macromedia® white paper

The Essence of Effective Rich Internet Applications

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Contents

"Companies stage an experience when they engage customers in a memorable way."

***Joe Pine and Jim Gilmore**, The Experience Economy*

Executive Summary

The focus of competition in consumer markets today is rapidly progressing beyond the mere delivery of products and services to address the quality of the complete customer experience. Businesses that provide a better customer experience can boost revenues and increase margins through their ability to acquire and retain customers without resorting to price competition. In software design, the complexities of interactive control remain the greatest impediment to a satisfying user experience. This paper identifies four essential qualities that extend familiar user-centered design criteria to define a new benchmark for interactive experiences. The software of tomorrow will be *seamless, focused, connected,* and *aware*. As the industry leader in enabling technology for Rich Internet Applications, Macromedia can help developers realize these essential qualities to their user experience today.

Why Experience Matters

Interactive software has evolved over the past forty years to provide increasingly accessible user interfaces to increasingly powerful functionality. The earliest software users were programmers as well. Their deep knowledge of the technology and personal commitment to exploiting it made them highly tolerant of complex interactive models and primitive visual displays. Today's users are very different. Virtually everyone in modern society interacts with software on a daily basis—from desktop applications to automated teller machines to telephone call routing systems—but few have any technical background or a desire to understand how things really work. Interactive software is now considered useful only to the extent that ordinary users can understand and take advantage of the functionality it provides. Usability has become a central concern in software development. Its focus is increasingly being broadened to recognize the importance of delivering a good user experience that encompasses all aspects of the product.

Joe Pine and Jim Gilmore[1] describe a Progression of Economic Value in which the focus of consumer activity shifts gradually over time from agrarian commodities to manufactured products to standardized services to memorable *experiences* that are matched to the preferences, desires, and values of the individual consumer. We are well into the transition from a service- to an experience-based economy in which *sensation* becomes a conscious source of consumer demand. Technology is not driving this transition, but the impact of new technologies will accelerate the emergence of rich, expressive, client-side platforms that deliver a more compelling sensory experience as well as a richer, more satisfying level of interactive control to the software user. Software that fails to embrace these enabling technologies will compete at a disadvantage in the experience economy.

[1] Pine, B. Joseph II and James H. Gilmore, *The Experience Economy; Work is Theater & Every Business a Stage,* Boston: Harvard Business School Press, 1999.

Providing a superior customer experience is already the key differentiator for the world's most successful consumer companies. The explosion of online access through the World Wide Web—and, increasingly, through wireless devices and mobile telephony—is extending the reach of every business and transforming its relationship with its customers. The rules of the game have changed. To remain competitive in the emerging experience economy, your business must fully exploit four key opportunities available to companies who find a way to deliver a better customer experience. We'll look briefly at each of them.

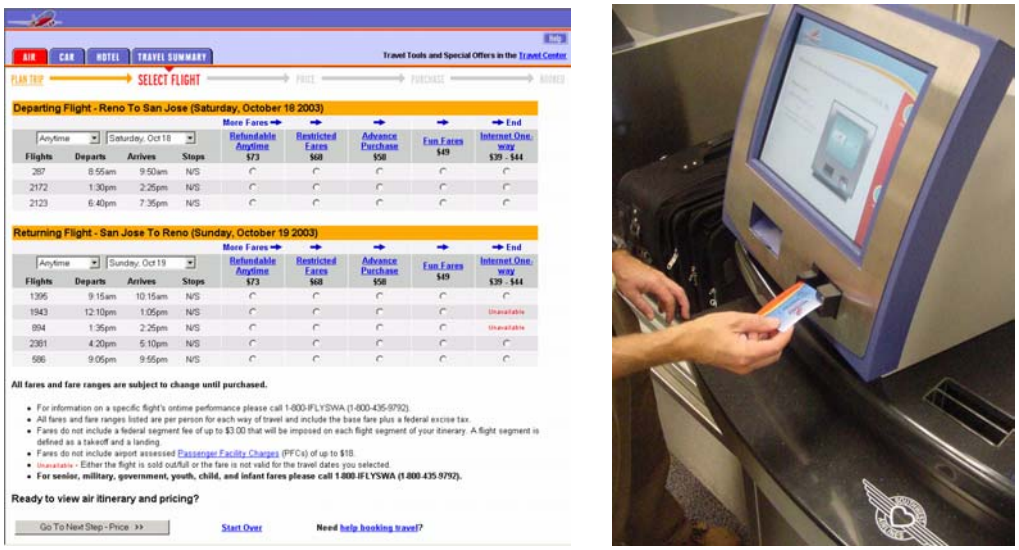


Figure 1: Southwest Airlines Reservation System and RAPID CHECK-IN Self-Service Kiosks *Southwest Airlines has one of the most effective online booking systems in the travel industry. The Reservations section of southwest.com (left) is both useful and usable. It accounts for over 50% of bookings on Southwest Airlines, which is more than double the level achieved by other major carriers, even when aggregating across all online sources.[2] And the experience extends beyond the booking phase. When customers arrive at the airport, they use the RAPID CHECK-IN terminals (right) to avoid the hassle of standing in line by obtaining their boarding passes directly from the check-in terminal. This saves Southwest Airlines the cost of serving these customers with a human employee and directly contributes to the airline's industry-leading cost structure.*

Online experiences are replacing personal interaction with customers

As customers conduct more business online, the interface to your website or application becomes the interface to your business. Online shopping has continued to grow, climbing 21% in the past three years.[3] Leading brands, like Amazon.com, prove that customers will buy online if provided with a quality interactive experience. You should take as much care to create the right kind of software environment for these customers as you take to create the right kind of physical retail environment. The online experience must compensate for the absence of a sales professional who stands ready to greet customers as they arrive and to cheerfully help them accomplish their goal. Creating a frustrating online experience is like keeping a rude, inattentive, uncooperative salesperson on the showroom floor. You shouldn't let either one undermine your business.

[2] Jupitermedia, 2003.

[3] Jupitermedia, 2003 *(excludes auto, travel, prescription drugs, auctions, and classified ads).*

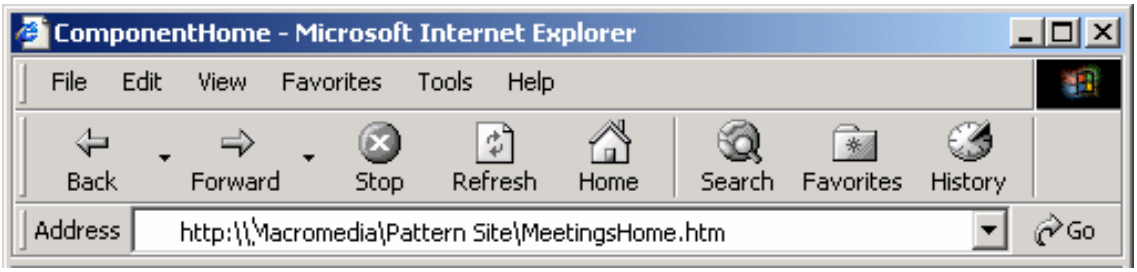


Figure 2: Global Navigation Controls in Internet Explorer *The web browser ensures that your competitor's product is just as accessible as your own—even from your own website. Without extensive custom programming, every website or application shares the same browser-level navigation system. These controls provide global navigation that may or may not help your application. Customers may become confused and leave your site inadvertently by clicking the Back button, thinking it means "back" in your application. Even worse, the presence of History and Favorites lists and that tantalizing Address field mean that customers can leave without notice and with minimal effort.*

Customer switching costs are lower than ever before

On the web, your competition is never more than a few clicks away. The cost of buying from a different website is far less than the cost of driving to a shopping center across town or in another city. Your online customers are free to sample a competitor's offering with little effort the moment they become dissatisfied with your website. A recent study targeting users of online travel agent found that 66% of the customers would immediately abandon their preferred online agent and switch to a competitor if they weren't finding what they needed.[4] This result is typical of the web shopping experience. Because it's easy to try an alternative source, any inconveniences or technical difficulties your customers experience in your website or application raise the very real possibility of losing them to a competitor. While it's certainly possible to get them back, it costs less in the long run to keep them satisfied by enhancing the customer experience in ways the competition can't match.

Figure 3: Expedia, Travelocity, Orbitz *These online travel sites exemplify the kind of free-wheeling competition enabled by the Internet. Switching costs are minimal because every site is selling out of a common inventory of travel products and pricings. Because of the common product, travel vendors must find other ways to differentiate their offerings. User experience is an obvious choice, and each of these sites has developed innovative interactive tools to help customers find attractive fares, better routes, or alternate dates or modes of travel.*

[4] Forrester Research, 2003.

