
2

CHAPTER

User Interface Design's Return on Investment: Examples and Statistics

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2.1

INTRODUCTION: WHAT DO WE MEAN BY THE RETURN ON INVESTMENT OF USABILITY?

Making computer-based products (and services) more usable is smart business. Usability increases customer satisfaction and productivity, leads to customer trust and loyalty, and contributes to tangible cost savings and profitability. User interface (UI) development is part of a product's development cost anyway, and it pays to do it right.

Most software and Web site development managers view usability costs as added effort and expense, but more commonly the reverse is true. Because the first 10% of the design process, when key system-design decisions are made, can determine 90% of a product's cost and performance, usability techniques help keep the product aligned with company goals (Smith and Reinersten, 1991). Usability returns many benefits (return on investment [ROI]) to products developed for internal use or sale (Lund, 1997; Mayhew and Mantei, 1994; Wilson and Rosenbaum, Chapter 8).

The following are some of the benefits that drive internal ROI:

- ♦ Increased user productivity
- ♦ Decreased user errors
- ♦ Decreased training costs
- ♦ Increased savings from making changes earlier in design lifecycle
- ♦ Decreased user support

The following are some of the benefits that drive external ROI:

- ♦ Increased sales
- ♦ Decreased customer support costs
- ♦ Increased savings from making changes earlier in the design lifecycle
- ♦ “Reduced cost of providing training (if training is offered through the vendor company)” (Mayhew and Mantei, 1994, p. 126)
- ♦ Increased perception of value of company by stakeholders

Usability also plays a role in the public's perception of a company, affecting brand value and market share. About 15% (Nielsen, 1993) of the space in reviews published in trade magazines, journals, and national newspapers is devoted to user friendliness or usability. Media giants such as the *New York Times*, the *Financial Times*, and the *Wall Street Journal* publish weekly columns that evaluate software (Mayhew and Mantei, 1994, p. 25). *Info World* devotes between 18% and 30% of its software review articles to ease of learning, ease of use, and quality of documentation (Nielsen, 1993). In recent years, ease of use is an increasingly frequent theme of consumer, Web, and mobile technology reviews. The *New York Times'* negative review of BMW's iDrive vehicle UI is characteristic of such usability-oriented reviews (Smith, 2002, p. 50).

Usability can also affect a company's financial health and public perception in less obvious ways. Many companies do not understand the issues users have with their products. Because of problems caused by these oversights, manufacturers have been found liable for defective designs. To their regret, the courtroom evaluation of a product's usability was often the first time such manufacturers were exposed to human factors engineering (Mauro, 1994, p. 127). More recently, the medical industry has noted that the use of human factors has reduced device-related medical errors (www.injuryboard.com/view.cfm/Article=810, as of September 1, 2004).

Let's now look at the evidence of ROI for usability in UI design.

2.2 HOW CAN WE “PROVE” THE RETURN ON INVESTMENT? SOME EXAMPLES AND STATISTICS

With an understanding of the basic benefits of usability, let's examine the evidence for a positive ROI. In the following sections, we list key usability benefits and then define appropriate value propositions. For each of these value propositions, we present examples from the literature that help interpret the cost of

usability challenges and/or we cite statistics. Although a cost-benefit analysis for every circumstance does not exist, these “proofs” of applying usability in UIs predict likely quantifiable benefits or ROI. For ease of reference, these findings are summarized in Table 2.1.

2.2.1 Overall Value of Implementing User Interface Practices

Because of the number of well-documented examples of cost savings with usability engineering, sound statistics can be applied generally to UI development. These statistics serve as benchmarks.

Value Proposition: High Return on Savings and Product Usability

Some Statistics

“The rule of thumb in many usability-aware organizations is that the cost-benefit ratio for usability is \$1 : \$10–\$100. Once a system is in development, correcting a problem costs 10 times as much as fixing the same problem in design. If the system has been released, it costs 100 times as much relative to fixing in design” (Gilb, 1988).

“The average user interface has some 40 flaws [note: this figure is presumably based primarily on client-server software applications, as opposed to Web sites; typical Web sites might have even more flaws considering the large number of sites constructed by developers with little usability training]. Correcting the easiest 20 of these yields an average improvement in usability of 50%. The big win, however, occurs when usability is factored in from the beginning. This can yield efficiency improvements of over 700%” (Landauer, 1995).

