

Hedonomics: The Power of Positive and Pleasurable Ergonomics

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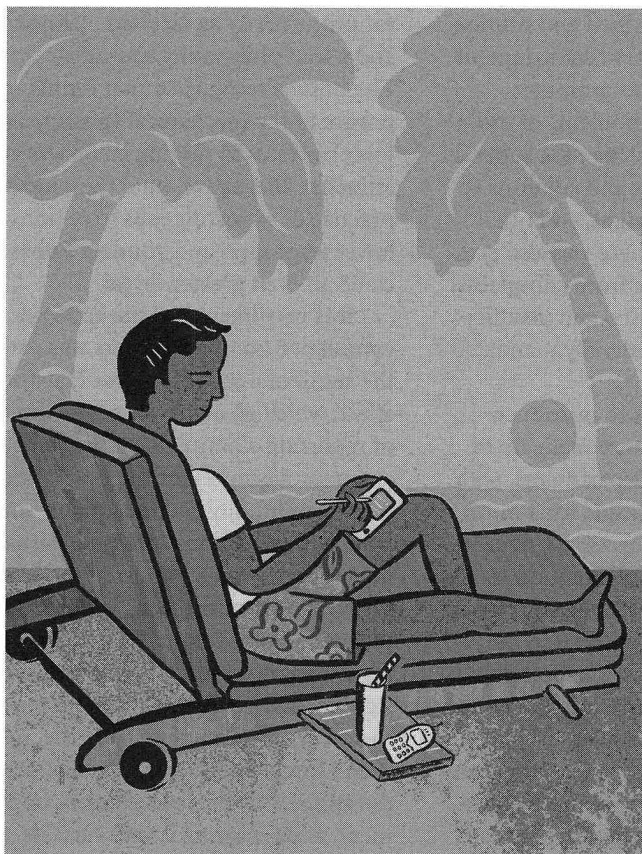
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Hedonomics:

The Power of Positive and Pleasurable Ergonomics

BY PETER A. HANCOCK, AARON A. PEPE, & LAUREN L. MURPHY

Once individual users' safety and functionality needs are satisfied, pleasure should be considered in the design of products, systems, tools, and environments.



In this article, we introduce a new term into the human factors/ergonomics lexicon: *hedonomics*. We define hedonomics as that branch of science and design devoted to the promotion of pleasurable human-technology interaction. In advocating for hedonomics, we seek to augment and expand ergonomists' arsenal for improving the design of all human-machine technology.

Our intention here is to (a) provide a philosophical framework for hedonomics; (b) contribute a model of a design priority hierarchy, in which we explain in detail the concept of individuation as the ultimate human approach to technology; and (c) offer potential design guidelines for and areas of hedonomic research that we believe should be pursued as an agenda for progress in the near future.

GENESIS AND MEANING OF HEDONOMICS

Like the term *ergonomics*, hedonomics is derived from two Greek roots: *hedon(e)*, meaning joy or pleasure, and *nomos*, meaning law-like or collective. In ergonomics, our traditional moral ethos is founded on the praiseworthy efforts to prevent people's pain and suffering, predominantly in the workplace. These concerns have grown over recent decades into a formal branch of science now devoted to a wider set of improvements in all physical and cognitive environments, thus serving to enhance the overall quality of life.

In contrast to the prevention of pain, but much in the same realm of human-technology interaction, hedonomics is primarily concerned with the promotion of pleasure. Hedonomics and human factors/ergonomics (HF/E) are consequently two sides of the same coin. However, whereas HF/E is often handicapped by trying to show the value of preventing events that eventually do not happen, hedonomics, being a positive enterprise, rejoices in the advantage of showing the value of events that do.

Fundamentally, ergonomics and hedonomics are synergistic perspectives directed toward the same goal of optimized human-technology interaction, which is central to the goal of all future design. Perhaps our first responsibility is to clarify an important issue. Although one of us (Hancock) coined the term *hedonomics*, the pioneering work in this area is primarily that of others (for example, Blythe, Overbeeke,

Monk, & Wright, 2003; Jordan, 2000). With these and other like-minded individuals, we see great value in this form of positive ergonomics, and this article articulates our current conceptual perspective.