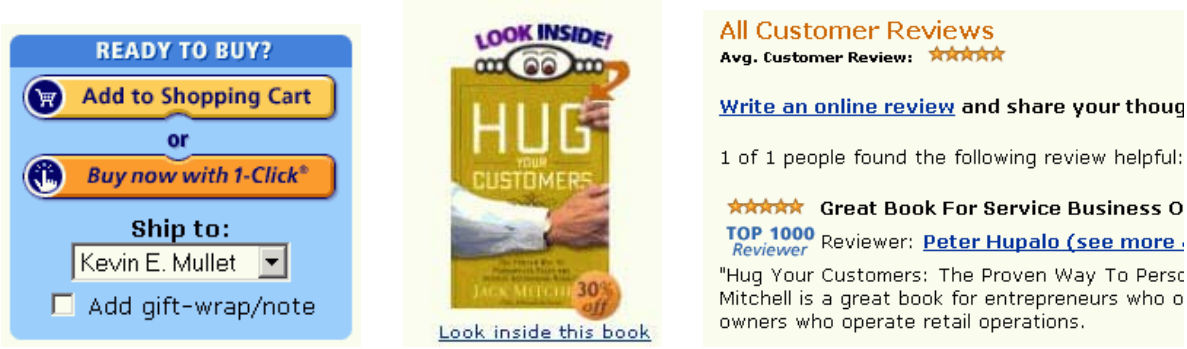


Figure 4: Unique Features Help amazon.com Deliver a Superior Shopping Experience *Although it had no "bricks and mortar" presence and its brand was initially less well known than those of established rivals, Amazon quickly built a dominant position by offering a superior online shopping experience. Innovations like the patented 1-Click® ordering model, recommendation lists, extensive customer reviews, content previews, and integrated used, rare, and out-of-print sellers combine to make the Amazon offering more useful and usable than those of competing online booksellers.*

Companies can gain new customers by offering a better experience

Customers flow toward the online experience that lets them accomplish their goals as efficiently, reliably, and predictably as possible. Anyone dissatisfied with your product can easily sample a competitor's offering to see how it compares. Satisfied customers, in contrast, produce a chain reaction of repeat business, both personally and through recommendations to others, who in turn generate additional business to the extent they, too, are satisfied with the experience. The economic leverage that results from this positive feedback effect is the key to dominating your market.

Products that offer a better user experience set up another positive feedback cycle in which customers depend more heavily on the product. Particularly when the experience is based on convenient access to stored personal data, the effect is to raise the switching costs, which continue to increase for as long your customers continue to use your product (Figure 5). When customers try a competing product, the amount of time and effort invested in re-establishing this historical data and the extra work they need to perform to get back to their benchmark experience quickly becomes apparent. Because these apparent costs generally exceed the perceived benefits of the change, they help keep customers using your product.

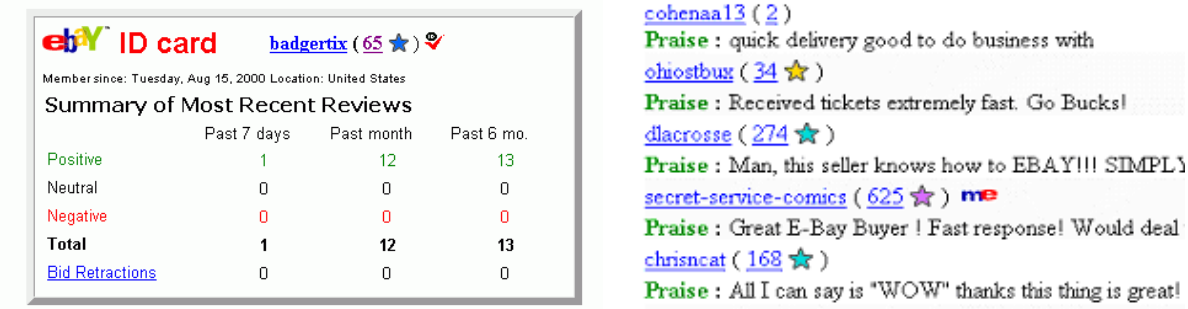


Figure 5: EBay Feedback Ratings *EBay users depend on feedback ratings to establish the trust needed to conduct transactions with people they've never met. Both buyer and seller rate each other on each transaction. Feedback accumulates over time, but you can't take it with you if you switch to another auction site. Because the rating is invaluable for both buyer and seller in an online transaction, it makes migration to competing auction sites much less attractive and thus raises switching costs.*

Figure 6: Apple Hardware Designs *Apple designed products illustrate the value of effective product design. These designs command a premium price for systems assembled from largely the same components used in commodity PCs. The higher margins help to offset Apple's smaller market size.*

Compelling customer experiences raise returns across the entire business

An online shopping experience that is less frustrating and error-prone leads to increased sales thanks to fewer dropped transactions or abandoned shopping carts. A recent survey found that more than 60% of online shoppers had been discouraged by a "bad" shopping experience.[5] Better interaction design can offset complex search and navigation tasks while a richer presentation opens the door to more effective cross-promotion and up-selling techniques that increase the value of the average transaction. The OnePage hotel booking system eliminates navigation entirely and provides a flexible interaction model (Figure 19), which has more than doubled conversion rates for some hotels.[6] As transactions are completed, reductions in the need for costly human intervention for order entry or customer service leads to healthier margins on every sale. Margins are further enhanced by the fact that customers who appreciate an experience will be willing to pay a premium price to get it, which leads to increased pricing power relative to the competition (Figure 7). For all these reasons, it is critical to provide a competitive experience—not just a better product or service—to the growing body of online customers. Experience matters to your customers, and it should matter to you as well. But how will you know whether you're providing a good experience or not? The rest of this paper reviews what we know about compelling interactive experiences, beginning with the nature of experience itself.

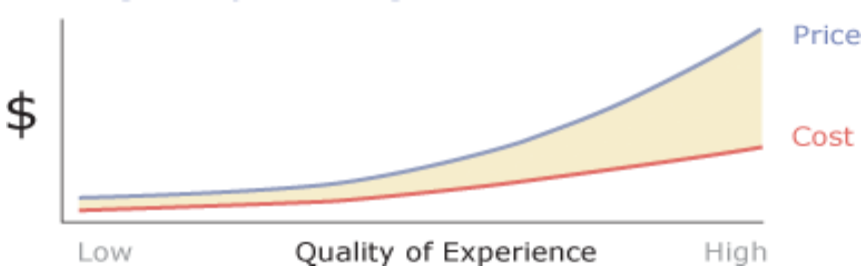


Figure 7: Expanding Margins *Customers are willing to pay more for a compelling user experience. Because the value added by the increased demand for good design rises faster than the incremental cost of material inputs, margins continue to expand as the customer experience is improved.*

[5] Joshua Dual, *The Business Impact of Rich Internet Applications*, Framingham, MA: International Data Corporation, April 2003.

[6] *Ibid.*

What Makes an Experience Great

We say we've experienced something in the real world when we can point to our own direct, active, personal involvement in the event. We haven't *experienced* a Broadway play if we've only read a review of the performance in the newspaper. Experience depends on our own presence as events unfold. The closer we are to the action—or, if not physically present, the closer we seem to be based on the qualities of the medium through which we follow the action—the more *authentic* the experience. The nostalgic "retro" design obsession of recent years trades consciously on the human desire for authenticity in the sense of purity or faithfulness to the spirit of the original design. Products like the new Mini use form and surface qualities to establish an authentic connection to another time and place.[7]

