1-1-2004

Intrinsic Motivation and Human-Centered Design

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Abstract

This essay seeks to clarify the paradigm shift from object-centered to human-centered research and design. It suggests abandoning the technological determinism that underlies the industrial era conceptions of human-machine interactions, which still informs much of current human factors or ergonomic research and making room for models of human-machine interactions that are derived from the human use of language, conversation and play. The essay demonstrates the significance of this shift by contrasting two ways users account for their involvement with artifacts: extrinsic and intrinsic motivation. It contends that intrinsic motivation largely escapes the traditionally object-centered scientific research methods. To inquire into the use of intrinsically motivating artifacts and aid the design of artifacts that have a chance to be intrinsically motivating, therefore, demands taking a different epistemological path, one that acknowledges the crucial use of language. This essay outlines such a path, pursues it and ends with practical suggestions for the design of artifacts that enable intrinsically motivating interfaces to arise.

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Abstract

This talk intends to invoke a paradigm shift from object- to human-centered design and will demonstrate this shift by contrasting two models of user engagement with everyday things: extrinsic and intrinsic motivation.

During our industrial era, goal-directedness dominated explanations of technology. Design inscribed functionality, economy of manufacture, and aesthetic theories into its products, thus reifying extrinsic motivations. Our rapidly evolving information society, by contrast, is shifting its emphasis from industrial products to a new class of artifacts: Interfaces. Interfaces are hybrids of human perception and interaction with technology. To understand them presents an epistemological challenge. For once, motivations for realizing them reside inside the process of engagement, radically undermining mechanistic/causal explanations and our traditionally functionalist design criteria (including human factors).

A model for interfaces is presented that derives from human languaging (dialogical use of language) and the coordination of affects (e-motions). It constitutively involves the human body and the culture in which this circularity arises. It seeks to account for the emotional excitement created by playful uses of artifacts and moves humans into the center of design considerations.

In this paper, I am proposing a paradigm shift in the way we conceptualize what designers have to attend to and how we do research in support for design decisions. This shift is necessitated by technological advances that have made the world at once more complex and

bears the potential of making it more human as well. I am urging this shift not for its newness or aesthetic pleasure but for the simple reason that our familiar ways of talking of human factors in design has reached a point at which it prevents us from coming to grips with what is much too loosely called "user-friendliness." I will be demonstrating the need for a new conceptual framework by means of two concepts, which I argue are central to address the emotional side of design: human-centered design and intrinsic motivation. Let me start by telling a couple of stories, examine their lessons, and present a summary of what needs to be realized.

A story of how intrinsic motivation hides behind theories that embrace extrinsic motivation

In the mid eighties, when personal computers (PSs) came to be purchased in noticeable numbers and entered various enterprises in the United States, the Wharton School of Business and Finance at the University of Pennsylvania conducted a large cost-benefit study of PC use. Mainframe computers had already demonstrated their worth for organizations that were hierarchically organized and experienced central accounting and scheduling problems. The PC was different. It stood on individual desks. It did not speed up typing but enabled editing, formatting, typesetting/printing, data manipulation and other enumerable benefits. But, subtracting the costs of purchasing and maintaining PCs from the benefits they created turned into a surprise: There was no justification to use PCs at all.

History proved otherwise. Since this quiestion was attended to by empirical methods, our culture took a drastic turn towards widespread use of information technology. The hierarchical structures in government and industry have become weaker. New inventions, like the Internet, have grown on the increasing use of PCs. Computer literacy is increasing. We have no longer a baseline against which to calculate the advantages of PC use but we realize our dependence on them when they break down. How could this development happen without seeming economic benefits, without a rational ground? I would suggest that this now seemingly counterintuitive finding did not result from measurement errors. Rather, there was something at work that completely escaped measurable economic variables and defied the rational arguments that were built into social scientific methods of inquiry. I am suggesting that the research was locked into looking for extrinsic motivations when the motivation for computer use was intrinsic to that use.