Given that hedonomics, like HF/E, is a hybrid, practical, and interdisciplinary area, the base knowledge is drawn from multiple fields in the sciences and humanities. Thus, hedonomics in its early form draws heavily on extant discipline-based constructs varying from examples such as emotion, or affect (Snyder & Lopez, 2002). However, the expectation is that it will develop as an individual and distinctive area of study. Many readers may already be familiar with the general concept of designing with pleasure in mind.

FROM TRADITION TO INNOVATION

Traditionally, design has conceived and created systems that largely appease the demands of the neocortex. This is reasonable given that the pragmatic needs of functionality mandate a foundation based on purely rational processes. However, in so doing, we have largely neglected the needs of the limbic system. Much appeal has been made to design for efficient, speeded, error-proof (or at least error-resistant) systems with the fundamental underlying ethos that the human is a part of the final system in the same way that other inanimate components are also parts of that same system. Even from this uncompromising original conception, based in an overwhelming concern for process efficiency, it has eventually emerged that a so-called human-centered strategy provides a superior outcome as an overall design ethic, especially as technical systems increase in complexity. Human-centered design places the concerns for the most fragile, the most unpredictable, but the most crucial component (the human) at the very center of system conception and thus temporally at the earliest initiation phases of design.

But in what sense has human-centered design been human? Concern is not expressed for the desires of *each individual person* but for the ways in which understanding the general sensory, cognitive, and response capacities of *any human* can be used to best advantage. In this sense, one could as easily generate monkey-centered design or, as evident from the work of Pepperberg (1999), parrot-centered design! There is a wonderful creative article on how to design for centaurs

(Wise & Fey, 1981). Centaurs are mythical creatures, it is true, but centaur-centered design is a feasible and achievable proposition within the overarching conception that makes the living system the central focus.

However, there are many unique dimensions to each individual human being (as perhaps there are to each monkey, parrot, and centaur). These characteristics extend beyond the common, shared sensory and cognitive capacities or momentary response limitations. Such dimensions include self-motivation, affect, pleasure, or, more generally, the idiosyncratic apperception of the world. Recognition of the importance of these personal dimensions encourages us to explore their impact and evaluate each individual with respect to his or her own unique motivations and aspirations.

▶ Starting from the premise that emphasizes commonalities across all human beings, we seek to extend such concern to an individual-based design.

The continuing revolution of human-centered design of the latter part of the twentieth century is evident in the gradual recognition of this primacy of human capacities as the centerpiece of design (see Billings, 1991). Although it is true that this principle has yet to thoroughly penetrate the full spectrum of design, its logical evolutions have already begun to emerge. For example, Flach and Dominguez (1995) emphasized the importance of goal achievement in the principle of “use-centered design.” Here the key element is *use*, which is a property that emerges from the combinatorial actions of humans and technology, rather than being a unique property of either.

This article takes human-centered design in a different but equally logical direction. Starting from the premise that emphasizes commonalities across all human beings, we seek to extend such concern to an individual-based design or state of *individuation* in which the focus is on the unique characteristics of each and every single individual user (e.g., Peter vs. Aaron vs. Lauren). We believe technology has now progressed to a point that it is capable of dealing with users on this individual, personal level, and this progress fits hand-in-glove with the growing concerns for affect as embraced by hedonomics.