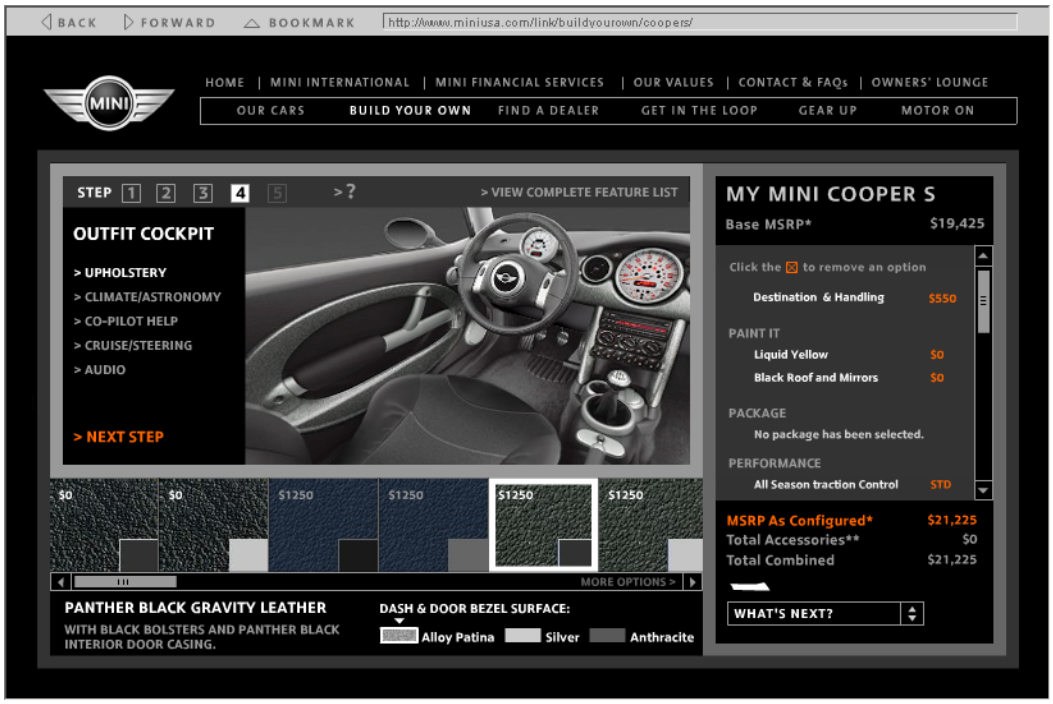


Figure 8: MiniUSA Site *All car manufacturers use websites to showcase their vehicles, but this example is particularly effective at using motion, sound, and expressive visual imagery to capture the essence of the Mini brand. This Rich Internet Application produced more than half the customer leads as the Mini shattered its US sales goals. Of the users who registered with the site, fully 75% configured a Mini to their personal specifications using the single-page configurator interface shown here.*

All other things being equal, we want our experiences to be as vivid–as immediate, direct, and engaging to our senses–as possible. Given the choice, most people prefer to experience a rock concert or a championship football game live and in person. If we can't actually be inside the stadium, then watching on television is preferable to listening on the radio: the combination of sight and sound makes the experience more vivid. The immediacy of radio makes it preferable to the online scoreboard (Figure 9) which, in turn, is far superior to waiting for an update on the evening news or (worse yet) the morning paper.

[7] See Postrel, Virginia, *The Substance of Style*, NY: Harper-Collins, 2003, pp. 109–117, for a discussion of authenticity as a design virtue and source of meaning beyond mere affectation.

Figure 9: Live-action Football versus "Live" Online Scoreboards *Rich, immersive experiences are inherently appealing, and we seek them out at every opportunity. Football is more exciting when experienced live in the stadium (left) than when followed using online scoreboards like ESPN Gametracker (right). The software experience is less immersive, but it compensates by offering interactive control to help users remain actively engaged as the event unfolds. Real-time connection to the actual game data provides a sense of immediacy, even when the accompanying imagery does not.*

The vividness of live experience arises from the direct engagement of our senses and the subconscious triggering of emotions by unfolding events. The experience of using a product follows the same course. Designers manipulate sensory inputs to trigger a desired emotional response. The surface qualities of a well-designed product give meaning to the design and produce an experience that is inherently desirable. As Virginia Postrel notes, "Our sensory side is as valid a part of nature as our capacity to speak or reason… Artifacts do not need some other justification for pleasing our visual, tactile, emotional natures."[8] But aesthetic concerns transcend mere desire. As Don Norman states, "Beautiful things work better."[9] The positive affect produced by aesthetic appreciation can actually facilitate performance.

Figure 10: Apple iPOD and Generic MP3 Players *The Apple iPOD (far left) achieved widespread success in the marketplace even though it was functionally similar to dozens of comparable MP3 players already on the market. The visual and tactile appeal of this simple, elegant design made the product immediately desirable to consumers even before its functional virtues were apparent. Without the initial appeal to desire, thousands of Windows users might never have considered buying an Apple product.*

[8] Postrel, Virginia, *The Substance of Style*, NY: Harper-Collins, 2003, p. 5.

[9] Norman, Don, *Emotional Design: Why We Love (or Hate) Everyday Things*, 2004.

In software design, performance is always a matter of significant interest. As with physical products, software presents the user with an *interactive* experience by introducing the element of personal control. Users must be able to make the product do what they want if it is to offer any real value. Aesthetics are important. They stimulate the customer's initial attraction by making a product inherently desirable, and they are often the decisive factor when choosing between otherwise comparable products. But purely aesthetic appeals must be kept in perspective. Products that depend entirely on current fashions or the novelty of a new technology may be desirable in the short term, but they'll soon be crowded out by something even cooler or more current. To achieve long-term success, a product must satisfy a genuine functional need in a way that remains accessible to its intended users.

A well-designed product is useful, usable, and desirable

Experience design is intimately tied to product design because all aspects of the product affect the user's experience. Getting the experience right depends on effective inter-disciplinary collaboration between design, marketing, and engineering organizations. Balancing the often competing interests of these organizations around a customer-driven product concept results in products that are simultaneously useful, usable, and desirable. We have already established that products become desirable when their surface qualities match the tastes and values of the target market at a deep, emotional level. Products become useful when they balance technical and marketing objectives to produce a solution that can actually fulfill the intended function in the hands of a knowledgeable user.

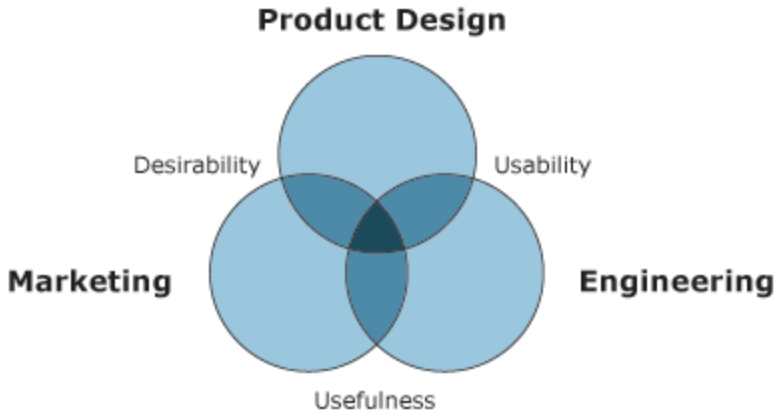


Figure 11: Product Design is an Interdisciplinary Activity *Successful products are created around a customer-driven product concept through a process of user-centered design. Marketing, engineering, and design professionals must work hand-in-hand to deliver solutions that are useful, usable, and desirable for their target market. Adapted from Cagan and Vogel.* [10]

Usability is more elusive. We speak of *using* software to help us complete a task or accomplish a goal. In the final analysis, we insist that our tax preparation software give us the right answer, no matter how painless the data entry process might be. And we want our software tools to be *usable* without too much incremental effort. What, after all, is the point of automation if it takes more work to do the job with the software than without it?

[10] Cagan, Jonathon, and Craig M. Vogel, *Creating Breakthrough Products: Innovation from Product Planning to Program Approval*, Englewood Cliffs, NJ: Prentice-Hall, 2002, p. 141.

Usability has always been the most difficult quality to instill in software design. It sits at the junction of form and function to constrain and inform the design of both aspects of the product. While still viewed as a black art by some, there is a substantial body of formal knowledge in psychology and human factors and a long history of accepted practice in the design disciplines that can guide the creation of usable products.

Usability depends on users and tasks

All products that are not purely decorative provide some level of functionality—those that don't are quickly rejected as not being useful. To determine the usability of a design, we must consider the tasks enabled by the product's functionality and the needs, abilities, and preferences of the users who will be performing them. The usability of a design determines how well the users will be able to perform the supported tasks. The best designs support the task in a way that is simple and natural for the intended user. For an interactive experience, this results in a design that lets users engage the application directly. The interface itself becomes transparent; it allows us to focus exclusively on the data we're manipulating and our progress toward the goal. The experience of *using* never interferes with the experience of *doing*. When pounding a nail, you don't stop to think about where to aim or how to hold the hammer—assuming you're using the right kind of hammer for the job, that is.

