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# On the Future of Work

**How the future promises to alter our concept of work.**

BY P. A. HANCOCK

ERGONOMICS REPRESENTS the laws of work. Therefore, to understand the role of ergonomics in design, we must be very sure that we know what work is. But isn't this obvious? I believe that the answer to this question is not as obvious as it first seems and that our conception of what work is now, and what work can or will be in the future, has to evolve.

In the ergonomics field, we have been overwhelmed by references to the change in the composition of work from a largely physical to a largely cognitive pursuit. However, this transition represents a change in the *form* of the demand imposed on the worker, not the fundamental conception of work as demand itself. I propose that in the future, the division between what are now thought of as work and leisure will dissolve. Furthermore, I assert that this dissolution should be an explicit aim of design. Consequently, future human-system interaction that is not intrinsically enjoyable will, by definition, be poorly designed. How the change in the concept of work occurs depends on not only future design but also the societal attitudes predicated on such design.

We should now assert that work will be enjoyable not just by accident, twist of circumstance, or individual idiosyncratic attitude but should be enjoyable by design. Consequently, changing designers' attitudes about the future nature of work should be one of the explicit goals of ergonomics in design (Hancock, 1996). In this article, I will illustrate why this should be so and the manifest benefits that accrue from such a design imperative.

## Work and Leisure

Not many centuries ago, leisure was the privilege of the few. For most people, work dominated life, and time away from work was spent in obligatory duties such as religious devotion. There are even epithets for the absence of work ("The devil makes work for idle hands"). In Judeo-Christian cultures, idleness and sloth are considered not as blessings but, as their semantic overtones still imply, as sins. For the laborer, prestige and standing were frequently associated with prowess at work, where physical strength was valued alongside the skills of the artisan. Much of the present-day attitude toward work is a residue of these societal values (although different cultures certainly vary in their views). These permeating Western attitudes have changed little in recent decades as the nature of work has changed radically.

To some extent, we have all experienced the metamorphosis in the content of work that has accompanied the information age, a time when the currency of work has changed from joules to bytes. Certain facets of this change have been examined in exhaustive and exhausting detail. In complex technical systems, the transfer of task demands from the physical to the cognitive, and the associated role change from active controller through passive monitor, to strategic systems manager has been the topic of extensive discussion.

However, the affective change that has accompanied this transition has not been explored to the same extent. In particular, the assumptions about attitudes toward work in relation to how tasks are designed and implemented have not evolved at the same rate as the technology itself. Why is it that a child can sit quietly and watch cartoons for a prolonged period and yet be viewed as having attentional problems in school? How can a data entry clerk sit in front of a VDT all day and experience severe visual fatigue, yet arrive home and be perfectly happy watching TV for several hours? The dichotomy here is not between

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active and passive behavior, considering that many people embrace the active challenge of video games whereas others watch screens for a living. The differentiation is in attitude toward the specific activity, intertwined with the nature of that activity and, consequently, how tasks are designed and information is displayed.

People who are regarded as having the most fulfilling lives have integrated their passion and their work. Csikszentmihalyi (1990) referred to these individuals as *autotelic* workers; they frequently seek and generate challenge despite the way in which their work is organized. Indeed, Csikszentmihalyi believed that "whether a job has variety or not ultimately depends more on a person's approach to it than on actual working conditions" (p. 161). Professional athletes, for example, often protest that they would play the game for free if they were not paid. Some of us may be jealous of individuals who get paid for activities that we pursue in our leisure time. For these people, their work and their lives are often one and the same thing. I suspect that most readers of this magazine gain considerable satisfaction from their jobs, although they might protest that some components are less enjoyable today than in the past. For us, therefore, it may be a step of empathy to see that most people do not enjoy their work at all. There are even names associated with this antipathy (e.g., Monday morning blues, TGIF).

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## Autonomy at Work

How can we achieve the goal of designing enjoyment into work? One of the first steps concerns the question of autonomy, or control over working conditions. Control is a vital factor in how work is viewed and how the individual responds to it. Traditionally, industrial workers have had little control over their own activities. In the past, extrinsic control emerged as a function of the manufacturing process itself; constraints on the production sequence require that parts and assembly be completed according to a central time schedule. This is only one example of how human beings are made slaves to time (Servan-Schrieber, 1988). However, the injection of some degree of freedom into a person's control over his or her activities accrues important benefits, especially in reducing work-related stress (Karasek, 1979). These benefits extend beyond momentary attitude alone to influence both long-term productivity and health.