2.2.2 Development: Reduce Costs

Usability engineering is most effective at the beginning of the product development cycle, especially if it is part of quality functional deployment (QFD), a process used for structuring the development process through a primary focus on customer (i.e., user, not purchaser) requirements. With use of QFD, reducing development time by one third to one half is possible (Scerbo, 1991).

Although full-blown versions of QFD may be too complex for a particular development project and QFD often requires a skilled facilitator to manage the process, “lighter” versions can be helpful in fast-paced and/or smaller

Table 2.1 Fast Stats

Overall Value of Implementing UI Practices	
High return on savings and product usability	"Once a system is in development, correcting a problem costs 10 times as much as fixing the same problem in design. If the system has been released, it costs 100 times as much relative to fixing in design" (Gilb, 1988).
Development: Reduce Costs	
Save development costs	"Approximately 63% of large software projects are over budget and the top four reasons rated as having the highest responsibility were related to usability engineering" (Nielsen, 1993).
Save development time	"Speeding up development is a key goal for integrating usability effectively into product development; one-quarter delay in bringing a product to market may result in the loss of 50% of the product's profit" (Conklin, 1991).
Reduce maintenance costs	"It has been found that 80% of software life cycle costs occur during the maintenance phase and were associated with 'unmet or unforeseen' user requirements and other usability problems" (Nielsen, 1993).
Save redesign costs	"Sun Microsystems has shown how spending about \$20,000 could yield a savings of \$152 million. Each and every dollar invested could return \$7,500 in savings" (Rhodes, 2000).
Sales: Increase Revenue	
Increase transactions/purchases	"You can increase sales on your site as much as 225% by providing sufficient product information to your customers at the right time" (User Interface Engineering, 2001).
Increase product sales	"It is common for usability efforts to result in a hundred percent or more increase in traffic or sales" (Nielsen, 1999a).
Increase traffic, size of audience	"The company said in the month after the February 1999 re-launch that traffic to the Shop IBM online store

Table 2.1 Fast Stats—*Continued*

	increased 120 percent, and sales went up 400 percent” (Battey, 1999). “The change increased the traffic [at HomePortfolio.com] up 129% the week we put it up” (Interaction Design, Inc., 2001).
Retain customers	“More than 83% of Internet users are likely to leave a Web site if they feel they have to make too many clicks to find what they’re looking for” (Arthur Andersen, 2001).
Attract more customers (appeal)	“When respondents were asked to list the five most important reasons to shop on the Web, 83% stated ‘Easy to place an order’ as the top reason” (Nielsen, 1999a).
Increase market share (competitive edge)	“The importance of having a competitive edge in usability may be even more pronounced for e-commerce sites, which commonly drive away nearly half of repeat business by making it difficult for visitors to find the information they need” (Manning, 1999).
Use: Improve Effectiveness	
Increase success rate, reduce user error	“In Jared Spool’s study of 15 large commercial sites users could only find information 42% of the time even though were taken to the correct home page before they were given the test tasks” (Nielsen, 1998b).
Increase efficiency/ productivity (reduce time to complete task)	“Inadequate use of usability engineering methods in software development projects have been estimated to cost the US economy about \$30 billion per year in lost productivity” (Landauer, 1995).
Increase user satisfaction	“In a Gartner Group study, usability methods raised user satisfaction ratings for a system by 40%; when systems match user needs, satisfaction often improves dramatically” (Harrison <i>et al.</i> , 1994, p. 215).
Increase job satisfaction/ decrease job turnover	“Surveys showed that video display terminal workers had twice as many complaints of neck and shoulder discomfort, eye strain was reported three times as