Figure 12: Specialized Tools Support Specific Tasks *Effective tools become transparent when applied to the tasks they were designed to perform. The user ceases to be aware of the operation of the tool itself and can focus all their attention on performing the task as effectively as possible. When tool and task are mismatched—when pounding nails with a soft rubber mallet or assembling furniture with a claw hammer—the user must concentrate their attention on trying to get the tool to do what they want. Quality of results becomes a secondary consideration, and the outcome is practically guaranteed to be substandard.*

Successful designs reveal fitness to purpose

The physical world is full of specialized tools whose forms have evolved over centuries to ever more closely match the needs a particular function or purpose. We should demand the same level of *fitness to purpose* from logical tools delivered in software form. We might even expect such tools to alter their form dynamically as needed to better suit the needs of specific users and tasks. Rich client technologies are ideally positioned to address both these desires. A well-designed software tool should become a natural extension of our own capabilities in the same way that a knife becomes the extension of a chef's hand or a keyboard the transcriber of a writer's thoughts. In all these cases, we want to experience the challenge of creating the artifact, not the challenge of overcoming the obstacles to effectively operate the tool. With these design values in mind, along with emerging trends in software technology, we can begin to envision a new kind of interactive experience that is qualitatively different from and vastly superior to the typical web-based experience of today.

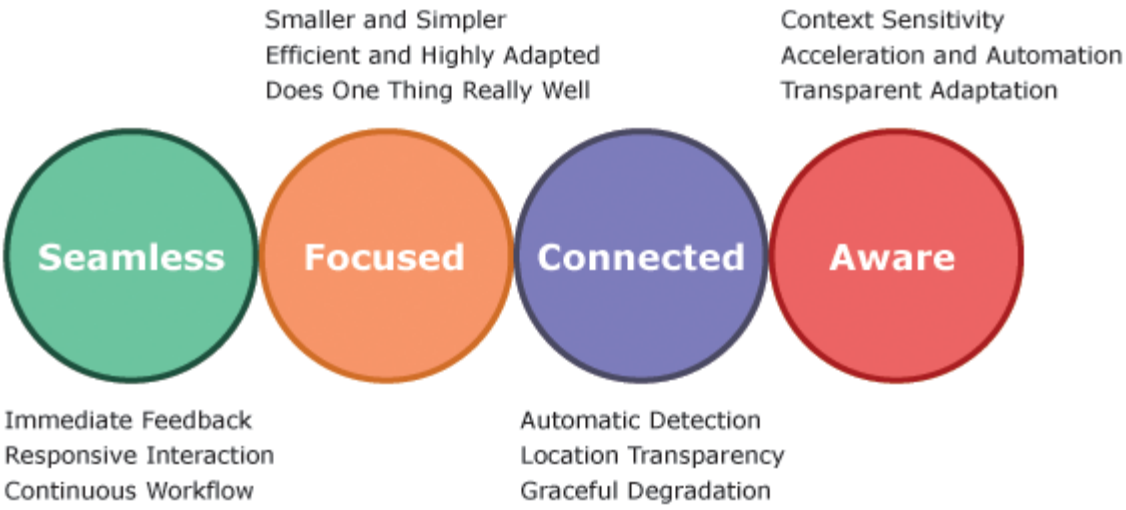


Figure 13: An Experience Ideal *The best engaging interactive experiences are seamless, focused, connected, and aware. Applications that can deliver all these qualities, in addition to the historically recognized success factors in user-centered design, will maximize usability and customer satisfaction.*

An Experience Ideal for Interactive Software

When designing the user experience, the impact of technology is always less important than a deep understanding of the task and its interaction with the user's priorities and abilities. Designers who achieve real insight into the application at this level can create a great solution in any software environment. Dan Bricklin's original VisiCalc spreadsheet was built on what would today be considered primitive presentation technology, yet it delivered a compelling interactive experience. VisiCalc created a new application category that has barely been improved upon in twenty years of subsequent development. The program and its direct descendants demonstrate that a simple, natural model, providing easy access to functionality that users care about, is enough to create a truly compelling experience in its own right, even without today's advanced rendering capabilities.

But technology does make a difference. New interaction technologies and delivery platforms are enabling qualitatively different forms of experience whose potential we are only beginning to exploit. The presentation capabilities of every software platform grow richer, more expressive, and more engaging with each release. The Mac OS desktop (Figure 14) offers a compelling indication of the direction the industry is heading. Consider the rapidly increasing use of transparency, shading, and other visual effects; better quality of color and typography; faster, more natural animation; and better dynamics in general—all delivered on bigger displays with higher resolutions and superior imaging and sound. These factors inevitably lead to a richer, more expressive interface for the user; but the actual experience will be better only if the new expressive power is used to communicate essential rather than superficial information.

For most applications, the ability to provide flexible, efficient, interactive control is more important than a beautifully rendered presentation. Game designers have understood this for years. They focus on synchronization and responsiveness as the critical success factors for an immersive gaming experience, and scale back their rendering ambitions if necessary.

Figure 14: Mac OS X and VisiCalc on the Apple II *Rich visual appeal is one way to attract users to a great interactive experience. The Mac OS X desktop (left) pushes all the right buttons by tapping into an innate human desire for sensory stimulation. In a complex environment, this kind of appeal may be needed to hold users' attention until they recognize the value of the underlying functionality. With VisiCalc (right), the value proposition is so readily apparent that the presentation can be extremely basic—in this case a primitive monochrome display—without undermining the experience.*

In its early years, the web was full of "brochure-ware" sites filled with heavy graphics but little interactivity or real content. As designers (and managers) have come to understand the true value proposition of the web, these sites have gradually been replaced by more functional designs that maintain a more print-like aesthetic and keep the focus on satisfying customer information needs. While the expressive capacity of new interaction technologies and delivery platforms is welcome, it is less critical for providing a great experience than the potential to serve as a better *medium for interaction*. As in gaming and simulations, interaction design dominates whenever real work needs to be done.

So how can we improve a medium for interaction? The defining qualities of a rich interactive experience are elusive. We all feel that we "know it when we see it" even if we have trouble putting a definition into words. The Macromedia Experience Design team, however, has identified four essential qualities that distinguish the rich interactive experience. Above all else, a great interactive experience must be *seamless*, *focused*, *connected*, and *aware*.

Seamless experiences

Interactive software produces a *seamless* user experience when it provides immediate responses and smooth transitions between tools, modes, states, displays, and other focal points within the application. The feedback loop for all user actions is tight enough to permit fine-grained control over the application without distracting users from their information management tasks. The workflow is smooth and continuous, with no unnecessary interruption or repetition imposed by the operation of the application through its user interface. Users remain in control at all times and can complete their work in the manner most convenient for them. Users can maintain their concentration on their task because they are never delayed or distracted by the mechanics of the interface itself.

Figure 15: Tab Controls in Web and Desktop Interfaces *Basic tab controls in Windows (left) provide a seamless user interface for navigating between displays. Users can switch immediately to any of the available displays by clicking the appropriate tab. The interaction is even more seamless than with folders in the real world. The HTML-based tab interface, by comparison, is never quite as fluid because the entire page—including the graphics representing the tabs themselves—must be redrawn whenever the user changes to a different tab. The entire tabbing framework disappears momentarily, and the resulting loss of continuity and visual momentum (see sidebar) is frustrating and potentially disorienting for the user. Even the best sites suffer this indignity (right). (www.amazon.com) Windows tab controls suffer from the same loss of visual momentum when multiple rows of tabs are presented and the user clicks outside the current row.*

Seamless interaction has never been the strong suit of HTML applications. Since a full-page refresh is usually needed to change any part of the display, the browser-based experience is punctuated by brief but frequent, and sometimes jarring, bursts of empty white background as the old content is replaced by the new. Even something as simple as a basic tab selector (Figure 15) is not particularly seamless in HTML renditions. The problem is exacerbated by partially rendered pages and the long delays needed to load bulky media or contact busy third-party ad servers. These delays limit the ability of HTML-based applications to offer the responsive feedback needed to deliver a truly seamless experience. Dynamic query systems, like the Vodafone Handy Finder (Figure 16), illustrate the more satisfying level of interactive control that can be achieved using local processing and data storage. The results of any changes to the control settings on the right side of the screen are immediately reflected in the set of visible products on the left. The visibility of each image is continuously filtered against the current settings, so images continuously appear and disappear as the user drags the sliders back and forth or clicks check boxes and radio buttons.