What is the difference between extrinsic and intrinsic motivation? Motivation is the answer to the question of why one does what one does. *Extrinsic motivations* justify one's doing as means to reach ends, to achieve goals, or to obtain results. Cost benefit analysis is a method indebted to extrinsic motivation. Rationality is the formalization and generalization of extrinsic motivation. Actions are rational when chosen in view of objectives to be achieved by them. Efficiency measures in human factors engineering are extrinsically motivated by relating (human) performance to externally defined performance criteria. Our cherished idea of "function," relating the roles of parts to the purpose of their whole (much like in biology), is a form of extrinsic motivation: parts are subordinate to their whole and justified in terms of what they contribute to the sustenance of that whole. Management theory considers motivation as the desire to put forth effort in pursuit of organizational objectives (Mondy, 1991:292). A recent NASA document (Castro-Cedeno, 2001) describes motivators in terms of incentives to perform, rewards or the avoidance of punishment, achieving personal goals, fulfilling leader expectations, satisfying personal needs, obtaining social approval, or succeeding in comparison (competition) with others. Most theories of motivation subordinate individual behavior to external or higher order goals. In our lingering modernist tradition, extrinsic motivation is the pervasive cultural norm. Deviations from that norm are easily dismissed as aberrant, unworthy of attention, and in the case of the Wharton study, unnoticed.

I shall say more about intrinsic motivation below. At this point let me say not more than that *intrinsic motivations* justify one's process of engagement in its own terms, that is, without reference to an outcome, achievement, or result. Having fun, doing something for its own sake, enjoying being there, and being involved are intrinsic motivations that people have no difficulties giving. They concern feelings that are experienced while doing something regardless of any end and therefore escape scientific or rational measurement protocols, such as for the motivation of PC use.

A story of how the conceptions of the observed can defy the theories of the observer

Starting in 1924, Elton Mayo and other industrial psychologists conducted a series of studies at the Western Electric Plant in Harthorne, Illinois. One experiment looked at how lighting affects worker productivity. Subjects understood that. Illumination was first increased

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to extreme brightness and then reduced in stages to the point were the materials to be assembled could hardly be seen. Workers maintained or even exceeded their original output. Similar results were obtained for wage incentives, supervision styles, length and frequency of rest periods, and length of the work week.

These Hawthorne studies followed the classical human factors design. Working conditions were varied, output served as the performance criterion, and correlations between predictor and criterion variables were used to determine which condition had what effects. In this study, no condition caused performance to drop. It improved or remained unchanged even when the original working condition was retested. With causal models in mind and human factors considered as independent variables, this clearly made no sense.

Mayo's explanation of this seemingly implausible finding was that workers were responding not to the objective working conditions but to what they meant to them, being attended to by the experimenters, being singled out for attention, and being taken seriously during interviews and consultations. To explain why the experiments failed to produce the human factors they sought, experimenters had to become unwitting participants in the very process they intended to understand, and the workers were the ones who could provide the very explanations that informed the researchers conclusions (not the quantitative findings). Today the Hawthorne studies are heralded as showing the failure of mechanistic conceptions and demonstrating the importance of communication in the process of discovery. Underlying this, on the one hand methodological failure, and on the other hand social theoretical windfall, is the recognition that models of human behavior that operationalize observer conceptions at the expense of those of the constituents of the process are bound not to explain what is going on. In the Hawthorn experiments, the conception of productivity and of the variables intended to explain outcome were the experimenters. Neither accommodated how the workers conceived of their job much less what motivated them to do what they did.

Imposing observers' conceptions is unavoidable when the observed do not have a mind of their own, objects of nature and technological artifacts, for example. Imposing observers' conceptions on people who bring their own conceptions to what they do, usually is misleading and at worst oppressive (e.g., subjecting perfectly intelligent human beings to unintelligent tasks and studying them as if they conformed to response mechanisms or cultural dupes). Communication studies have shown over and over again that being inside a conversation is very

different from observing it from the outside. The Hawthorne studies taught us that context sensitive and interactive phenomena easily escape observation.

Stories of intrinsically motivating activities

What is it that is intrinsically motivating and so easily escapes traditional scientific measurement? Before addressing computer interface and web design, let me consider three activities we tend to engage in for their own sake: skiing, making art, and playing computer games.