Individuation is not just the pursuit of self-centeredness. This is so because optimization of an interface for a specific user alone, which allows him or her to interact intuitively and personally, does not affect only the user; it also affects the user's environment and all aspects of that environment, including other people (see Hancock, 2003). This widespread effect could be either pleasant or detrimental in nature, given that satisfying one individual's hedonomic need has no necessary link to the hedonic state of any other individual. For example, Moray (1993) commented on the benefit of smart houses for “making life easier and safer for inhabitants

FEATURE AT A GLANCE: Hedonomics takes ergonomics one step forward from its initial prevention of pain to its contemporary promotion of pleasure in human-technology interaction. We provide a philosophical framework, contribute a model of a design priority hierarchy, and offer potential areas of future research for hedonomics, which we define as the promotion of pleasurable human-machine interaction. Individuation and experience goals should be incorporated into fundamental design priorities in order to optimize user experience and improve the quality of life for all affected by advancing technology.

KEYWORDS: Well-being, affect, performance capability, hedonic design, happiness, usability

and reducing energy consumption.” The ability for a smart house to detect and adapt to individual characteristics of its inhabitants would not only allow for individual comfort and optimal operation but also could conserve energy for the greater good – in this case, a collective positive benefit (see Mynatt, Melenhorst, Fisk, & Rogers, 2004).

Additionally, human factors/ergonomics specialists have a responsibility to consider potential negative effects of the outflow of poor design and the failure that is produced when we do not take into consideration the strengths and limitations of each human (Vicente, 2004). A bitter but pertinent example derives from the human factors failures that led to disaster at Chernobyl, which affected not only the lives of the exposed controllers but also the individuals in the surrounding communities and eventually people of many other nations.

FROM PREVENTING PAIN TO PROMOTING PLEASURE

From its formal inception in the middle of the nineteenth century (Jastrzebowski, 1857) to its flowering in the post-World War II era (Marek & Pokorski, 2004), ergonomics has been founded on the fundamental and morally laudable concept of the prevention of pain. Whether this prevention addresses acute effects in terms of bodily injury or the more chronic expressions involved with repetitive strain trauma to either musculature or cerebrum, ergonomics seeks to dissipate the entropy evident in maladaptive operational conditions (also see Karwowski, 2000). This goal is achieved largely through design and redesign of aspects of the surrounding environment.

Frustration, pain, stress, fatigue, overload, injury, and death are all symptoms of systems that desperately require the attention of the professional ergonomist. Preventing bad things from happening through design, redesign, or other remedial processes is an activity we share with a larger community of professionals such as those in safety and occupational health. However, all preventative measures are acts of negation. Logically, attempts to value such acts come under the general compulsion of proving a negative, which remains both a philosophical and a practical conundrum. We refer to this historical and traditional foundation as the *ergonomics of negation*.

Human factors/ergonomics is not the only scientific enterprise that has focused on prevention or subsequent damage limitation; it is only one of many sciences whose primary aim has been to seek the reduction of adverse events. Psychology, one of the base disciplines of HF/E, has been especially focused in the post-World War II era on addressing the problems of disturbed and mentally infirmed individuals and those who are suffering psychological illness. Even many so-called pure research efforts in the supporting neurosciences are founded on the desire to push for knowledge to alleviate neurological problems; thus, much of the contemporary focus on drug therapies. However, rather than avoiding or trying to cure the negative, there is a completely different perspective that focuses on the promotion of the positive.

ACCENTUATE THE POSITIVE

Like a number of other human-based disciplines, human factors/ergonomics has now begun this transition from a basic concern about the issues of pain and injury to a greater focus on the pleasurable aspects of interaction (see Helander, Khalid, & Tham, 2001). This potential paradigm shift – or, more correctly, paradigmatic expansion – is evident in many growing spectra of human science (e.g., Suedfeld, 2001). Indeed, the aims of so-called positive psychology coalesce completely with those of hedonomics because both innovations seek to improve different but related facets of the overall quality of life.

► To fulfill the needs of the user, we need to incorporate an explicit recognition of motivation, quality of life, enjoyment, and pleasure into design recommendations.