Figure 16: Vodafone Handy Finder *Continuous control inputs with immediate visual feedback create a seamless interactive experience. This dynamic query interface lets users filter a selection of cell phones based on any combination of parameters, such as price, display, or battery life. The set of matching products on the left is updated in real time as the user adjusts the filtering controls on the right. This highly interactive design lets users immerse themselves in the process of exploring the space rather than in the mechanics of submitting individual transactions and waiting for the updated display. (www.vodafoneshop.de/shop/main/index.cfm > Handy Finder)*

Visual Momentum *Continuity across a set of dynamic displays can be as important as the organization of elements within the displays themselves. Human factors research[11] shows that displays are processed more effectively when key structural elements in the display do not change from one view to the next. Applications with a high degree of visual momentum share common elements across displays. The familiarity give users a set of continuously visible reference points, which prevents them from becoming confused or disoriented as they move through the navigable space.*

Some degree of visual momentum is provided by any standard layout scheme. The various stores of amazon.com (left) share a common header layout, tabs, search forms, and directories along the top and left side of each main page. Consistent positioning of these common elements across stores helps customers maintain a sense of place and focus as they browse, even though the elements do briefly appear and disappear as the display is redrawn and may shift positions slightly between pages.

The benefits of visual momentum are at their greatest when the core elements don't disappear at all from one page to the next. It's hard to provide a seamless interactive experience when the display is repeatedly interrupted by periods of emptiness, no matter how brief. The web, of course, suffers mightily from this problem. The navigation framework is the most crucial single element in any website. Like the dashboard on a car or truck, the "view" is always changing but the controls provided to direct the view should maintain their position in a predictable location at all times.

[11] D.D. Woods. "Visual Momentum: a Concept to Improve the Cognitive Coupling of Person and Computer." *International Journal of Man-Machine Studies*, vol. 21 (1984): 229–244.

Seamless interaction designs ensure smooth transitions between visual states, and fluid control over any adjustments that must be made. The user is never interrupted, forced to wait for the application or required to follow rigid, predefined sequences. The entry, exit, and movement of display elements are modulated to avoid abrupt changes in all but the most extreme cases. Pacing then becomes an additional variable for encoding information that can be used to attract the user's attention. Context is preserved wherever possible and transparently restored when necessary. By eliminating barriers and distractions in the interaction model, the application frees users to immerse themselves completely in the task domain. Their ability to maintain focus on the work they are trying to accomplish lets them maximize their performance and satisfaction with the tool.

Focused experiences

A *focused* experience has a purpose that is clearly defined at the outset and continuously reinforced. In addition to providing seamless interaction, the listing system in Figure 17 provides a great example of a focused application design. It presents all of the information available on the real estate listings for a particular region, but that is all the system displays. There are no mode errors, and navigation errors are practically impossible to make. The only real navigation decision users need to make is to choose the type of property to view. An application has focus to the extent that it provides a very good solution for a small and clearly defined set of problems. Focused application designs abandon the goal of being all things to all people in order to concentrate on doing a few things—or even just one—especially well.

Figure 17: Finques Armengol Online Real Estate Catalog *This simple user interface for online real estate listings in Valldoreix, Spain, lets users rapidly browse through a set of available housing units in an elegant single-page application. After selecting a type of housing from the menu on the left, users click the specific unit they want to view in the central column, and then select from the row of thumbnails to view detailed images and information. The resulting interaction is far more fluid and direct than in comparable HTML-based interfaces. (www.finquesarmengol.com)*

Figure 18: Good Design Always Means Fitness to Purpose *The differences in the design of the cleaver (left), bread knife (center), and boning knife (right) arise directly from variations in the specific cutting task for which each is intended. Each design is focused on a particular cutting problem, from smashing through meat and bone, to sawing through soft bread, to gently separating meat from bone. The form exhibited by each knife represents the outcome of a process of evolution through which the basic design is incrementally improved to make it "better" for its intended cutting task.*

Every physical tool (Figure 18) represents the outcome of an evolutionary process through which its design is optimized for the purpose it serves. Over time, tools become simpler and easier to operate. Software design, in contrast, often seems to be moving in the opposite direction. The typical website or application has become so full of features that it is a challenge just to locate the core functions that users need most often. The average software user is now inundated with system and application software, shared libraries, hidden configuration information, and confusing "Help" systems. Consumers are responding by embracing a new generation of simpler, more focused tools, described as information appliances (see sidebar), that support a narrowly defined set of tasks and information needs. Tools that target a single task are easier to learn, remember, and use efficiently.

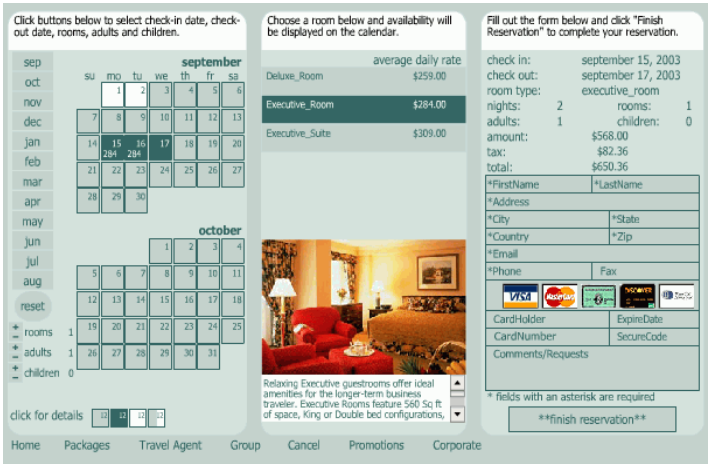


Figure 19: OneScreen™ Hotel Reservation System *The most reliable way to deliver a seamless navigation experience may be to eliminate navigation altogether. The OneScreen™ booking system presents all the necessary functionality in the same display. This design doesn't just eliminate the sequence of pages, it also produces a seamless workflow by allowing users to complete the data entry tasks in any convenient order without having to re-enter any of the data they previously entered. (www.thewatergatehotel.com > Make a Reservation)*

Information Appliance *The idea of a simple device designed around the information needs of a single function was first promoted by Jef Raskin at Apple Computer in 1978[12]. The concept has evolved into a design strategy for interactive tools hoping to break through the complexity barrier imposed by such generic computing devices as the personal computer. Don Norman defines an information appliance as a device or instrument that is specialized to support the information needs of a specific function or activity and the ability to freely exchange information with other such devices.[13] Individual applications can remain very simple without precluding their aggregation into higher-level solutions as the need arises.*

The stopwatch is not useful for telling time, but it is both useful and highly usable for timing the durations of events. The stopwatch is a highly specialized information appliance that does one thing—track elapsed time—very well. What this analog example (top) may lack in terms of connectivity to other devices could easily be addressed in an electronic version of the same functionality.

*The simple, small, and affordable Palm Pilot (center) succeeded where its much hyped predecessor—the Apple Newton—failed by discarding complex, expensive, mostly immature technologies and focusing on a core set of critical personal information management tasks. Software, too, is increasingly being deployed in small modular units that focus on critical information tasks. The E*TRADE stock quote utility based on Macromedia Flash (bottom) lets users enter the symbol to be tracked at the top of the module, after which the price is periodically updated.*

[12] Norman, Donald A., *The Invisible Computer: Why Good Products Can Fail, the Personal Computer Is So Complex, and Information Appliances Are the Solution*, Cambridge, MA: MIT Press, 1999, p. 52.

[13] Ibid, p. 53.

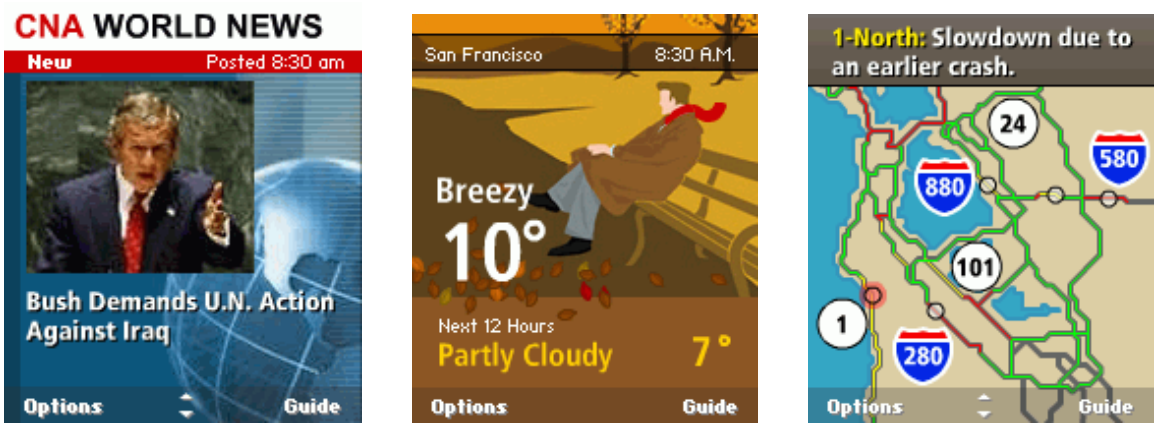


Figure 20: Focused Applications for Small Devices *Small display screens, limited input capabilities, and reduced memory and processing power all argue for small, simple, single-purpose applications on PDA and Web Phone platforms. Each of the mobile applications shown here is focused on a specific information delivery task and is accessed through a common navigation system at the bottom of the display. A full suite of applications lets users access current news (left), weather (center), and traffic (right) reports, as well as sports, financial, entertainment, and shopping information.*

The web is already proving this point as highly specialized niche sites like fandango.com, weather.com, or drudgereport.com have come to dominate their respective market segments. This trend will continue as today's monolithic applications are broken up into smaller, more manageable pieces, and the prevailing ethos of the software industry shifts from "one size fits all" to "the right tool for the job." As Don Norman observes in *The Invisible Computer*[14], what we really need for any task is not a single monolithic application, but little pieces of several applications that work together in a coordinated way to help us accomplish our goals. To achieve this coordination, application modules must be able to exchange data transparently and reliably by connecting directly to the resources they need.

