Making Computer and Internet Usability a Priority

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As usability professionals, we are all too aware of the productivity losses, frustration, and lost business that results from poorly designed user interfaces. And we are uncomfortable with the risks created by poorly designed computer systems in life-critical applications such as air travel, medical care, and military applications.

Yet despite the common sense of our approach, we still find it difficult to convince the technical and managerial communities that usability is a critical business parameter. While senior managers may support the concept of usability, project mangers and developers, coping with too tight schedules, often see it as a nicety that can be eliminated.

As business transitions into the new economy, usability has become a strategic business goal. In "new corporations" enterprise-wide systems reach out to consumers for sales and service and to vendors and strategic partners as well. Corporations that cannot deliver systems that are easy to use will find it hard to compete in an increasingly competitive marketplace. And competition is not only coming from long-established companies but from upstart new companies that are unburdened by the need to retread or replace complex legacy systems.

Users too, face a great deal of frustration. They still feel guilty when they make mistakes and often feel that they should somehow be able to figure out what to do. The fact that IDG's "for dummies" series generated $121 million in revenue last year suggests something about how users view themselves as well as their hunger to master the technology. Unfortunately, poor design both of the software UI and user assistance, makes it difficult for them and wastes tens of billions of dollars in lost productivity.

Over time, it is likely that market forces will encourage more attention to software usability. In e-commerce, for example, consumers will evaluate the quality of their interactive shopping experience much as they evaluate their in-store experiences. Companies that produce confusing or rigid interfaces will lose customers. A hint of that market pressure was reported by the Boston Consulting Group in a study released in April 2000 that found that a full 28% of online purchasing transactions fail. And consumers are angry. Twenty-eight percent of consumers who suffered a failed purchase attempt stopped shopping online; 23% stopped purchasing at the site in question; and 6% also stopped patronizing the retailer's physical store[1].

But while market forces will ultimately force improvements in the user experience, corporations would do far better to take an active role in promoting usability than waiting for evolution to run its uncertain course. As business transitions to the information economy, those who insult, frustrate and poorly serve their customers' needs will pay a heavy price. We need to establish usability as a priority now. And having gotten the attention of management, we need to teach the software industry the techniques of user-centered design. Let's do it right!

Crafting a Message

As an industry, usability professionals need to present a clear, consistent message. We propose that it should contain the following three elements:

1. Good usability is good business.
2. Poor usability is a failure of management
3. Correcting the problem is straightforward and well within the scope of normal business practice.

The way in which we deliver the message must be pointed and unambiguous. While among ourselves we will surely continue to debate nuances, outside the usability community we must deliver punch and clarity. The message needs to be crafted so it speaks directly to managers, software developers and end-users. It needs to be supported by data that support the business case. And as an industry, we need a better public relations pipeline to get the message to the media.

With a clear message in hand, we need to look at the reasons that usability has not been a higher priority in the business community. In our opinion there are three pillars of development that will support the needed change: (1) increased technology fluency in the business community and (2) a cultural shift in IT and (3) the integration of user-centered design into product development life cycles.

Technology Fluency in the Business Community

Computer technology is complex and often confusing to the uninitiated. Even information technology professionals often find themselves struggling to understand technology that seems inevitably rapidly changing, fragmented, immature and poorly documented. Imagine the pain of the non-technical end-user.

While making users feel empowered is a significant concern, we are equally concerned by the negative impact that uninformed users can have on the quality of design. Line managers who are not fluent in technology are often intimidated. Increasingly they are taking on fiscal responsibility for projects that they barely understand. And because they don't know how to make good decisions they often defer to technologists without fully understanding what they are agreeing to. This fact was painfully obvious at a recent meeting in which an IT representative met with a senior executive and vendor to help evaluate the vendor's proposal. Midway in the meeting, the IT "professional" stalked out telling the others that they were wasting his time and didn't understand anything. The senior executive confided that she was so dependent upon the IT department that she could not fight back. "We're terrified of them," she confided.

Perhaps in the past, "leaving it to IT" was acceptable but business today cannot afford the luxury of losing the insight and wisdom of its business professionals. Software that will be used by consumers, sales and service staff must reflect a profound understanding of the products and services being offered and how to position them effectively. This is not a job for which most programmers are qualified.