Peterson and Seligman (2004) approached the cultivation of individual human strengths and character by developing a taxonomy of character virtues that includes wisdom, knowledge, courage, humanity, justice, and temperance. This work is part of a general effort by leaders such as Seligman and Csikszentmihalyi (2000) who have appealed for this reorientation of focus. They advocate that attention should now be directed toward an understanding of the benefits rendered by psychological insights into well-adjusted, so-called normal individuals for whom we can promote positive life experiences. These include explanations of a sense of expansiveness or awe (Woodruff, 2001) and the notion of optimal experience or “flow” (Csikszentmihalyi, 1990).

This positive vision transfers especially well to the practice of hedonomics in design. In the past decade, we have seen progress in human-computer interaction (HCI) and usability that has begun to be similarly oriented in this positive fashion (see Teague & Whitney, 2002). This development has proceeded along a path from an initial focus on errors and failures to today’s considerations for user preference. Contemporary efforts (Han & Hong, 2003; Helander & Tham, 2003; Khalid, 2004; Krippendorff, 2004; Liu, 2003) are directed toward the search for the promotion of positive, pleasurable experience to augment and expand on the laudable efforts to prevent negative outcomes.

Unfortunately, most usability studies that integrate user experience have focused largely on aspects of user satisfaction or preference as a measure of their immediate success. The reification of any form of subjective response often leaves a field largely bereft of theoretical foundation and sometimes even scientific grounding. Given that satisfaction can be, and most often is, a predominantly momentary or transient state that is unique to the individual, hedonomics is challenged with the same scientific developmental issues as usability, positive psychology, or any enterprise in which private experience is a central element (see Lazarus, 2003).

HEDONOMIC HIERARCHY OF NEEDS

In order to establish hedonomics as a field of study, we provide an initial theoretical framework through which to promote the opportunity for pleasurable interaction based on a design priority hierarchy. In human-machine interaction, the system must first be designed to be safe, functional, and usable before it is designed to be pleasurable. Maslow's (1970) model of the optimization of human satisfaction through a hierarchy of needs specifies that higher-level needs can be fulfilled only after lower-level needs are satisfied. We take this principle as a design imperative and for our ergonomic and hedonomic hierarchy of needs, which is shown in the illustration below.

The foundation of our hierarchy is safety. Those who are in peril cannot be expected to reach for or be concerned with either pleasure or individuation. Thus, the necessity to ensure the well-being of the user is a mandatory requirement that must be achieved before subsequent design goals are considered. Once the user is ensured of safe operating conditions, the next level requires a functional system that enables the user to accomplish his or her desired goal. Safety and functionality are twin basic needs on which high-level aspirations are based.

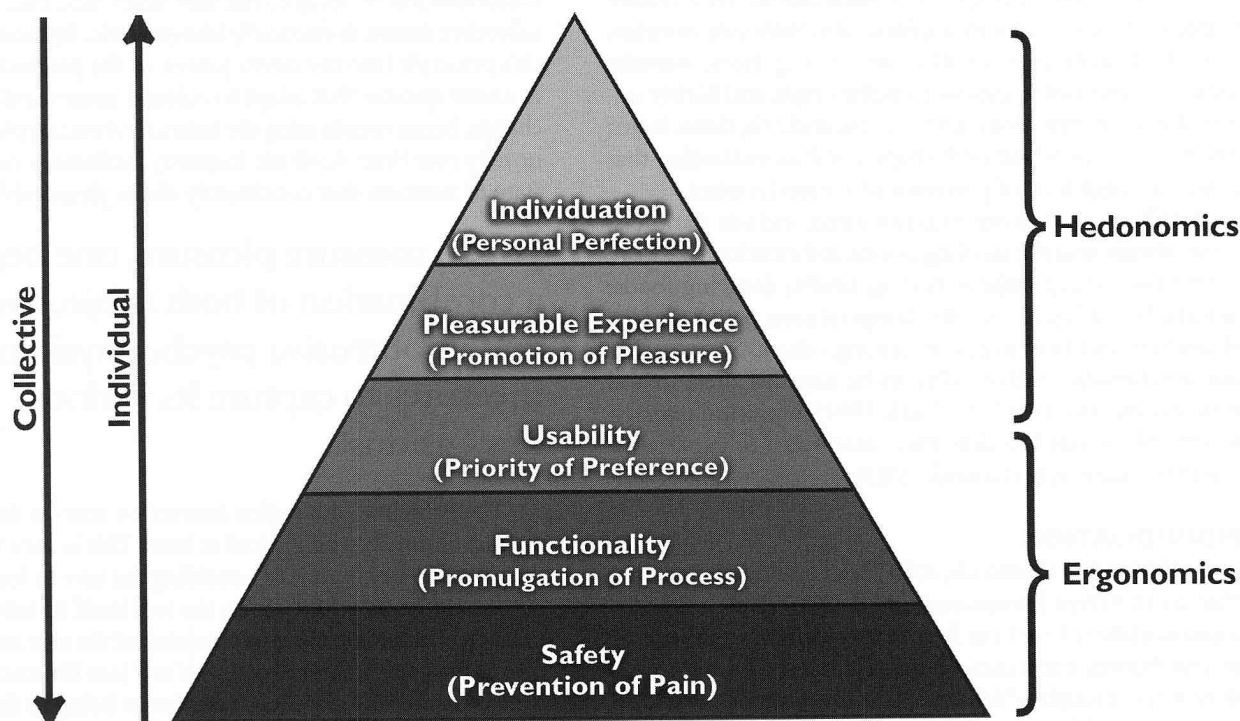
Once functionality is achieved, usability facilitates performance by consistently enabling the user to accomplish the task. This experience conditions the user to develop a sense of trust; he or she can perceive the system as consistently stable, predictable, and safe. In addition, usability improves