Connected experiences

Laptop computers are rapidly replacing desktops as the platform of choice for consumers as well as business and technical users. These portable devices are in turn being augmented, and in some cases replaced, with even more portable PDAs and smart web phones. With the current explosion in wireless networking and cellular data transmission, applications will increasingly need to be able to offer continuous access to the resources they need, regardless of the user's physical location. *Connected* applications will transparently locate and exchange information with a variety of data sources and communication devices to shield users from the complexity of having to manage the connections themselves.

[14] Norman, Donald A., *The Invisible Computer: Why Good Products Can Fail, the Personal Computer Is So Complex, and Information Appliances Are the Solution*, Cambridge, MA: MIT Press, 1999.

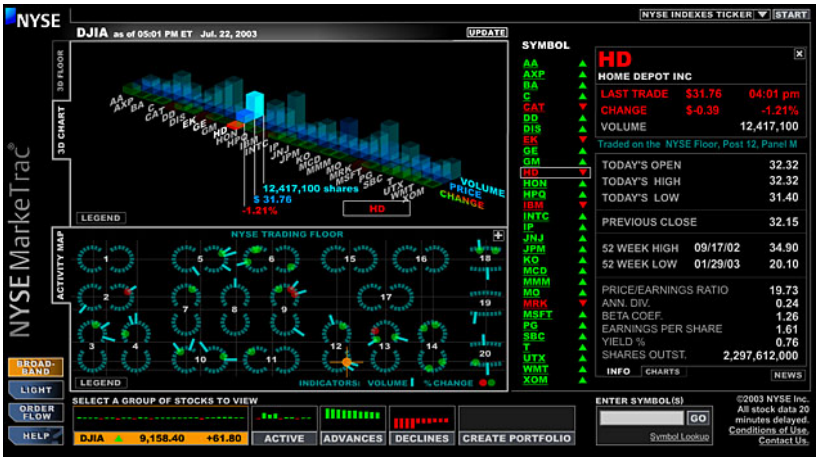
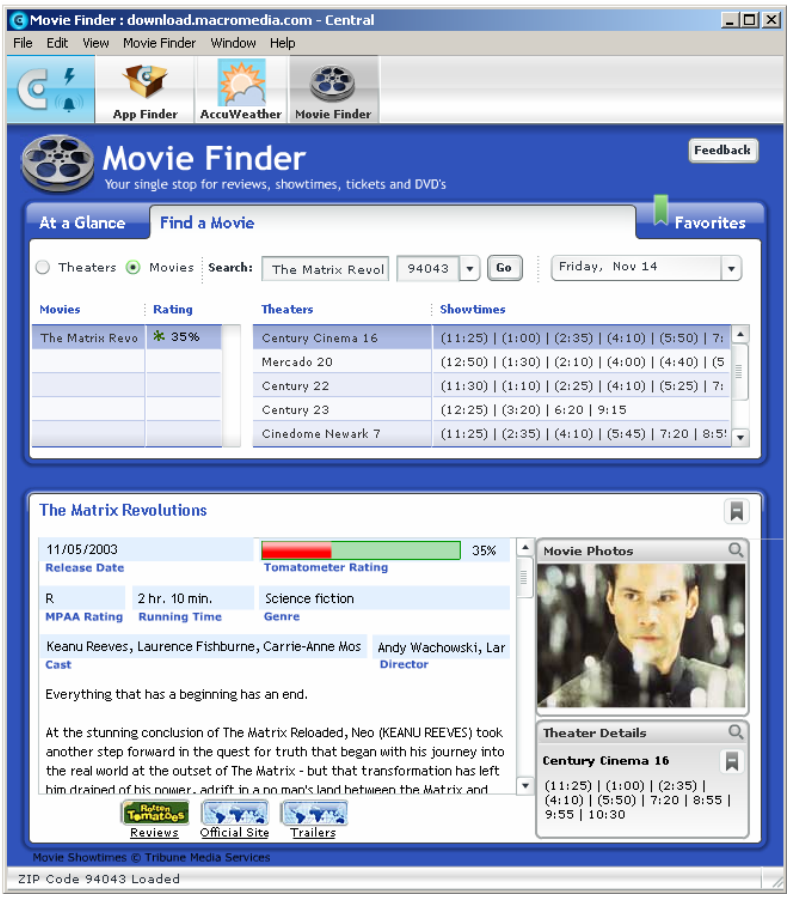
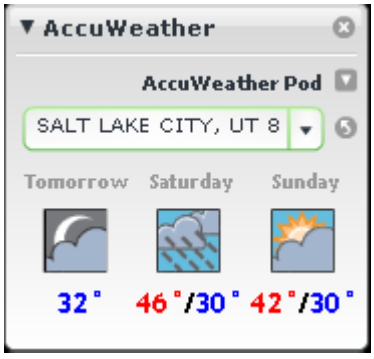


Figure 21: NYSE MarkeTrac Application *Connected applications let users continuously monitor rapidly changing data in "live" feeds from a variety of sources while shielding them from the complexities of setting up and managing the connections themselves. The New York Stock Exchange provides this MarkeTrac application to help traders and investors monitor the day's activity. Users can access detailed information on any stock through the graph view, the trading floor map, or the summary table. (marketrac.nyse.org/mt)*

Applications will connect to other applications and remote data sources to transparently exchange information and facilitate users' tasks. They'll also help users connect with one another in collaborative applications that transcend the limits of physical space. Transparent connectivity can help to eliminate the technology glitches (access codes, dropped calls, high latency, and low fidelity) that degrade the experience of remote collaboration today in the same way that the widespread adoption of cellular telephones in the mid 1990s changed the way we think about interpersonal communication. Suddenly, our phones were always available, which meant we were always available—for good or bad—to callers from the outside world. The ubiquity of mobile devices also opens up entirely new usage scenarios that we are just beginning to appreciate.

Figure 22: Cellular Telephony and Data Applications *Mobile phones automatically locate and connect to their network. Interactive software is rapidly achieving a similar degree of connectivity. This trend is fueled by the steady incorporation of wireless networking into many electronic devices and the introduction of rich interactive software to mobile phones. Any portable device can benefit greatly from portable information access (center) or location-based information services (right).*





(www.macromedia.com/software/central)

Occasionally Connected Computing

With the rapid growth of wireless networking and mobile computing devices equipped to exploit them, business users increasingly expect to connect to their usual network resources and access their usual enterprise data, regardless of their physical location. People want to be productive even when they are traveling or moving between work locations. As wireless access becomes ever more ubiquitous, the occasional service drop-outs and discontinuities that persist will be increasingly annoying.

Intel is promoting a model for occasionally connected computing (OCC) that lets users work as if they were enjoying continuous network connectivity, even if their connection is only intermittent.[15] *The OCC model depends on smart clients with local data storage to replicate the subset of enterprise data for which an individual user needs continuous access. When the network goes offline temporarily, the user can continue to work from the locally cached data in most cases.*

Macromedia Central implements many of the key features of OCC. Because applictions built in Central run locally outside of the browser they do not depend on a remote application server to handle basic rendering, layout, and interaction tasks. By caching data locally, the smart client can continue to function, even when the network connection is temporarily disrupted. The Movie Finder (top) is a typical information access application in that its content changes relatively infrequently. As long as the connection is available at least once a week, the distinction between occasional and continuous connections is not noticeable.

