his published material[5], are below.

1. *Visibility of system status*
The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

2. *Match between system and the real world*
The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

3. *User control and freedom*
Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. support undo and redo.

4. *Consistency and standards*
Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

5. *Error prevention*
Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

6. *Recognition rather than recall*
Minimize the user's memory load by making objects, actions, and options visible. the user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

7. *Flexibility and efficiency of use*
Accelerators—unseen by the novice user—may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

8. *Aesthetic and minimalist design*
Dialogues should not contain information which is irrelevant or rarely needed. every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

9. *Help users recognize, diagnose, and recover from errors*
Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

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10. *Help and documentation*
Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

2.3 ETHNOGRAPHIC RESEARCH

Ethnographic research may be thought of as the most empathetic of all user research. it is the one type most likely to reveal the preferences, foibles, and general inner workings of individual users. As a result, it has a tendency to reveal surprising and unexpected insight that other types of user research often overlook. For the most part it is conducted in one-on-one interview settings where an interviewer either leads a targeted discussion or observes a user performing tasks. like heuristics and unlike engineering models, ethnographic research may be used throughout the design process in different forms.

2.4 EXAMPLES OF ETHNOGRAPHIC RESEARCH

Ethnographic research, like heuristics, comes in many varieties. the following are activities pulled from the work of alan cooper for use during this phase.[6]

1. *Stakeholder interviews*
Generally speaking, a stakeholder is anyone with authority and/or responsibility for the product being designed. interviews with stakeholders should occur before any user research begins because these discussions often inform how user research is conducted. If you don't ask for stakeholders' knowledge and opinions up front, it is likely to be forced upon you later, often in the form of a critique of your proposed solutions.

2. *Subject matter expert (SME) interviews*
Many sMes were users of the product or its predecessors at one time and may now be trainers, managers, or consultants. Similar to stakeholders, sMes can provide valuable perspectives on a product and its users, but designers should be careful to recognize that sMes represent a somewhat skewed perspective.

3. *Customer interviews*
When interviewing customers, you will want to understand:

- Their goals in purchasing the product
- Their frustrations with current solutions
- Their decision process for purchasing a product of the type you're designing
- Their role in installation, maintenance, and management of the product
- Domain-related issues and vocabulary

4. *User interviews*
Interviews can be conducted throughout the process, but at the outset it is generally advisable to meet with people from the following groups: management. The goal of this activity is to understand the context of how the product fits into the lives or workflow of actual users: when, why, and how the product is or will be used. information obtained during these interviews may consist of domain knowledge such as what users need in order to do their jobs, current tasks and activities such as what the current product accomplishes and what it does not, goals and motivations for using the product, how they think about their jobs and activities, what expectations they have for the product, and any problems or frustrations they may have with the current version.

5. *User observation*
Most people are incapable of accurately assessing their own behaviors, especially when they are removed from the context of their activities. You can talk to users about how they think they behave, or you can observe their behavior first-hand. the latter route provides superior results.

2.5 ENGINEERING MODELS

Of all the approaches to measuring usability, engineering models are the most rigorous and resource-intensive. But with the added investment comes a unique yield: accuracy. With an engineering model, we are able to collect measurements about task execution times with extreme precision. Task analysis performed in this way allows us to compare efficiency across many methods and reproduce design patterns determined to be most effective. by using them to identify the most effective methods, we're are able to

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measure their apparent "usability."

Unlike ethnographic research, engineering models are not particularly effective in understanding what role an individual's personality and preferences might play during the performance of a task. In general, this type of testing should be reserved for a few specific situations: when a decision needs to be made between the efficiency of two prototypes of an important feature, or when comparison of improvements over previous versions become relevant. If the development process is progressing rapidly enough, this type of testing might be performed as often as once every three months. in such tests as these, the ability to access actual end-users may prove beneficial.

3. THE PIIM PROCESS

PIIM utilizes a highly specialized methodology for all of its programs and research areas. this method—the Visualization driven rapid Prototyping (VdrP) method—significantly integrates innovation into graphical user interface design, user experience design, and technology and systems development. While most development methodologies introduce low–level technical assessments at the outset, PIIM reserves these until after user definitions, initial design, and visualization work are completed. by enabling PIIM product designers and engineers to collaborate on end-user issues first-and-foremost, PIIM ensures that its programs are user-centric from the start.

Adopting PIIM's program documentation and communication protocols, this process enables crystal clear, highly visualized work products to be created and distributed to all stakeholders—providing a clear picture of program objectives and outcomes from day one.

Major benefits of utilizing PIIM's proprietary Visualization Driven Rapid Prototyping method include:

1. Enhanced communication channels among stakeholders
2. Concretized shared vision of program objectives
3. More effective collaboration among product, engineering, and management teams
4. Improved specification and requirements definition
5. Increased utility of user feedback cycles
6. Improved presentation capability from start to finish

Typically, procedures are already in place at customer sites, and PIIM will work closely to integrate its VdrP process into existing management and development frameworks. this activity not only ensures a cohesive bond between PIIM and its customer but it provides a solid collaborative foundation between both parties.

Whether PIIM is tasked with ultimately engineering the customer solution or simply injecting user-centric innovation into the program, the Visualization driven rapid Prototyping method provides significant enhancement and benefit.

4. CONCLUSION

The techniques outlined in this document represent an array of options for the improvement of usability and thus the success of a given piece of software. although the format of the activities vary greatly, each represents a unique piece of the user puzzle and contributes greatly to the task of creating usable software. But they cannot function on their own—unless integrated with the design process at every level, their effectiveness is greatly reduced. A holistic approach to design, one that recognizes the importance of user needs and usability considerations from beginning to end, is the approach most likely to engender success.

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