the system by making it more memorable, learnable, efficient, and easy to use, which are base elements for pleasurable interaction. At these three levels of safety, functionality, and usability, design is human-centered or nomothetic in nature.

When the system has achieved functionality and usability, it then can be designed to fulfill users' more fragile psychological and sociological needs, such as their need to belong, to achieve, to be competent and independent, thus making interaction a fully pleasurable experience. To fulfill the needs of the user, we need to incorporate an explicit recognition of motivation, quality of life, enjoyment, and pleasure into design recommendations. Designing the system to aid the users in the need to live up to their fullest and unique potential is the paramount goal of hedonomics. This final goal can be accomplished through individuation, which incorporates customization principles to permit each individual to adapt the system to his or her individual traits, personal idiosyncrasies, changing goals, and mood states over time.

FROM FUNCTIONAL USABILITY TO HEDONOMIC FULFILLMENT

Usability has typically been defined as seeking three goals: effectiveness, efficiency, and user satisfaction (Preece, Rogers, & Sharp, 2002). Of these three, the first two have received the most attention. It seems that satisfaction has taken the place of the user in general experience in interacting with the system; it is rarely measured as anything more



A hierarchy of ergonomics and hedonomic needs derived from Maslow's conception. The fact that these design imperatives match the social edict of "life, liberty, and the pursuit of happiness" has not escaped our attention (see Hancock, 1999).

than user preference. Moreover, when satisfaction issues conflict with the measures of effectiveness and efficiency, they are most often ignored. Indeed, many of the most popular surveys for usability (for example, QUIS) have completely left out any reference to satisfaction, much less pleasure. The reason that user satisfaction has been overlooked is partly because of insufficient measurement specifications and implementation guidelines. Hedonomics aims to develop these and other metrics of user experience.

In order to fulfill the expectations of the user, we need to incorporate experience goals as primary goals at the level of fundamental system design and development. Traditionally, experience goals have been left up to graphic designers, marketers, and advertisers (Teague & Whitney, 2002). Such research relies on focus groups and samples of opinion as to what are preferred interactive modes. Intrinsic to such an evaluative procedure is a concern for enjoyable and pleasurable interaction, but it is frequently expressed as summated opinion of the selected sample group. As we will show, the emphasis on the individual at the idiographic level can provide pleasure-promoting systems but ones that are unanchored in a world of subjectivity. In order to incorporate experience goals at the fundamental level, a scientifically grounded framework needs to be developed. One start toward developing this framework is through the conception of *hedonomic affordances*.