[15] Fineberg, Dan, *The Occasionally Connected Computing (OCC) Model*, Intel White Paper, Santa Clara, CA: Intel Corporation, 2003.

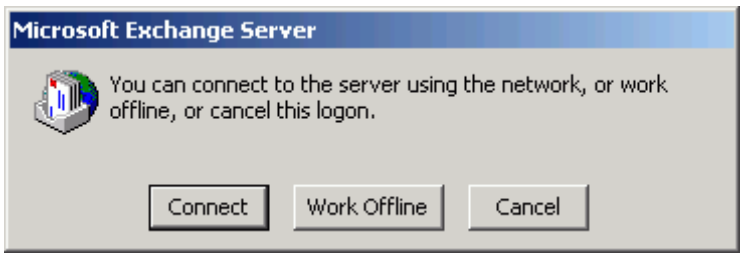


Figure 23: Microsoft Outlook Offline Mode *Applications can be designed to "feel" connected even when the network is only intermittently available. Microsoft Outlook provides a rudimentary example in its Offline mode, where locally cached data lets users view and respond to existing appointments and messages at their convenience. Automatic dispatching of queued requests gives users the impression of being continuously connected even though they may spend significant portions of their day offline.*

With the proliferation of "always on" broadband connections, the distinction between online and offline status seems increasingly artificial to users. *Occasionally connected computing* (see sidebar) is already the norm for many laptop users who may do small amounts of work while in transit between physical access points. It's time to start designing for the day when such disconnections are the exception rather than the rule. There will always be breakdowns in network connectivity, just as there are always dead spots in cellular telephony networks. The key is to ensure that users are never forced to interrupt their normal workflow by temporary network outages. The connected application is simply the occasionally connected computing model with complete transparency from the user's point of view. Without compromising on security, applications must be able to automatically locate the resources they need and present the user with an appropriate context for any combination of location and task. Eventually, smarter software may even demonstrate an awareness of our current location, as applications gain the ability to alter the functionality they present as we move about in the physical environment.

Experiencing awareness

Applications seem to be *aware* of what the user is trying to do when they recognize the current operating context (location, goals, tasks, applications) and use this information to transparently facilitate user and task needs. The ability to capture, maintain, and reuse contextual information has never been a strength of interactive software, but it will be a critical success factor in taking the user experience to the next level. Accelerators, automation, and context-sensitive adaptation will all contribute to a user experience that produces more output for a given level of input than ever before.

Even simple automation capabilities make a big impression when they save time and effort for the user. Applications that dynamically adjust their behavior to reduce the user's workload quickly come to be seen as intelligent assistants rather than just tools. Nobody wants to repeatedly enter the same data, set the same options, or answer the same questions. Imagine a dialog module that *dynamically* adds a "Yes to All" button after the user clicks "Yes" several times in sequence in response to the same confirmation request. Simple task-based accelerators like this are highly predictable given even a rudimentary understanding of the task, yet they add tremendous value in everyday use.

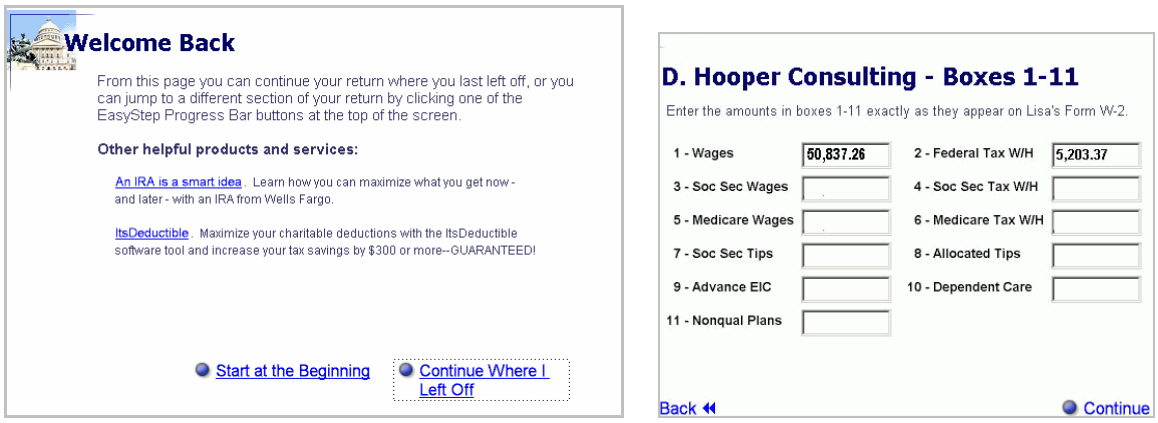


Figure 24: Application Memory in TurboTax *Applications create the illusion of being aware of what we're doing when they recognize, remember, and correctly recall contextual data without being explicitly instructed to do so. TurboTax "knows" how to continue from where you left off the next time you launch the program. The program automatically locates last year's return and imports the data. It "remembers" your personal data along with items that simplify data entry, such as employers or bank accounts that commonly persist from year to year.*

Interfaces that adapt to the current user and task can achieve efficiency without sacrificing learnability by automatically providing the right controls for the situation. Supportive interaction styles (such as Clippie, the infamous Office Assistant) that seem intrusive to experienced users can be replaced by more efficient interfaces for those recognized as experienced users. Applications that can filter their interface elements based on a user and task context provide an experience superior to any one-size-fits-all solution. The software of today is only beginning to exploit these techniques, but the potential is already apparent.

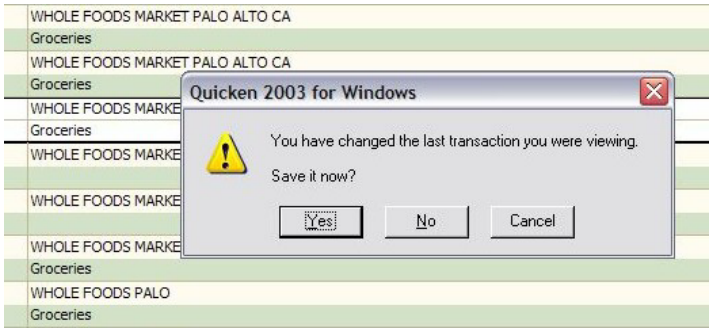
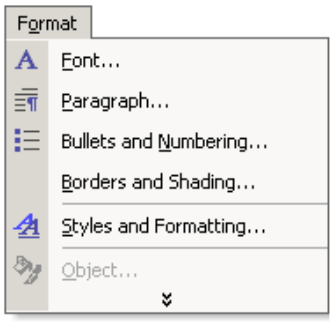
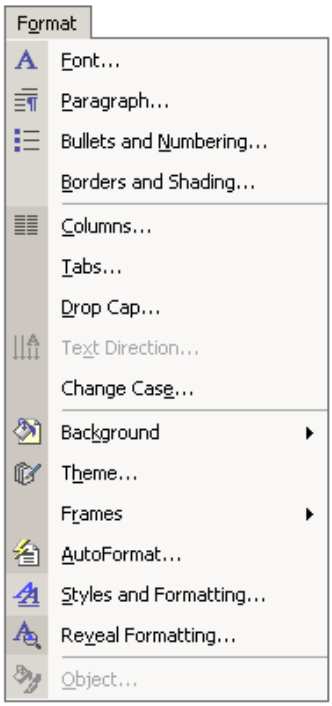
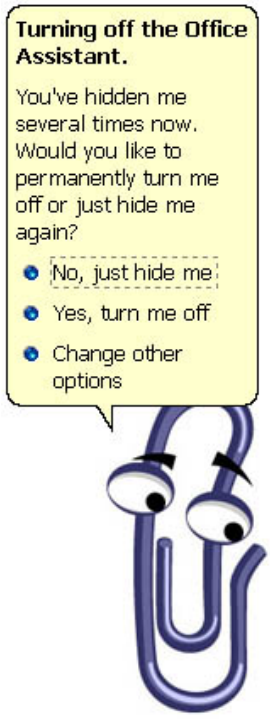


Figure 25: Dynamic Key-mapping in Quicken *When Quicken notices users repeatedly choosing "Yes" in this dialog, the program asks if they would like the Save operation to be applied automatically in the future when they finish editing a transaction. If the user agrees, this dialog never appears again. The Don't Ask Again option is as popular here as in dialogs reminding us to register our software online.*







Adaptive Systems *David Benyon defines the adaptive system as, "a knowledge-based system which automatically alters aspects of the system functionality and interface in order to accommodate the differing preferences and requirements of individual system users."*[16] *Adaptive systems alter their appearance or behavior to adjust for the needs, preferences, and abilities of the current user. The most advanced adaptive systems employ an explicit model of the user and their knowledge of tasks and procedures and uses this to tune the interaction.*

User interfaces based on adaptive technology can relieve designers from long-standing dilemmas, such as the need to balance competing design goals like efficiency and learnability. With intelligent adaptation, this trade-off can be adjusted so the interface becomes more efficient, albeit less explicit, as user expertise increases. While the promise of adaptive systems is great, the difficulty in achieving convincing intelligent behavior is daunting, and early attempts have produced mixed results.