Standing in long lines at ski lifts that bring people like cattle up a mountain from which they have to come down on their own to where they had started, certainly doesn't make much sense to an outsider, especially in Winter when it is cold. There is an unusually high probability of accidents. People get killed or break their bones. Why would anyone do it?

Or take painting. There are many painters. A few make a living of it, painting clients' portraits or to please a gallery owner. But most are not so lucky. They make a living from doing menial jobs that barely pay for the materials, spend much of their time with a canvas in front of a landscape, usually to the ruin of their family. For most painters, onlookers are a nuisance for they surely wouldn't understand.

When entering a game parlor naïvely, one might be struck by buzzing, humming, and ringing sounds, emitted by machines that take money in return for letting people direct a television screen for a while. Yes, some of these machines designate winners and losers or give performance scores by which better and worse players are told apart -- but this does not seem to matter, and indeed, no physical reward is offered. Yet people seem engaged and have fun. This too is the description by a detached observer.

What do these rather diverse activities have in common? In his *The Psychology of Optimal Experience*, Mihaly Csikszentmihaly (1990) reports on interviews he conducted with people who described such experiences. Typical attributes are "enjoyable," "elated," "exhilarating," "extraordinary," "effortless," "smooth," "being free," "blissful" -- all suggesting a state of heightened emotions. Alison Andrews (1996) reviews his and several other conceptualizers' work. Let me summarize the features of intrinsically motivating activities in my own terms:

- They consist of **interactivity**, not physical properties. Actions and reactions follow each other reliably, directly, and without noticeable delay. In painting, brush motions and their effects are almost indistinguishable in time. Good electronic games give immediate and sufficiently informative feedback. Competition is a frequently occurring form of interactivity

- They involve **multiple sensory-motor coordinations**, ideally the whole body. In skiing, the movement of virtually every bodily part translates into changes in speed and direction, and irregularities in the environment are sensed as patterns involving several senses that confirm each other

- They require a considerable level of **skills as well as challenges**. Skills are acquired abilities to do something well, challenges stimulate changes in how things are done. Together, these somewhat conflicting requirements encourage a **path of continuous learning** that balances the need to be on safe grounds against the desire to escape boredom from repetition. Skills are marked by the absence of errors. Challenges must not frightening. In computer games, when breakdowns occur and manuals need to be consulted, intrinsic motivation is gone

- They inspire **competence**. Some writers describe this experioence in terms of being control. But perfect control can never be achieved. What intrinsically motivated activities provide is a sense of not loosing control, an absence of the fear to get into trouble or not being able to do something. Intrinsically motivating activities preserve confidence. Indeed, confidence can enable unbelievable feasts

- They provide a **clear sense of place and direction**. While painting, painters are alert to where they are and know what they are doing. But beyond that, goals tend to be vague if not absent. Rarely have painters visions of the final product, witness frequent revisions. A painting is not finished until the painter knows it is. In downhill skiing, a slope has its end, of course, but at any one moment, intrinsically motivated skiers know where they are and have a clear sense of the direction they are taking. There is a sense of purpose but no goal.

- They are **embodied in the presence.** The history of intrinsically motivated activities quickly become background and their future is never too far ahead of the presence. The process paces itself, creates its own sense of time, which often is at odds with standard time. Moreover, feelings, an important ingredient of intrinsically motivated activities, always reside in the present. (one may recall past emotions, but recall is not the same as living them)

- They require **extreme concentration**, blocking out from attention everything irrelevant to the point of not noticing the time that elapses, witnesses, even that activity's potential dangers. Action and the awareness of the action merge into a form of being in the process (or flow), sometimes described as being absorbed, submerged, or one with that activity
- They present **their own reality**. Intrinsically motivating activities are so involving that there have no place for alternatives, for projecting a desirable self image, for impressing others with the skills involved in the activities, for lying, faking, or role playing. Other authors describe this experience as a loss of self-consciousness. I suggest that this loss refers to a pretend self bringing forth a self that is real at any one moment of the activity