Hedonomic affordances invite an emotional reaction from the user by way of the objects' physical attributes that result in the users' appraisal and perception of something as enjoyable, pleasurable, and fun. As usability goals rely on properties of perceptual affordances, experience goals should rely on hedonomic affordance. Some examples of attributes (see Norman, 2004) that invite positive affect are smiling faces; warmth; comfort; sweet tastes; pleasant smells; bright and highly saturated hues; harmonious music and sounds; rhythmic beats; symmetrical, round, smooth shapes; and an evaluation that indicates a high level of perceived situational control.

Attributes that invite negative affect include darkness; harsh, abrupt sounds; startling noises; information overload; bitter tastes; sharp objects; rotting smells; decaying foods; sudden, bright lights; extreme temperatures; perceived lack of control; and time pressure, among others. Systems that lack functionality and usability invite negative affect in and of themselves (see Bonds & Canak, 1999). Empirical research is certainly needed to link these attributes to experience (Murphy, Stanney, & Hancock, 2003).

INDIVIDUATION

Individuation (Hancock, 2003) is an individual-centered ethic distinct from human-centered design, which seeks only implementation based on functionality and nomothetic or general human capacities. Individuation is directed to explore ways through which each and every single individual can customize his or her own tools to optimize the pleasure and efficiency of his or her own personal interaction. In this era of burgeoning technology, it is possible to achieve these

goals when systems must be customizable and dynamically adaptable to individuals by responding to their affective needs and changing requirements (MacDonald, 2003).

Customization allows for the accomplishment of experience goals on an individual level as users bring their own cognitive appraisals, past experiences, traits, and mood states to the interaction and as these users change their views of the situation and themselves over time. When individuals work in a social context, it is the responsibility of the adaptive technical system to integrate their respective individual preferences for interaction. In hedonomics design, operators are viewed as complex entities with a range of multilevel needs. Therefore, tools must be adaptable to fit the individual needs of the operator, and to do this, we need customization principles. To begin, we suggest two principles: *aesthetic longevity* and *seamless interaction*.

Aesthetic preference is related to a balance between typicality and novelty (Hekkert, Snelders, & Wieringen 2003). The user seeks products that are similar in style to the norm yet are also fresh and creative. In time, however, new ideas that were once popular because they were original become the norm, causing the product to tip toward typicality and lose its novelty. Aesthetic longevity is a customization principle of design that keeps a classic form combined with innovative option features that can be changed over time (for example, face plates on cellular phones). Traditionally, the approach to the study of aesthetics has focused largely on investigating the consensus of what the population finds transiently pleasing. Hedonomics takes an individual-centered approach through customization in recognizing that aesthetics, because of its subjective nature, is essentially idiosyncratic. By incorporating this principle into the development of the product, we seek to create systems that adapt to cultural norms and personal change, hence maintaining the balance between typicality and novelty over time. Aesthetic longevity facilitates a continuous state of newness that consistently elicits pleasurable feeling.

► To measure pleasure, one needs a combination of both subjective and unobtrusive psychophysiological measures to capture its various dimensions.

The principle of *seamless interaction* enables the user to interact optimally with the tool at hand. This in turn facilitates the transparency of the tool, enabling the user to focus effort on task completion and not on the tool itself. In this way, the tool becomes an unconscious extension of the user and is integral to the conscious experience of self (see Hancock, 1997). This promotes the experience of *flow* or being in the *zone of optimal function* as the seamless interaction between the user and the system itself induces intrinsic pleasure. The act of customization should in itself be a seamless interaction enabling

the user to easily adapt the tool to him or herself; but ideally the tool should adapt to the user, the former being passive customization and the latter being active customization.