Continues

Table 2.1 Fast Stats—*Continued*

	often, and there were higher rates of absenteeism, less job satisfaction, and increased (30%) turnover” (Schneider, 1985).
Increase ease of use	“Incorporating ease of use into your products actually saves money. Reports have show it is far more economical to consider user needs in the early stages of design, than it is to solve them later” (IBM, 2001).
Increase ease of learning	“A study by <i>Computer + Software News</i> (1986) found that users rated ease of use second at 6.8 out of 10, while ease of learning was rated fourth at 6.4 on a scale of important purchase factors” (Harrison <i>et al.</i> , 1994, p. 211).
Increase trust in systems	“[EuroClix user trials] . . . study clearly shows that consumers’ trust concerns can significantly be alleviated by providing relevant information when and where users need it” (Egger and de Groot, 2000).
Decrease support costs	“In the next release, support calls ‘dropped dramatically’; Microsoft recognized ‘significant cost savings’ ” (Ehrlich and Rohn, 1994, p. 96). “Over 50,000 users called support for assistance, at a cost to the company of nearly \$500,000 a month. To correct the situation, the manufacturer . . . ended up spending \$900,000 on the problem. No user testing . . . was conducted before its release . . .” (Mauro, 1994, p. 129).
Reduce training/ documentation cost	“A study by <i>Computer + Software News</i> (1986) found that information systems managers rated ease of training seventh (out of 10) on a scale of important purchase factors” (Harrison <i>et al.</i> , 1994, p. 211).
Other	
Litigation deterrence and safety	“Usability is a principal factor for determining manufacturers’ liability based on expert hard evidence on how a design should have used usability” (Mauro, 1994, p. 127).

development environments. For example, new products do not require investment in any particular design—and numerous possibilities can be explored at relatively little cost (Bias and Mayhew, 1994) (Fig. 2.1).

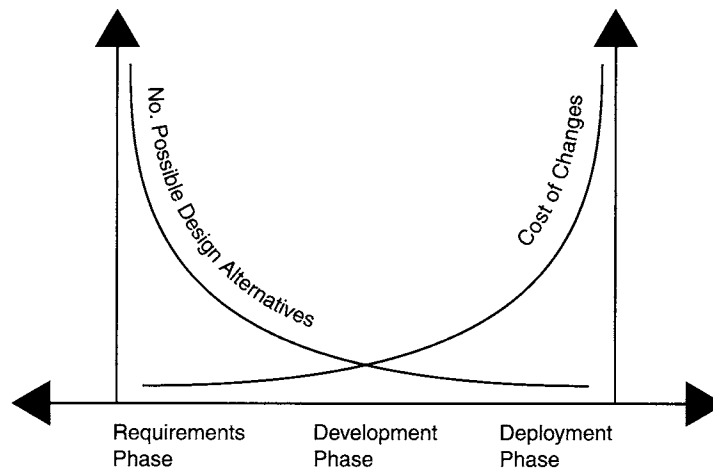
Usability analysis can help establish key, substantive design issues, even for new versions of existing products or to counter stakeholder belief in adhering to flawed existing products. Applying human factors in the initial design can greatly reduce extensive redesign, maintenance, and customer support, which can substantially eat away profits.

Reducing costly repairs to flaws can accumulate short-term benefits during product development, and reducing customer interactions can accumulate long-term benefits during product release. Customers directly benefit from usability improvements by increases in ease of use, ease of learning, user satisfaction, and user productivity. At the same time, decreases occur in the number of “user” errors, costs for training and support, and maintenance. Taking proactive measures in usability and quality during the initial production stages can produce a cost-saving “ripple effect.”

Value Proposition: Save Development Costs

Examples

“Savings from earlier vs. later changes: Changes cost less when made earlier in the development life cycle. Twenty changes in a project, at 32 hours per change and [a minimal] hourly rate of \$35, would cost \$22,400. Reduc-



FIGURE

2.1

The number of possible designs decreases as the cost to make changes increases (Erlich and Rohn, 1994, p. 80).

ing this to 8 hours per change would reduce the cost to \$5,600. Savings = \$16,800" (Human Factors International, 2001a).

"A financial services company had to scrap an application it had developed, when, shortly before implementation, developers doing a User Acceptance test found a fatal flaw in their assumptions about how data would be entered. By this time, it was too late to change the underlying structure, and the application [was] never implemented" (Dray, 1995).

Statistics

"When managers were polled regarding the reasons for the inaccurate cost estimates, the top four reasons were issues that could have been addressed by following best practices in usability engineering. These include frequent requests for changes by users, overlooked tasks, users' lack of understanding of their own requirements, and insufficient communication and understanding between users and analysts" (Barker, 2000).