Note, many intrinsically motivating activities occur in competitive games: playing chess, cards, or computer games. They have rules and final outcomes. Of these many are public: playing soccer, racing cars, or running marathons. These have official and unofficial judges. This does not contradict the above experiences, however. Rules are largely for beginners who have not internalized what there is to know or for referees who are above the game. Intrinsically motivated activity arises where players have achieved a level of mastery on which these rules have become so natural as to be the barely noticeable background of the activity. Under these conditions, rules are not consulted but lived. Superficially, the presence of outcomes might suggest playing games to be extrinsically motivated. This might well be the so. My point is that extrinsic motivation rarely explains the whole story just as intrinsic motivation does not account for everything. I would argue that without intrinsic motivation, most sports would be barbaric. In fact, good athletes do not want to play with those who play to win at any cost. The typical reason is that it wouldn't be fun, which is the justification for engaging in intrinsically motivated activities.

Object-centered and human-centered design (and research)

Having identified intrinsic motivation as the source of enjoyment and emotional involvement in the use of artifacts, let me offer a series of decisions we need to make, consciously as I would argue in order not to loose sight of what we wish to explain and enable in the design of artifacts. First is the distinction between object-centered and human-centered

design as well as research. The distinction seems trivial but its consequences lead to far from trivial epistemological paths.

We can focus either on the design of things, what they are supposed to be and how they are to function -- screw drivers, palm tops, operating rooms, conference centers -- and approach their design in functional terms, not realizing that functions do not exist in nature but are attributed to material objects by someone and within a particular cultural context (Kr4ippendorff and Butter, 19XX). Industrial design grew up during the industrial revolution, at a time of material scarcity and rampant authoritarianism. Under these conditions designers rarely ever questioned where these generalized conceptions came from, whose they were, whom they benefit, and what they destroy. In fact, advertisement, consumer instruction, and design education was to assure that appreciation of mass products served industry's interests in expanding markets, often at the expense of non-western (equal not "technologically advanced") cultures. This product orientation is heavily supported by renaissance science, its objectivism in particular. Object-oriented design focuses on the design of tangible objects, products, thing in the belief that the conceptions of users did not matter or entered design only as a factor, the human factor. Human factor research, an outgrowth of this attitude, has made great strides in identifying where human physiology, behavioral limitations, cognition, and attitudes enter the proper use of technological artifacts. But these factors are nothing but appendices of object-centeredness. Moreover, human factor research is unaware that these factors are the product of conceptualizations by the researcher/designer who took their conceptions as if they were true for everyone, of for everyone who was sufficiently scientifically trained or sensitive to see the world exactly as the human factors theorists did. I am suggesting that information technology plus widespread democratization has created a post industrial culture in which an object-centered epistemology is no longer viable. The need to have a conference like this and the search for new approaches to understand fun, emotional involvement, and what drives technological development, intrinsic motivation, attests to this.

In contrast, I call human-centered an approach to design and research that takes seriously the proposition that behavior and understanding goes hand-in-glove, that the use of artifacts is inseparable from how users conceive of them and engage with them in their world. Let me state the proposition more concisely:

Humans do not respond to the physical qualities of things

but to what they mean to them

I maintain that intrinsic motivation escapes comprehension by outside observers without appreciation of the particular skills, conceptions, and learning abilities that people bring to this experience. Any operationalization of these experiences in terms of objective measurements, as provided by mechanical devices or scales imposed upon those who have these experiences, necessarily fails or at best correlates with the phenomena to be explained and encouraged.

A proposition so general

applies to users, designers and scientific observers alike

Users, designers, scientists, and other kinds of people are different, of course, but not in the sense of one being superior to the other, a view that industrialization needed and renaissance science institutionalized. Each lives in different worlds. Utilizing or consuming something is an interaction different from creating something that affect others, which in turn differs from trying to accurately describing it. Not that it would be impossible for anyone to move from one world to another, but privileging one world over another entails the very attitude that prevents us to understand how different people create their own worlds, interact with artifacts in ways that may well be typical within a group or culture, but not generalizable to all people.