When the partnership between the business and IT is not effective, the usability of the software inevitably suffers. Participatory design cannot be effective if business partners cannot express their needs or vision alternative solutions. In the anecdote we related above, the obvious problem was the rude and unprofessional behavior of the IT representative. While such behavior is clearly unacceptable, we see a deeper issue in the senior executive's lack of technology fluency. Without the conceptual knowledge to understand the proposal, she was unable to employ her excellent business skills to manage the decision-making process.

Most users have, by now mastered the basic operation of their computers. They can operate a word processor, use email, create a spreadsheet and get on to the Web. But technology fluency is more than this. A 1999 report by the National Research Council B*eing Fluent with Information Technology*[2], argues that familiarity with a few basic software programs "…is too modest a goal in the presence of rapid change…." The report suggests that a higher level of competence – *technology fluency* – is required so that individuals can vision and apply technology to their work and personal lives. We do not think that business managers and business professionals should become programmers. We do think that they should become fluent in the language and concepts of technology.

Usability professionals, like business analysts, have often seen an aspect of our jobs as compensating for our business clients' lack of technological sophistication. But the role of "interpreter" is no longer enough in the fast moving transition to e-business. We would like to see usability professionals help business managers and professionals develop more technology fluency. In addition to helping with design and evaluation, usability professionals can also serve as technology coaches, helping business professionals acquire the concepts and skills necessary to become full partners in the development process.

We understand that some usability professionals may disagree with the idea that business users should have to understand technology. They would like to protect users from the details. We see many examples in other fields, however, where an educated understanding of the basics is a powerful tool. It is hard to make a responsible decision about repairing your car if you cannot have a meaningful conversation with the mechanic. And getting good medical care is almost impossible for patients who do not understand how to evaluate their options. Our vision of the user-centered future is one in which senior executives, line managers and business professionals are able to "think in the language of technology" and function as full partners to their information technology counterparts.

Creating a Cultural Shift in IT

Cultural artifacts have a long life. In the early days of computing, the information technology department was a self-contained unit, which maintained the hardware, developed software and ran the programs. Business units requested "program runs" and received the output, but had little direct responsibility for technology.

In this environment, it was assumed that engineers and programmers would manage all aspects of software; the user interfaces were designed for technical users. The pressure for efficient use of machine resources led to decisions that put heavy cognitive burdens on the users, but they were often drawn in to the challenge of dealing with complexity. In the 1970's, for example, running a program on an IBM mainframe required the user to construct a st of JCL (Job Control Language) commands like the following:

```
//QUICK  JOB  , 'JOE USER',TIME=(0,5)
//JOBLIB DD DSN=MWD.DT34A.LOADLIB,
//        DISP=SHR
//STEP1  EXEC  PGM=IEBGENER,REGION=1024K
//UPFILE   DD   DSN=QWL.DS34B.BKUP.MSTRBKUP(+00),
//            DISP(OLD,KEEP,KEEP)
//INFILE    DD   DSN=QWL.DS34B.BKUP.MSTRBKUP(-01),
//            DISP(OLD,KEEP,KEEP),
//            UNIT=(AFF=MSTRBKUP)
//SYSIN  DD  *
//
```

JCL was only meaningful to an information technology professional and it was a rare user who would brave it. For an IT professional, however, investing the time to learn JCL was reasonable. In short, the technology world before the PC was inaccessible to most users.

The personal computer, of course, changed the "social" environment but a lot of cultural baggage from the past still remains. When the personal computer emerged, the need for easier to learn, easier to use, and easier to remember software interfaces became apparent. The desktop GUI metaphor of the Xerox STAR in 1981 and the Apple Macintosh in 1984 suggested a direction that would enable less technical people to use computers. There were fewer esoteric commands to learn, typing errors were dramatically reduced, and even intermittent users could remember what to do from session to session.

When Microsoft adopted the desktop GUI metaphor for Windows, it seemed as if significant progress in user interface design might be made. In the past 15 years, as successive versions of Windows came to dominate the market, there has been inadequate progress in usability. This has led to the paradox of more people doing more work on computers, without basic improvement in UI design. It remained for the emergence of the World Wide Web to once again change the social equation.

The Web has transformed the computer into a mass medium like the television or telephone. While business users participating in design require a high level of technical fluency, consumers can not be relied upon to have fluency. The simple point and click hypertext interface of the World Wide Web is a good starting point but far too simplistic to support full featured web applications. As web programming tools such as Java mature, we can expect the emergence of complex web applications. As web applications grow in complexity, the associated user interfaces will likely become more complex as well. Without a commitment to user-centered design, we can expect web usability to become an even more serious problem than the client-server software of the past decade.