"A study of software engineering cost estimates showed that 63% of large software projects significantly overran their estimates. . . . When asked to explain their inaccurate cost estimates, software managers cited 24 different reasons and, interestingly, the four reasons rated as having the highest responsibility were related to usability engineering. Proper usability engineering methodology will prevent most such problems and thus substantially reduce cost overruns in software projects" (Nielsen, 1993, citing from Lederer and Prasad, 1992).

Value Proposition: Save Development Time

Examples

Usability techniques allowed a high-tech company to reduce the time spent on one tedious development task by 40% (Ehrlich and Rohn, 1994). At another company, usability techniques helped cut development time by 33% to 50% (Bosert, 1991).

Statistics

"Conklin (1991) states that speeding up development is a key goal for integrating usability effectively into product development and that a one-quarter delay in bringing a product to market may result in the loss of 50% of the product's profit" (Karat, 1994).

"Increased revenues accrue due to the increased marketability of a product with demonstrated usability, increased end-user productivity, and lower

training costs. Conklin (1991) states that another usability goal is speeding up market introduction and acceptance by using usability data to improve marketing literature, reach market influencers and early adopters, and demonstrate the product’s usability and reduced training cost” (Karat, 1994). Although much of Conklin’s work was based on long development cycles (lasting years in some cases), and even with the emergence of extreme programming, agile programming, and other means to achieve programming results quicker, even letting users do quality assurance by responding to the current state of Web sites or Web applications, these techniques still have value.

Value Proposition: Reduce Maintenance Costs

Example

“[Usability engineering techniques] are quite effective at detecting usability problems early in the development cycle, when they are easiest and least costly to fix. By correcting usability problems in the design phase, American Airlines reduced the cost of those fixes by 60–90%” (Harrison *et al.*, 1994, p. 217).

Statistics

“One [well-known] study found that 80 percent of software life-cycle costs occur during the maintenance phase. Most maintenance costs are associated with ‘unmet or unforeseen’ user requirements and other usability problems” (Pressman, 1992).

“Martin and McClure found that \$20–30 billion was spent worldwide on maintenance. Studying backlogs of maintenance work shows that an ‘invisible’ backlog is 167% the size of the declared backlog. Anonymous case study data show that internal development organizations are spending the majority of their resources on maintenance activities and thus cannot initiate development of strategic new systems” (Martin and McClure, 1983).

Value Proposition: Save Redesign Costs

Example

“Sun Microsystems has shown how spending about \$20,000 could yield a savings of \$152 million. Each and every dollar invested could return \$7,500 in savings” (Rhodes, 2000). Whether a login improvement saves thousands of people a few seconds every day for a year or a dialogue box eliminates

the need for a limited number of people to spend an hour of time, the net savings can be dramatic.

2.2.3 Sales: Increase Revenue

Usable products often lead to substantial cost savings and sales. Unusable products most often prevent a customer from accomplishing a task or retrieving information necessary to make an e-commerce purchase. Online shoppers spend most of their time and money at Web sites with the best usability (Nielsen, 1998a). Good navigation and Web site design make it easier for users to find what they're looking for and to make a purchase once they've found it (Donahue, 2001). Because so many poorly designed Web sites exist, when customers find one that "works," they tend to return for repeat business and gain trust in the organization.

Usable products also lead to good product reviews. Publications devote space just to this one factor, and good reviews lead to increased sales.

Value Proposition: Increase Transactions/Purchases

Statistics

"You can increase sales on your site as much as 225% by providing sufficient product information to your customers at the right time. In our recent research, we found that the design of product lists directly affected sales. On sites that did not require shoppers to bounce back-and-forth between the list and individual product pages, visitors added more products to their shopping cart and had a more positive opinion of the site. By understanding your customer expectations and needs, and designing your product lists accordingly, you can significantly increase your sales" (User Interface Engineering, 2001).

"One study estimated that improving the customer experience increases the number of buyers by 40% and increases order size by 10%" (Creative Good, 2000).

Value Proposition: Increase Product Sales

Examples

Wixon and Jones did a case study of a usability-engineered software product that increased revenue by more than 80% over the first release of the product (built without usability work). "The revenues of the usability-enhanced system were 60% higher than projected. Many customers cited

usability as a key factor in buying the new system.” Usability activities included field studies, tracking of usability bugs, and heuristic evaluations (Wixon and Jones, 1995).