Through principles such as aesthetic longevity, seamless interaction, and customization, the user's perception of control over the environment is progressively enhanced. Perceived control has been shown to improve job satisfaction, work motivation, and positive affect because it fulfills the need for autonomy (Fritzsche & Parrish, 2005). The function of system stays, but the features can be customized. True individuation would be in a sense unlimited customization, which we see as a feasible possibility in the foreseeable future.

DESIGN RECOMMENDATIONS

As is evident from the foregoing discussion, hedonomics is in its infancy. It may appear premature, therefore, to advance design guidelines for an area of such relative immaturity. However, drawing on allied areas of research, we think we can posit the following initial recommendations:

- Designing for pleasure should be an explicit goal from the initiation of each project.
- Until we understand more of hedonomic design, pleasure as a design goal should remain subordinate to safety, functionality, and usability.
- To achieve hedonomic goals, we need to establish a valid and reliable "measure of pleasure."
- An explicit requirement of hedonomic design is that it is theoretically driven and empirically grounded.
- Hedonomic design achieves its explicit goal with full individuation, which, in combination with general human-centered design, expressly requires a personalized design for each and every individual. This may be achieved by incorporating principles such as aesthetic longevity, seamless interaction, and others that we anticipate will emerge from advances in hedonomics inquiry we have discussed.

SUMMARY AND CONCLUSIONS

Throughout human history, design has sought to serve the goals of its progenitors. Since humans first fashioned tools, such goals have ranged from the laudable to the lethal. History shows that for much of civilization, the pain associated with tool use has been the lot of the masses, whereas the pleasure that the blessings of technology render has predominantly been the privilege of the few. Some would argue that this imbalance persists in the world today (Moore, 2001).

Fortunately, contemporary technical systems provide the flexibility to achieve both their proximal goal of production while also permitting and promoting pleasurable interaction. This opportunity can change the aversive character of work into an activity that is much more interesting and engaging. Although work and play remain, in most people's minds, fun-

damentally different conceptions, we can bring some of the elements that make play enjoyable into work. If we are able to achieve this, the invidious division between obligatory work and discretionary play could potentially begin to dissolve. Marxian divisions between different forms of class predicated on the nature of work would no longer be tenable, and technology would further fulfill its true purpose in rendering to all the maximum opportunity for self-realization. We have suggested that this be defined by the term *hedonomics* following Hume's assertion that giving a concept a name makes it a stronger reality (Hume, 1739).

► Integrating adaptability into designs and providing users with control each promotes the opportunity for pleasurable interaction.

In the genesis of hedonomics, it is important that the development of the science be theoretically grounded and empirically driven. Pleasure, similar to other subjective constructs like mental workload, stress, fatigue, and situational awareness, is a multifaceted concept. To measure pleasure, one needs a combination of both subjective and unobtrusive psychophysiological measures to capture its various dimensions. Further research is needed in developing an operational definition and assessment of pleasure. Pairwise comparison of affective states may be a pragmatic approach to measurement, but it provides no absolute basis for design perfection. For the science to progress, especially in the affective realm, we have to look to the brain. Fortunately, an emerging confluence between ergonomics and neuroscience may provide a guide: *neuroergonomics*. The fusion of neuroscience with ergonomic application has been proposed by Parasuraman (2003), who notes that all interactions, being brain-mediated anyway, can provide further windows into brain function (also see Hancock & Szalma, 2003).

Hedonomics requires that we investigate more carefully those affective facets of response and the neuropsychological understanding that underpins their occurrence. Integrating adaptability into designs and providing users with control each promotes the opportunity for pleasurable interaction. Although pleasure itself has rarely been the primary goal in work situations, it is often just that in leisure activities. Hedonomics does not seek *dolce far niente* (life without care), as challenge and exploration are two primary sources of pleasure. Rather, it seeks to make technology "convivial" (Illich, 1973) in its opportunity to self-select one's own interactive mode among which pleasure and happiness are prime concerns.

With this change, the *erg* of *ergonomics* need no longer be aversive, "TGIF" (thank goodness it's Friday) will be a thing of the past, and humans will embrace their occupations as both a productive *and* self-fulfilling activity.

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