If business is to be successful in satisfying this mass market of consumers there needs to be a realization on the part of software developers that to support millions of users, the industry must cast off the cultural remnants of the old mainframes. IT professionals must come to respect usability as a valued asset of their products. And they must come to understand that they, as information professionals, have a far different mental model from their target users.

One of the most valuable aspects of usability testing is that it is objective and empirical. It does not rely on hand-waving arguments about what users can do or what users want. It easily answers the question "what works and what doesn't."

Our vision of the user-centered future is one in which information technology professionals have more appreciation of the "soft" skills that business professionals bring and understanding the value of incorporating business wisdom into the products they create. We hope that information technology professionals will understand that they operate within a complex, technical world and that they must restrain the technology from bleeding into the interfaces of their products. And, perhaps most of all, they must understand that interaction design cannot fall victim to the stress of production. It is not a nicety but a necessity.

User-Centered Design

Usability professionals clearly understand the value of user-centered design. Few outside the profession do. This leads to conflict and misunderstanding. Particularly frustrating is the lack of attention to UI design in Object Oriented Analysis and Design (OO/AD) that frequently takes the position that UI design should be deferred to the end of the software development cycle rather at the beginning. This is, in our opinion, a flawed assumption and as OO/AD becomes standard in many development shops, user-centered design is placed at risk.

There is a consensus among usability professionals as to the steps that comprise an acceptable framework for user-centered design. This consensus is reflected in various commercial methodologies such as the LUCID Framework[3] and the ISO standard 13407 Human-Centred Design Process For Interactive Systems.

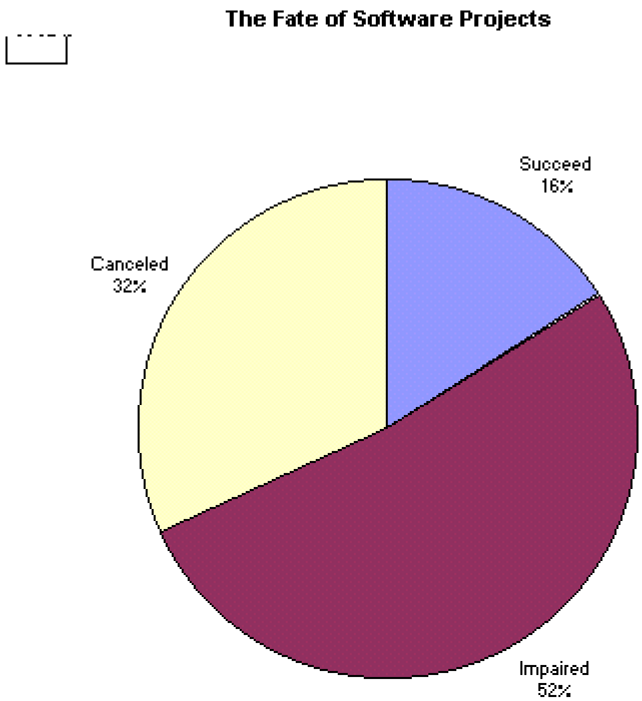
Design and validation of the user interface is a small part of the overall software (or product) development process. But it is an essential one. Our vision of the future is that user-centered design process will be incorporated into all software development methodologies ensuring that user-related issues are considered at appropriate points throughout the development process and guaranteeing a usable result.

Measuring the losses

Although every usability professional has seen the impact of poorly designed user interfaces, we have too few studies that quantify the problem. Because sales of personal computers have been so important a part of the growing information economy, few analysts have challenged the assumption that more computers equaled more productivity. Stephen Roach of Morgan Stanley, a skeptic of the value of information technology, has been examining the "productivity paradox" which found little broad support for the thesis that information technology increases productivity. In a May, 1998 interview with CIO magazine[4], Roach said "…we spend a lot and get little from it….the problem is, a lot of indiscriminate spending on relatively low value added functionality in the IT and the universe. I think the paybacks remain decidedly disappointing."

Roach has not been alone in lamenting information technology productivity. Paul Strassman, in his 1997 book *The Squandered Computer*[5], said, "…Computers are only tools. They are not an unqualified blessing…. They enhance sound business practices. They also aggravate inefficiencies whenever the people who use them are disorganized and unresponsive to customers' needs. The best computer technologies will always add unnecessary costs to a poorly managed firm. The problem seems to rest not with the inherent capabilities of the technologies, which are awesome, but with the managerial inability to use them effectively." Strassman cites a Gartner Group study[6] that claims, "Seventy percent of IT projects have not delivered their expected benefits because they have failed to integrate the results into work processes."