“After move.com completed the redesign of the home ‘search’ and ‘contact an agent’ features based on a UI consulting firm’s recommendations, users’ ability to find a home increased from 62% to 98%, sales lead generation to real estate agents increased over 150%, and [move.com’s] ability to sell advertising space . . . improved significantly” (Vividence Corp., 2001).

Statistics

“The magnitude of usability improvements is usually large. This is not a matter of increasing use by a few percent. It is common for usability efforts to result in a hundred percent or more increase in traffic or sales” (Nielsen, 1999b).

“Convolutd e-commerce sites can lose up to half of their potential sales if customers can’t find merchandise, according to Forrester Research, Inc.” (Kalin, 1999).

Value Proposition: Increase Traffic (Size of Audience)

Examples

“IBM’s Web presence has traditionally been made up of a difficult-to-navigate labyrinth of disparate subsites, but a redesign made it more cohesive and user-friendly. According to IBM, the massive redesign effort quickly paid dividends. The company said in the month after the February 1999 re-launch that traffic to the Shop IBM online store increased 120 percent, and sales went up 400 percent” (Battey, 1999).

“At HomePortfolio.com we monitored site traffic, observed consumers in usability studies and worked with internal business groups. This helped us make changes that made the site’s purpose clearer and increased transaction rates measurably. The change increased the traffic up 129% the week we put it up” (Interaction Design, Inc., 2001).

Value Proposition: Retain Customers (Frequency of Use)

Statistics

“More than 83 percent of Internet users are likely to leave a Web site if they feel they have to make too many clicks to find what they’re looking for, according to Andersen’s latest Internet survey” (Arthur Andersen, 2001).

“A bad design can cost a Web site 40 percent of repeat traffic. A good design can keep them coming back. A few tests can make the difference” (Kalin, 1999).

Value Proposition: Attract More Customers (Increase Appeal)

Example

“Staples.com determined that the key to online success and increased market share was to make its e-commerce site as usable as possible. Staples.com spent hundreds of hours evaluating users’ work environments, decision-support needs, and tendencies when browsing and buying office products and small business services through the Web. Methods included data gathering, heuristic evaluations, and usability testing.” [They achieved these results]:

- ◆ 67% more repeat customers
- ◆ 31–45% reduced drop-off rates
- ◆ 10% better shopping experience
- ◆ 80% increased traffic
- ◆ Increased revenue (Human Factors International, 2001b).

A Statistic

“In a 1999 study of Web users, respondents were asked to list the five most important reasons to shop on the Web. Even though low prices definitely do attract customers, pricing was only the third-most important issue for respondents. Most of the answers were related to making it easy, pleasant, and efficient to buy. The top reason was ‘Easy to place an order’ by 83% of the respondents” (Nielsen, 1999a).

Value Proposition: Increase Market Share (Competitive Edge)

Example

“‘Usability is one of our secret weapons,’ says Mark Thompson, vice-president of customer experience at Charles Schwab & Co., Inc. The secret weapon appears to be working. Schwab’s main Web site for U.S. investors, www.schwab.com, handles more than \$7 billion in securities transactions a week, with more than 2 million active customer accounts holding \$174 billion in assets. With those numbers, you might wonder why Schwab would need to make any changes to its Web site at all. But Schwab knows it cannot afford to coast; as more and more newcomers get online and the competi-

tion for their dollars increases, more e-commerce sites are making ease of use a differentiator. ‘A year ago, it was a rush to put up applications and functionality. . . . It’s now a rush to be useful’ ” (Kalin, 1999).

Statistics

“The importance of having a competitive edge in usability may be even more pronounced for e-commerce sites. Such sites commonly drive away nearly half of repeat business by not making it easy for visitors to find the information they need” (Manning, 1999).

“The repeat customers are most valuable: new users at one e-commerce site studied spent an average of \$127 per purchase, while repeat users spent almost twice as much, with an average of \$251” (Nielsen, 1997a).

2.2.4 Use: Improve Effectiveness

User-centered design benefits users, the users’ company, and the vendor’s company. Increased usability increases productivity and job satisfaction while decreasing customer support needs and documentation requirements. All these benefits, with additional possible reduced employee absenteeism and turnover, align with fulfilling successful business goals.