The abbreviation behavior for menus in Microsoft Office (top) works well for some usage patterns, but can be a hindrance in others. Most users find they need the full menu too often to justify the occasional easy access. More useful adaptations are frequently achieved with less ambitious means by simply storing recently entered data, such as the navigation history in a web browser. Most users of Microsoft Office eventually figure out how to permanently dismiss the intrusive Office Assistant thanks to one particularly welcome adaptation (bottom).

[16] Benyon, David, Dianne Murray and Frances Jennings, "An adaptive system developer's tool-kit." *Proceedings of INTERACT* (1990): 573-577.

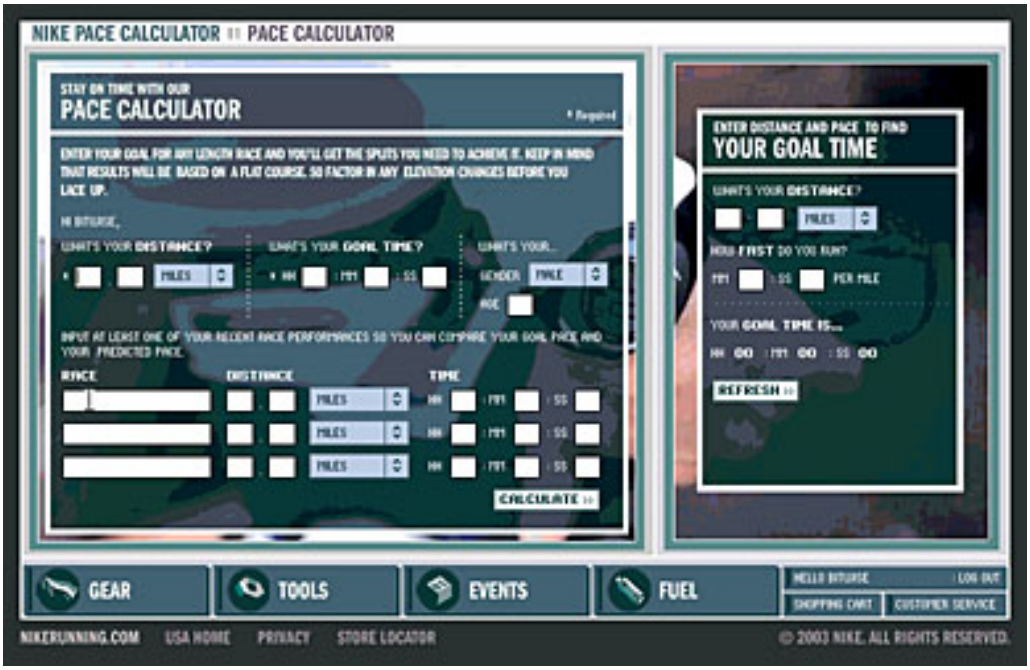


Figure 26: Adaptive Tools in NikeRunning.com *Nike's runner-oriented specialty site provides personalized tools that help runners plan their training, track their performance, and monitor their equipment. Users enter their vital statistics, along with their goals and aspirations, and the site provides advice and performance projections tied to their recent race and workout times. The site "remembers" previously entered information to simplify and personalize subsequent data entry for common distances, routes, and checkpoints. The site even "knows" when it's time to buy new running shoes for runners who track all of their usage here.*

User-centered design

All of the traditional criteria for user-centered design apply to Rich Internet Applications as well: it remains as critical as ever to speak the user's language, to exploit natural mappings and familiar mental models, to provide clear visual affordances and immediate feedback for every action, to guard against common errors and make all actions reversible. And it is still essential to develop the user experience through an iterative process that features rapid prototyping to support early and continuous testing with representative users. These principles are described in detail in many classic references[17,18,19,20] and will continue to be critical success factors for delivering a great user experience. The qualities described here simply represent the focal points for qualitative improvement that are enabled by the rich interaction paradigm. New applications that are more seamless, more focused, more connected, and more aware are elevating software to the point where users can shift their attention from operational usability to performance virtuosity.

[17] Norman, Donald A., *The Design of Everyday Things*, New York: Doubleday, 1990.

[18] Nielsen, Jakob, *Usability Engineering*, San Francisco: Morgan-Kaufmann, 1994.

[19] Nielsen, Jakob, *Designing Web Usability*, Indianapolis: New Riders, 2000.

[20] Baxley, Bob, *Making the Web Work*, Indianapolis: New Riders, 2002.

The Bottom Line on Interactive Experience

We have seen how providing a better user experience can boost top-line revenues by helping you acquire and retain customers without having to sacrifice margins to aggressive price competition. Customers care about the quality of the user experience, and they are increasingly willing to pay a premium to get it. Companies that can deliver interactive experiences that are seamless, focused, connected, and aware will enjoy a clear competitive advantage over those that cannot. But realizing these qualities in software delivered today can be difficult and expensive using current technology—and therein lies the rub.

If delivering the kind of rich interactive experiences described in this paper is too costly, then revenue increases on the top line might not be enough to offset the added cost of producing the better experience. Competing based on the experience that is provided may not make sense in every product category (Figure 27, left), so in the short term you'll need to focus your efforts on products and services where experience really does matter. Competitive markets for commodity products provide the best opportunity to achieve differentiation on the strength of a better user experience. In the highly competitive market for online travel booking (Figure 27, right), customers can flock to whatever site offers the best searching and booking experience. On the other hand, even unique products sold into narrow market segments can benefit greatly from experiences that enhance their brand and effectively communicate the qualities that make the product desirable.

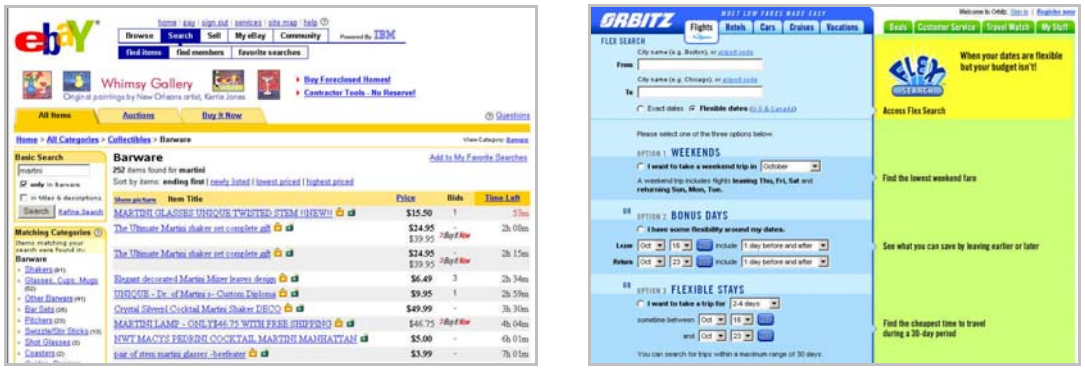


Figure 27: When Experience Matters *The quality of the user experience is less critical for products like eBay (left) that have no real competition and already have users securely locked in. Changes to eBay are introduced slowly and with great caution—despite some obvious design shortcomings—because the potential rewards don't seem great enough to offset the risks to the stability of their online marketplace. Contrast this conservative approach with that of online travel agencies like Orbitz, which depend on a far more refined visual design, as well as constant innovation, in providing powerful new tools, such as the Flex Search module (right), that help customers achieve better results with less effort.*

Macromedia is working hard to lower the barriers to delivering a rich interactive experience for any type of application. Along with more powerful development tools and new delivery channels, Macromedia is creating enhanced component and framework technologies that let developers add high-quality, fully optimized experience elements "out of the box" using familiar software engineering methodologies. As development costs continue to fall, the business case for investing in a better customer experience will make sense for an ever-broadening range of applications. The day is fast approaching when all software users will expect a user-centered experience that is seamless, focused, connected, and aware. Macromedia is ready to help you provide it.

www.macromedia.com/special/experience_matters