The Standish Group[7] reported similar numbers in a 1995 study entitled Chaos. The study surveyed 365 IT Executive Managers. The major finding was that only 9-16% of software development projects can be classified as successful, where success is defined as being completed on time, on budget and implementing the original vision. Of the remainder, 31.1% of projects are canceled before they ever get completed and 52.7% of projects will cost 189% of their original estimates. In terms of original vision, the study found that projects completed by the largest American companies have only approximately 42% of the originally-proposed features. For smaller companies the number is a more reassuring 75%.



The study noted that the numbers only related to the cost of development but that the lost opportunity cost could be much higher. Of particular interest to usability professionals, is the Standish Group's analysis of the factors that predict success in software development projects. The top 10 factors are shown in the table below along with weighting showing their relative importance. Most of these factors are components addressed in user-centered design approaches.

SUCCESS CRITERIA	POINTS
1. User Involvement	19
2. Executive Management Support	16
3. Clear Statement of Requirements	15
4. Proper Planning	11
5. Realistic Expectations	10
6. Smaller Project Milestones	9
7. Competent Staff	8
8. Ownership	6
9. Clear Vision & Objectives	3
10. Hard-Working, Focused Staff	3
TOTAL	**100**

From the usability professional's point of view, a key question is separating the inefficiencies due to poor UI design from other sources of inefficiency in information technology. Again, we have less research than would be desirable.

SBT Accounting Systems in San Rafael, Calif., conducted a 6,000-person survey of office workers and found that non-productive use averages of 5.1 hours per week. SBT estimates the cost to American businesses is some $100 billion a year in lost productivity.

Tom Landauer's 1995 economic analysis, *The Trouble with Computers*[8], suggested that applying user centered design strategies to software would yield productivity gains of 40 to 80 percent. Translating this into economic terms could have a significant gain for the entire economy on the order of 3%.

Creating awareness

It is our belief, that it is time for the usability profession to work together to make software usability (and other applications of usability as well) a national priority. This means that business leaders, technical leaders and end users will all recognize the value of well-designed software interfaces and will work together to solve the management problems that lead to poor designs. The field of usability or human-computer interaction (HCI), needs to be seen as a valid and essential sub-discipline of the computer industry and the professional approach to usability engineering will lay the foundations for a change in priorities and practices in software development.

As a field, we can trace our origin to the historic conference in Gaithersburg, MD in 1982 that many feel launched HCI as a distinct discipline. Since 1982, there has been a steady growth of research that ties computer science with psychology, graphic design, technical writing, and other topics. Today, we have at least four professional organizations with overlapping interests in promoting this field. Since 1991 the Usability Professionals Association has promoted user-centered design approaches in business and government, supporting usability testing, expert reviews, and participatory design. ACM's Special Interest Group on Computer Human Interaction (SIGCHI) brings researchers and professionals together in an annual conference. The Human Factors & Ergonomics Society (HFES) and the Society for Technical Communication (STC) have also been active in promoting high quality UI design.

Until now, however, these groups have addressed a fairly narrow audience and have been seen as peripheral (at best) within the software engineering community. Usability-oriented groups have taken a back seat to such topics as object oriented programming, component-based software, and client-server networks.

By and large, the profession has been unsuccessful in creating awareness and action about the need for usability. So long as business managers feel unable to confront technology professionals, so long as users feel that they are responsible for their confusion, so long as IT executives do not acknowledge their responsibility to create highly usable tools, the situation will not change.

Media attention about usability issues is sporadic. Books such as Landauer's *The Trouble with Computers* and Dertouzos's *What Will Be: How the World of Information Will Change Our Lives*[9] get modest attention and journalists raise the issue from time to time but the issue does not receive sustained attention. But the media finds other issues far more exciting than end-user struggles with software. Even when aircraft disasters (such as Korean Air 007 and the American Airlines crash in Cali or the AEGIS design flaw that contributed to the shoot-down of Iran Air 655) are determined to be related to user interface problems, there is little awareness that things could be different.

We will only have sustained progress when business fully understands that it is in their interest to promote the usability of their products; when there is public outcry, pressure from industrial buyers, and the government mandates requirements for publicly funded systems. Public awareness to promote change is primary. And it is up to the profession to make the case.