To understand intrinsically motivating interactions with artifacts, these two propositions lead us to distinguish at least three participants in the design of such artifacts:

- A diverse user group whose members bring their own conceptions to anything that enters their world
- Artifacts that, when entering any of the many worlds of users, gives rise to rather different interfaces with them – as conceptualized by these users
- The artifacts that designers specify for production and distribution in a world that includes a population of stakeholders, users among them, who all live in their own worlds and necessarily perceive and interact with these artifacts in ways different from each other and from the designer – of course as conceptualized by designers

In the above, there are no privileged world conceptions, only different kinds. But how could we get in touch with worlds that are not our own yet evidently possible and lived in by others? The answer is through language, by listening to how others speak to us about their worlds, in our case by listening to how they describe their intrinsically motivating experiences.

This is what Csikszentmihaly did with ordinary people and what Andrews did with designers of advanced interactive system designed to enable such experiences.

Verbal interaction is an interface as well, but one that does not require mediating technologies. It is a way to understand something of each other, to coordinate each other's behavior, and over time create the artifacts that satisfies the shifting languaging of its participants. Designers need to know not only what the many worlds of users are like, but also what the worlds of their stakeholders are like, all of which are known to differ from their own. Finally, we should not overlook the fact that much of design is languaging: translating clients wishes into detailed specifications, narrating futures in which a design would make sense, arguing for the benefit of a proposal, getting information about alternative solutions, cooperating with other designers. In all these ways of languaging, the structure of the language that is used has much to do with what emerges from it: what an artifact comes to mean and given this, how it is being interfaced with. Hence the probably most challenging proposition of human-centered design:

Artifacts are languaged into being

Manifestations of embodied and discursive understanding

***   Now, design is a very purposive activity and conceptualization is almost exclusively tied to language, as I suggested. Even designers acknowledge an intuitive ground, another kind of knowledge they cannot easily talk of but in emotional terms, whether these express admiration, visual pleasure, or simply the desire to touch or possess the object of their emotional attention. People with intrinsically motivating experiences are similarly short of words describing what they experience. ***There thus are two kinds of understanding we need to distinguish:

- *Embodied understanding* is manifest in doing, and in the case of intrinsically motivating activities, in doing something self-pleasingly well
- *Discursive understanding* is manifest in accounting experiences to others

The former may be demonstrated by its practice. As it is the whole body that undserstands, demonstrating it often is the only way to show it to others and for others to understand what is being talked about. Discursive understanding is evident in accounts given after the experiences being talked of. It may never be understood by others who did not have similar experiences.

Also, discursive accounts are given by someone to someone else, occur in social relationships. When asked for, discursive accounts are affected by the space that any question opens for the respondent to answer. This is why focus groups do not reveal much of what could be exciting. They elicit opinions, rational answers to questions, unanticipated arguments, warnings, but little embodied understanding. To design artifacts that can participate in intrinsically motivating experiences requires a correlation of the discursive accounts offered, ideally unquestiond, and a demonstration of the embodied understanding they describe -- whether by observing what people talk of or by exposing oneself to the experiences and talk with those who have similar experiences. Both are entailed by a human-centered approach to understanding.

Not attempting such a correlation leads to all kinds of irrelevant designs. Skiers who have optimal experiences do not have them because of the colors of their ski. Painters rarely attribute their excitements to the wrappers around their paint, and users of interactive media would not attribute their excitement to the color and lines of the box containing their computer and/or screen. For intrinsically motivating experiences these are mere backgrounds and designers that stop there miss the point of human involvement in the artifacts of this world.

Knowing artifacts and knowing the stakeholders of artifacts

I said enough about the distinction between intrinsic and extrinsic motivation. To reiterate, motivations are verbal accounts given of why one does what one does. They occur in language and communication among people, not in someone's brain. Accounts that justify an involvement in terms of means and ends relations, in terms of function or subordination to larger organizational objectives, in terms of success and failures, or in terms of factors that enhance performance criteria are extrinsic motivations. Accounts that justify an involvement in terms of itself are intrinsic motivations. I suggested that optimal experiences, the pleasure of being, job satisfaction, enjoyment, excitement, and fun, are intrinsically motivating and are important drivers of technology, albeit not recognizable by empirical methods that celebrate extrinsic and dismiss intrinsic motivation.

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