Value Proposition: Increase Success Rate and Reduce User Error

Examples

“One study at NCR showed a 25% increase in throughput with an additional 25% decrease in errors resulting from redesign of screens to follow basic principles of good design” (Gallaway, 1981).

“On Disney.com, for example, when UIE asked users to find the hotel closest to the monorail at Disney World, about 20 percent became lost in Disneyland and didn’t even know it. ‘If one in five people who came to the theme parks got lost,’ [Jared] Spool says, ‘Disney would fix it.’ Disney Online’s Senior Vice President and General Manager Ken Goldstein notes that Disney Online is already committed to developing an easy-to-use Internet design. While Disney Online did not have anything to do with Spool’s tests, Goldstein is interested in his findings. ‘As the next generation of Disney.com evolves,’ Goldstein says, ‘we will continue to respond to customer input through our own usability testing’ ” (Kalin, 1999).

Statistics

“A study from Zona Research found that 62% of Web shoppers have given up looking for the item they wanted to buy online (and 20% had

given up more than three times during a two-month period)” (Nielsen, 1998b).

“In Jared Spool’s study of 15 large commercial [Web]sites, users could only find information [that they were seeking] 42% of the time even though they were taken to the correct home page before they were given the test tasks” (Nielsen, 1998b).

Value Proposition: Increase Efficiency and Productivity (Reduce Time to Complete Tasks)

Examples

“With its origins in human factors, usability engineering has had considerable success improving productivity in IT organizations. For instance, a major computer company spent \$20,700 on usability work to improve the sign-on procedure in a system used by several thousand people. The resulting productivity improvement saved the company \$41,700 the first day the system was used. On a system used by over 100,000 people, for a usability outlay of \$68,000, the same company recognized a benefit of \$6,800,000 within the first year of the system’s implementation. This is a cost-benefit ratio of \$1:\$100” (Karat, 1994, pp. 57–58).

“To build a model intranet, Bay Networks spent \$3 million and two years studying the different ways people think about the same thing. The result: all think alike about the \$10 million saved each year” (Fabris, 1999).

Statistics

“Inadequate use of usability engineering methods in software development projects have been estimated to cost the U.S. economy about \$30 billion per year in lost productivity (see Tom Landauer’s excellent book *The Trouble with Computers*). By my estimates, bad intranet Web design will cost \$50–100 billion per year in lost employee productivity in 2001 (\$50B is the conservative estimate; \$100B is the median estimate; you don’t want to hear the worst-case estimate!). Bad design on the open Internet will cost a few billion more, though much of this loss may not show up in gross national products, since it will happen during users’ time away from the office” (Nielsen, 1997b).

“On a corporate intranet, poor usability means poor employee productivity; usability guru Jakob Nielsen estimates that any investment in making an intranet easier to use can pay off by a factor of 10 or more, especially at large companies” (Kalin, 1999).

Value Proposition: Increase User Satisfaction**Example**

“One airline’s IFE (In-flight Entertainment System) was so frustrating for the flight attendants to use that many of them were bidding to fly shorter, local routes to avoid having to learn and use the difficult systems. The time-honored airline route-bidding process is based on seniority. Those same long-distance routes have always been considered the most desirable. For flight attendants to bid for flights from Denver to Dallas just to avoid the IFE indicated a serious morale problem” (Cooper, 1999).

Statistic

“When systems match user needs, satisfaction often improves dramatically. In a 1992 Gartner Group study, usability methods raised user satisfaction ratings for a system by 40%” (Harrison *et al.*, 1994, p. 219).

Value Proposition: Increase Job Satisfaction and Decrease Job Turnover**Example**

“Humantech, Inc., studied ergonomic office environments and productivity for 4000 managerial, technical, and clerical workers in a broad cross-section of North American industries. Surveys showed that video display terminal workers had twice as many complaints of neck and shoulder discomfort, eye strain was reported three times as often, and there were higher rates of absenteeism less job satisfaction, and increased (30%) turnover” (Schneider, 1985).