A Call to Action

It is time for the professional societies to extend their reach and initiate a sustained and vigorous campaign to promote awareness of the value of usability and the role of the usability professional. Through research and professional development, we have laid the foundation for action and for change, but our influence remains limited to a narrow community. Now we need to send our message to the larger community in terms that will promote action.

This is the right time to extend our efforts. Computing is no longer a private corporate activity. The web has become central to delivery of software and has fundamentally changed the nature of computing. Through the web, corporations reach out to their customers through e-commerce, and to their suppliers through enterprise resource planning (ERP) systems. Corporations have far less control over users in other organizations than they do over their own employees. Poorly designed user interfaces will make it difficult for the new corporation to achieve its goals and compete successfully

As corporations become increasingly global, the role of the virtual workgroup becomes more important. Corporations need to locate talent which can be applied to a specific project and initiate and manage the projects through computer-based communications tools. Here too, high quality UI's are critical to productivity.

Finally, the role of the IT department is evolving. There is increased recognition that user needs are not being met although changing in some corporations. Increasingly, aspects of software development responsibility are moving from a centralized IT department to the business units while IT retains responsibility for technical infrastructure.

How should such a program be structured? Given that the four professional societies have strong overlapping interests in promoting usability, a cooperative outreach program would be potentially effective. Such a program would enable them to pool scarce resources and also increase the impact of the message.

The outreach program needs to be multifaceted. Some possible components would include the following:

1. Conduct studies and report results to the media

   The best way to get media attention is to conduct studies that quantify the problems caused by poor UI design. As a profession we have both the resources (usability laboratories) and expertise to document the problem. By doing so we will be able to secure media attention and convince the business community and the government of the importance of our mission.

   In addition to studies sponsored by the professional associations, we should also consider seeking funding from foundations and the government to document the extent of the problem and its economic consequences.

2. Develop technical training programs for usability professionals

   While many usability professionals are technically adept, others have come to the profession with less technical backgrounds. To serve the role of user advocate best, usability professions must be able to meet software developers on their own ground. This does not mean that usability professionals need to become programmers but it does suggest a need for a comprehensive conceptual foundation in software engineering and an understanding of emerging trends and problems. We suggest that the professional societies consider sponsor technical training as part of a continuing education program for usability professionals.

3. Develop usability training programs for technical professionals

   The complementary side of the training for usability professionals is providing software professionals with training in user-centered design. Until programmers understand our field they will not respect it nor will they participate in it. Many of the books on UCD that have been written to date are focused on the usability professional. We suggest that the professional societies help develop courses and curricula for software engineers.

4. Develop technology fluency training for the business community

   The third leg of the training effort is to help end-users develop conceptual level skills in technology and user-centered design so that they can become full participants in the design process. Despite the numerous opportunities for computer training that are available in the marketplace, this type of training is not widely available/

5. Work with software engineering methodology projects to ensure that UCD processes are incorporated.

There is a lot of current work related to the development of new software engineering methodologies. In general, user-centered design is not emphasized in these methodologies and usability professionals rarely have a role in designing them. If user-centered design is not incorporated into these development methodologies, there is significant risk that it will be treated superficially in projects that follow the methodologies. If we are able to make UCD a part of software development methodologies, it will be easier to argue for its incorporation into development projects and the allocation of significant resources to it.

6. Work with the government to define procurement regulations

   Finally, we believe that the usability professional should work with government to create mandates for minimum usability standards when software is procured for government use. This would apply both to commercial off-the-shelf software and custom development projects.

7. Develop awards programs

   Awards can be helpful in identifying good practices and products. Awards, such as those given by the American Institute of Architects, could influence other designers and industry leaders. Awards are useful stimulants of discussion and hopefully offer incentives to designers of the next generation of user interfaces.

8. Create alliances with trusted evaluators

   Evaluations by such groups as Consumer's Union and Underwriters Laboratory can carry considerable weight. These groups maintain objectivity and independence that generates a level of trust in their evaluations. It would be useful for the professional organizations to explore working with such groups to establish minimum criteria for usability and promote public awareness.

   Another area for potential alliances is for industry associations, such as the Software Publishers Association, that might find it in their own interest to become champions of usability.

Looking to the future

This is a critical time for the usability industry. The world of computing is changing and if we take a strong and coherent stand for user-centered design, we can emerge as key players in the development process. If we fail to do this, the role of UI designer and evaluator may fall to less skilled and passionate players. As usability professionals, we need to raise our profile to the public, to software developers and to managers. We need to communicate the value of our position and teach the techniques we have developed. Only then will we be able to create tools that can transform society.

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