One classic contemporary example of increasing worker control of work scheduling is telecommuting, in which the worker is minimally constrained in time or space. Typically, work is performed at home, and piecework rates are paid for productivity. Flexibility is currently reflected in the spatial location of work and, to a lesser degree, the temporal scheduling of work. I propose that there should be a comparable flexibility in the *structuring* of the work by design. That is, one should be able to decide not only when and where the work is done but also *how* the goals are to be achieved and how the interface is to be configured to accomplish the goals. When information is the medium and content of work and computer systems are the platform on which such work is erected, choice as to the structure of work should be both a feasible and a supported proposition.

## Designing Enjoyable Work

Advocating that enjoyment should be a design imperative is all very well, but how is this to be achieved? After all, some people sit quietly in a corner with a good book and call it enjoyment, whereas others use the same term for jumping out of low-flying aircraft on a glorified elastic band. Obviously, defining enjoyment presents the challenge here, a challenge similar to the concept of *affordance* as expressed in ecological psychology (see Flach, Hancock, Caird, & Vicente, 1995). Great controversy remains over the exact nature of affordances – even between those who strongly espouse the concept (see Hancock & Chignell, 1995). In general, an affordance is expressed as a relational opportunity between an individual and his or her ambient environment.

In a similar manner, enjoyment is an interactive property, although some philosophers would claim that it is subjugated totally to human control (Aurelius, 120). Moray (1994) advocated the exploitation of affordances to design artifacts that encourage the "behavior patterns of least resistance" (my interpretation) with respect to critical global problems such as energy and water conservation. Thus, designs are created to minimize waste by channeling behavior patterns toward preferred action sequences, as, for example, in the use of the low-volume toilet.

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I suggest, however, that this "affordance of least resistance" can be used to promote not only passive behaviors but also active, enjoyment-seeking behaviors. The critic might view this as exploiting human greed and laziness; the pragmatist might ask "Is there an alternative?" Any declared attempt to manipulate behavior is always viewed with great concern. However, if technology is to bless rather than to curse society, change in human behavior must be acknowledged as a clear and explicit goal of design.

In some ways, enjoyment is like art: We might not understand it very well, but we know what we like. It is in this observation that we find one approach to a solution. In this and other areas of human behavior, a common impasse arises. While recognizing that all individuals are different, people still want to make assertions about how they are the same in some fashion. To accommodate this variety in unity, systems must be adaptive (Hancock & Chignell, 1987), and to achieve this aim, interfaces must possess some degree of intrinsic "intelligence" (see Kantowitz, 1988). Under such circumstances, people can customize their physical workstations and the software-based structure of their work to accommodate their interests. In addition, such characteristics should be able to change over time as operators' capabilities and desires evolve.

Some central pillars of this form of work organization are variety and challenge, which present explicit goals with clear feedback. However, as Moray (1994) rightly pointed out, interfaces should not be infinitely adaptable, or else continual reconfiguration could prove confusing and error-promoting. Also, adaptive capability must be carefully shaped if the interface is to be used by teams or several individuals at different times. Under such circumstances, one operator's interface may well be another operator's nightmare!

Because design is the confluence of art and science, innovations cannot simply be prescribed by some interface development algorithm. Hence, good ideas need to be highlighted frequently in the form of instructive case studies. One of the more novel examples comes from the work of Sweeley, Holland, and their colleagues (e.g., Holland, Leary, & Sweeley, 1986; Sweeley, Holland, Towson, & Chamberlin, 1987). Their original goal was to evaluate urine samples for potential irregularities in the normal profile using an oscilloscope display. Under such monitoring conditions, minor irregularities were rarely detected. The task was then redesigned to present the peaks as a sequence of notes, which, under the normal profile, played a recognizable tune ("Yankee Doodle Dandy"), where in principle any tune could be used. Any anomalies then stood out as jarring notes, increasing the detection rate to 100%. The transformed display promoted both performance and enjoyment.

The ability to control one's time is an attribute of job design. Westrum (1991) categorized technologies along a continuum from *technotonic* to *technostressful* depending on the degree of control available, the skill demands, the aesthetic pleasure, and the affective associations that a device invokes. This follows on earlier work, which identified characteristics that make work either attractive or aversive (see, for example, Herzberg, 1966). Such information is of considerable value and underlies many current design recommendations. However, the radical change in what currently composes information-mediated work demands a reappraisal of the future of work.

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Such a reappraisal certainly relates to the form of work, but, more critically, it questions whether people's fundamental conception of what work is can or will hold in the future. Computer-based operations mean that tasks, their display, and their allocation can be flexible when intelligent interfaces are components of systems (Hancock & Scallen, 1996). Adaptive task design is a facet of software flexibility. All of these manipulables are critical in the generation of enjoyable and challenging pursuits. However, we must never lose sight of the fundamental basis of enjoyment: worker attitude.