Value Proposition: Increase Ease of Use**Statistic**

“Incorporating ease of use into your products actually saves money. Reports have shown it is far more economical to consider user needs in the early stages of design, than it is to solve them later. For example, in *Software Engineering: A Practitioner’s Approach*, author Robert Pressman shows that for every dollar spent to resolve a problem during product design, \$10 would be spent on the same problem during development, and multiply to \$100 or more if the problem had to be solved after the product’s release” (IBM, 2001).

Value Proposition: Increase Ease of Learning

Statistic

"A study by *Computer + Software News* (1986) found that users rated ease of use second at 6.8 out of 10, while ease of learning was rated fourth at 6.4 on a scale of important purchase factors" (Harrison *et al.*, 1994, p. 211).

Value Proposition: Increase Trust in Systems

Example

"User trials were used to redesign the EuroClix Web site before its launch. In its first six months, it convinced more than 30,000 users to sign up. This study clearly shows that consumers' trust concerns can significantly be alleviated by providing relevant information when and where users need it" (Egger and de Groot, 2000).

Value Proposition: Decrease Support Costs

Examples

"At Microsoft several years ago, Word for Windows's print merge feature was generating a lot of lengthy (average = 45 minutes) support calls. As a result of usability testing and other techniques, the user interface for the feature was adjusted. In the next release, support calls 'dropped dramatically'; Microsoft recognized 'significant cost savings'" (Ehrlich and Rohn, 1994, p. 96).

"A certain printer manufacturer released a printer driver that many users had difficulty installing. Over 50,000 users called support for assistance, at a cost to the company of nearly \$500,000 a month. To correct the situation, the manufacturer sent out letters of apology and patch diskettes (at a cost of \$3 each) to users; they ended up spending \$900,000 on the problem. No user testing of the driver was conducted before its release. The problem could have been identified and corrected at a fraction of the cost if the product had been subjected to even the simplest of usability testing" (Mauro, 1994, p. 129).

Value Proposition: Reduce Training and Documentation Cost

Examples

"In another company, business representatives did a cost-benefit analysis for a new system and estimated that a well-designed GUI front end had an Internal Rate of Return of 32%. This was realized through a 35% reduc-

tion in training, a 30% reduction in supervisory time, and improved productivity, among other things” (Dray and Karat, 1994).

“At one company, end-user training for a usability-engineered internal system was one hour compared to a full week of training for a similar system that had no usability work. Usability engineering allowed another company to eliminate training and save \$140,000. As a result of usability improvements at AT&T, the company saved \$2,500,000 in training expenses” (Harrison *et al.*, 1994, p. 215).

Statistic

“A study by *Computer + Software News* (1986) found that information systems managers rated ease of training seventh (out of 10) on a scale of important purchase factors” (Harrison *et al.*, 1994, p. 215).

2.2.5 Other Return on Investment Factors

Since the early 1960s, product safety-related issues have led to pro-plaintiff legal precedents in U.S. courts. A manufacturer that has not included usability factors into its product is usually found liable. If a manufacturer has assimilated human factors engineering into its development process, claims on the grounds of usability may be greatly reduced.

Value Proposition: Litigation Deterrence and Safety

Examples

“Although software makers don’t seem liable to the same sorts of litigation as, for example, a manufacturer of medical equipment, poor usability may be an element in lawsuits. For example, the Standish Group reported that American Airlines sued Budget Rent-A-Car, Marriott Corporation, and Hilton Hotels after the failure of a \$165 million car rental and hotel reservation system project. Among the major causes of the project’s disintegration were ‘an incomplete statement of requirements, lack of user involvement, and constant changing of requirements and specifications,’ all issues directly within usability’s purview” (Standish Group, 1995).

“Poor usability is a potential element in lawsuits and other litigation. The U.S. government’s recent case against Microsoft hinged on a usability question: Are users well-served when the browser and operating system are closely integrated?” (Donahue, 2001).

Statistic

Chapanis (1991) cites two independent studies that showed a 54% reduction in rear-end accidents with the use of human factors improvement: the centered high-mount brake light on autos.

2.3 CONCLUSION

The examples and statistics listed here are limited by space to brief citations. The original documents provide more complete contexts and additional details of which specific functions led to savings of money, time, or effort or to the improvements in performance or preference. The return can be a modest but important savings in user's time or a dramatic increase in safety that is recognized as a profound industry-changing paradigm.