An instructive example comes from recent research on vigilance and workload. In related work, my colleagues and I proposed (Hancock & Warm, 1989) and demonstrated (Warm, Dember, Gluckman, & Hancock, 1991) that enforced monitoring was a stressful pursuit, resulting in a high level of perceived load for the apparently passive task of sitting and watching display screens. Sawin and Scerbo (1993) questioned these findings. They asked subjects to watch a screen of uniform color for 30 minutes looking for occasional "flickers." Half the participants were

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given traditional instructions for the task (monitor carefully and report all "critical" signals), and the other half were simply told to relax and watch the screen. Results showed no significant difference in detection performance (although both groups experienced the expected decline in hit rate over time, the *vigilance decrement function*). However, there was a substantive difference in perceived workload: The relaxation group reported significantly less workload (particularly on the frustration scale) than did their peers in the traditional detection paradigm.

The clear inference from Sawin and Scerbo's study is that participants' *attitude* directly influenced their perception of the workload of the task without adversely influencing their efficiency. Would one be justified in suggesting that the long-term adverse effects of high workload could be reduced with this simple manipulation? The freely chosen rate of work is frequently close to an individual's long-term optimal rate (Sparrow, 1983). Consequently, the individual is an adaptive system that, if permitted, seeks optimal solutions to imposed physical demands. My suggestion here is that this intrinsic strategy will extend into an individual's search for optimal solutions to cognitive demands. This can occur only in jobs that are designed to provide such freedom and flexibility. I propose that enjoyment of work is one hallmark of success in the search for cognitive optimality.

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## Design Recommendations

What practical advice can be distilled from the present suggestion to enable designers to make jobs enjoyable? Below are some rudimentary guidelines, although at the present stage they cannot be considered hard-and-fast rules.

- Autonomy and choice are critical design characteristics of tasks.
- Work should be paced by operators, not machines.
- Interfaces should be adaptive. Both the physical workstation and the information interface should permit and promote individual customization.
- Tasks should present challenge and permit safe exploration of possible operational states.
- Repetitive, rote tasks are direct candidates for automation.
- Tasks should be designed such that achievement of the prescribed goals provides intrinsic satisfaction.
- The operator should be involved in the design of tasks, especially how the required system functions are mapped to interface characteristics.

As such goals are achieved, it will become progressively more difficult to distinguish between computer-based work and computer-based games. At some point, we will have to recast what we define as work. It may well be that we will begin to design goals and processes and allow people to match their aspirations and preferences to such processes and goals, in which case the machine system will be not merely an intermediary but an insightful companion concerned with how goals are achieved as much as the safety and efficiency with which they are achieved.

## Conclusions

Our view of work, and information-based work in particular, is outmoded. Although we have reaped many of the benefits of the electronic age, we have not yet exploited fully the affective change in the fundamental nature of work that is enabled by software and computer systems. In our rush for the high ground of automation and semiautomation, we have rarely stopped to ask whether those involved might *want* these changes (Hancock, 1996). It is even rarer that we have stopped to ask ourselves how such work might be made enjoyable. Work has always been viewed in contrast to leisure, and there is the disturbing and antithetical proposition that people might need it that way! Definitions of leisure include reference to discretionary time not spent at work. Leisure has been defined as "my time," whereas work is viewed as "company time." In an information age, such a view is dated, recidivist, and ultimately self-defeating. However, one can argue against but never ignore the counterproposition that the differentiation in time that work provides represents a form of variety that human beings cannot do without.

Work is important and serious business. However, it should never be mind-numbingly boring or soul-destroyingly repetitive. Seri-

ous does not always mean joyless, and importance does not always exclude enjoyment. If individuals work better at a task they enjoy, then enjoyment is directly related to safety and performance. Long faces are not always efficient, nor are smiling ones idle. Societal attitudes toward work must change. Although changing human nature might be an insuperable problem, changing the work environment to afford enjoyment and therefore influence behavior is a feasible design objective. I echo Csikszentmihalyi's exhortation that "The sooner we realize that the quality of work experience can be transformed at will, the sooner we can improve this enormously important dimension of life. Yet most people still believe that work is forever destined to remain 'the curse of Adam.'" The people to direct such change are those who mediate between humans and technology—that is, those who use ergonomics in design.

The central concept of enjoyable and challenging work has been broached many times before, as shown in the different literatures bearing on this topic. However, a science that addresses how people interact with technology should give considerable attention to an individual's well-being beyond the physical hazards of work. If the nature of the work is now cognitive, cognitive well-being and the system factors that influence such well-being are the designer's responsibility. Changing attitudes toward work by changing tasks, displays, and interfaces certainly represents a major dimension of the "laws of work" and therefore should assume an important role. Although human factors/ergonomics professionals have engaged in some efforts in this direction (e.g., Hendrick, 1987), the central tenet of enjoyment as a design principle to change future work has yet to be fully articulated and exploited. I hope the present work will provide an impetus for designers to do so.

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