One other aspect not touched upon by this chapter is the concern that improved usability might mean that companies can hire users with less training and background or that increasingly usable software might put usability professionals out of a job. First, for decades inevitable business pressures have led companies to find less expensive laborers to complete business tasks. This has little to do with the goal of achieving usability. Some professionals hide behind obscure, arcane practices to preserve their privileged positions, anyway. Whoever is doing the work should have access to a UI as usable as professional designers and analysts can achieve. Everyone benefits in the end.

Another aspect of increased usability is that some of the professional work, for better or for worse, is transferred to the general public. Consider desktop publishing, which transferred specific skills of typographers, graphic designers, graphic artists, compositors, printers, and other specialists to the general public. One can argue for both a democratic spread of capabilities and a patrician concern for loss of quality and expertise. Although it merits consideration, discussing this argument would require another chapter in this book.

One might lament the state of public and professional education and expertise. They are related. More usable products and services mean greater efficiency, effectiveness, and satisfaction at whatever level one attains, plus the opportunity to go further if so desired. Lack of usability inhibits such achievements.

In short, usability remains a viable, positive goal for UI design, even if other concerns, such as branding, user experience, and preference, seem to have a greater share in the current professional spotlight of attention.

As for usability professionals being put out of a job by increasingly usable software . . . if only that were so. One might as well be concerned about teach-

ers not being needed anymore if everyone becomes well educated. This is not likely to happen in our lifetime—or anyone else's. New technology, new organizations of society, new media, and new content always generate new usability challenges. The only thing for certain is that things will always change. This has been apparent for several decades now, as new technology inevitably brings new players into the product/service development mix. The mistakes made are always recycling, but with different twists. There will be no lack of usability work to be done. Which country it will be done in remains to be determined (Marcus, 2004).

Finally, let us not forget that usability is not the only determinant of ROI. It is one of many factors that contribute to product/service success. Very useful products/services might be badly marketed, overpriced, not delivered in time, too technologically far ahead of their time (i.e., too demanding of it), too far ahead of their time in terms of customer understanding and desire, or badly timed in terms of the national or international economies. Users of the Apple Newton personal digital assistant (PDA), for example, continue to praise its design features, but it appeared too far ahead of the marketplace that now exists for such handheld products.

Returning to the argument for basic usability in products/services: The benefits of usability engineering can be achieved throughout the lifecycle of development. By applying usability techniques to the production process, developers can make them more efficient, which, in turn, can uniquely benefit the lifecycle. Efficient development methods can result in a faster release date, allowing manufacturers to unveil their products or services to the market prior to a competitor's. A user-centered product or service can garner positive media reviews, leading to increased sales. An effective, user-friendly UI can increase customer ease of learning, ease of use, job satisfaction, and trust in the product. As noted, it might even lead to less employee absenteeism and turnover.

Each product/service will require individual usability tasks, which also may differ from country to country or culture to culture (Marcus and Baumgartner, 2004). Developers should determine appropriate techniques for UI development before beginning a project to obtain the optimal results to facilitate cost-analysis projections. Competing groups are constantly seeking budget resources, so it is crucial to identify the cost justifications of usability engineering. Usability advocates must present a solid business case to business managers who will be looking at the company's bottom line.

Customers are constantly becoming more reliant on technical tools. As these tools are upgraded, users must learn increased information, functionality, and complexity, and usability becomes ever more critical. Because most software and Web users are not technical experts, it is imperative to make accomplishing goals

simpler and easier. Regardless of the activity, whether performance tasks or vendor purchases, the user must be the center of the design process.

Cost-benefit analyses consistently show healthy returns on the dollars invested in usability. As more companies understand the significant benefits of usability and do careful cost justification, usability techniques will become standard.

Planners, analysts, marketers, engineers (implementers), designers, and trainers face many challenges ahead. For example, it is worthwhile to know the best techniques for communicating ROI benefits in differing contexts and marketing/sales situations, as well as the best techniques to achieve specific kinds of benefits. Some of this information is discussed in the literature, but it is not always easily available to those who need to know.

The goal of this chapter has been to make available an initial useful compendium of information about the ROI of usability, especially for UI design.

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