

Does Aesthetics Matter in Human-Computer Interaction?

Noam Tractinsky

Department of Information Systems Engineering, Ben-Gurion University of the Negev

Abstract

Usability experts and researchers alike have largely ignored the aesthetics dimension of human-computer interaction. This paper argues that aesthetics should be conceived as an integral part of information technology (IT) just as it is in other aspects of our lives. Four reasons are provided for this premise. (1) In many cases, aesthetics becomes a major differentiating factor between IT products. (2) Our evaluations of the environment, including IT, are primarily visual and thus are susceptible to immediate and sustainable aesthetic impressions. (3) Aesthetics satisfies basic human needs, and human needs are increasingly supplied by information technology. (4) Aesthetic considerations are becoming increasingly important and pervasive in our society, in large part thanks to IT.

1 Introduction

Early information processing artifacts were designed to support a small number of well defined organizational activities (e.g., payroll processing). However, as years went by, information technologies have permeated almost every aspect of our lives. The way information technology (IT) serves society have gone through some dramatic changes. Accordingly, people's experiences with IT have changed as well along with their expectations, demands and evaluations of existing and new IT artifacts. These changes call for reevaluation of how we approach the design of the IT artifact. Whereas past research and practical guidelines stressed avoiding negative user experience, a new vision of IT sees opportunities for positive experiences. One aspect of these new types of experience is the visual aesthetics of the IT artifact. By this term I mean the beauty or the pleasing appearance of the artifact.

I view the people whose profession, or perhaps craftsmanship, revolves around the design of information technology-based artifacts as architects. The ideas presented in this paper are anchored in some of the oldest notions on design, put forward by Vitruvius (1st Century BC). Vitruvius, the earliest known architecture theorist, argued that architecture must satisfy three distinct requirements: *firmitas* (strength) – which covers the field of statics, construction, and

materials; *utilitas* (utility) – the use of the building and its functioning; and *venustas* (beauty) – the aesthetic requirements (Kruft, 1994). Although architectural theories have since evolved considerably, Vitruvian principles still hold much intuitive and theoretical appeal to this date (Kruft, 1994).

It is easy to see the parallels between the Vitruvian principles and some of the principles governing the design of IT artifacts. Much of the work in this field relates to the soundness and the robustness of the artifacts created by professionals (*firmitas*). This is no different in the field of IT. Every professional in the field would agree that requiring reliable, correct, stable and internally logical products is at the core of designing IT artifacts.

The second Vitruvian principle, *utilitas*, is the focal point of the human-computer interaction (HCI) community. It deals with the ways in which information technology should be designed to meet individual and organizational needs in order to promote efficiency and effectiveness. In a way, the field of HCI emerged as a counterforce to the traditional, *firmitas*-oriented computing disciplines. Here, understanding users, their tasks and how the system can facilitate achieving users' goals were brought to the fore (Card, Moran, and Newell, 1983). Carried by its flagship concept of usability (Gould and Lewis 1985), the *utilitas* principle of IT artifacts has gained considerable ground over the last two decades. Once a marginal aspect of computing, usability is now considered a major factor in the design of IT products.

Until very recently, however, IT professionals and researchers paid only scarce attention to *venustas*, the third Vitruvian requirement. This absence is particularly glaring in studies of interactive systems. HCI texts hardly make any reference to matters of aesthetics. Whenever aesthetic issues are discussed, they are likely to be qualified by warnings against its potentially detrimental effects. There may be a couple of reasons for the neglect of aesthetics in the computing disciplines. One reason may stem from resentment of attempts by some in the computer industry to oversell glitz and fashion in lieu of substance and usefulness. Another reason may lie in the computing disciplines' origins in disciplines that emphasize hard science, efficiency and utility. Thus, other aspects of the interaction were not recognized as belonging in the field.

Again, this is in contrast to other design disciplines, in which much attention was given to the role of aesthetics and to considerations of blending aesthetics into the product experience. The balance between the aesthetic qualities of artifacts and the other two Vitruvian dimensions has shifted through the years. The emphasis on mass production following the industrial revolution tilted the pendulum away from aesthetic consideration. In the early 20th century, however, industrial designers began introducing aesthetic considerations to mass production, partially for marketing purposes (Petroski, 1993). From the consumer viewpoint, aesthetic quality can make engineering products more readily acceptable and can improve their commercial value, desirability and acceptability. The contrary viewpoint saw aesthetics as irrelevant (or even detrimental) to the achievement of users' goals and as a gratuity that diverge the design effort from issues of substance to issues of style (Norman, 1988).

There is a sense however, that the attempts to belittle the role of aesthetics in design go contrary to human nature. The importance of beauty has been recognized since antiquity. In

some ancient traditions, beauty was of cosmic importance (Feagin and Maynard, 1997). Following Vitruvius, Alberti defined beauty as the wholeness of a body, “a great and holy matter” (in Johnson, 1994; p. 402). Modern social science has established the importance of aesthetics in everyday life. In a seminal paper, Dion, Berscheid and Walster (1972) demonstrated that a person’s physical appearance influences other aspects of the social interaction. Still, we are affected not only by the beauty of other people but also by the aesthetics of nature, of environments (e.g., Nasar, 1988; Porteous, 1996; Russell and Pratt, 1980), and of various artifacts (Postrel, 2002; Coates, 2003; Helander, 2003; Norman, 2004).

Recently, evidence supporting the importance of aesthetics in HCI has started to emerge. This evidence encompasses both hardware and software issues. For example, Apple’s iMac was heralded as the “aesthetic revolution in computing,” and an indication that the visual appearance of IT has become a major factor in buyers’ purchase decisions (Postrel, 2002). Recent empirical studies indicate that aesthetic design enhances perceptions and attitudes of various computing products, and specifically in the context of the web (Schenkman and Jonsson, 2000; Kim, Lee, Han and Lee, 2002; van der Heijden, 2003). Other studies have found aesthetics to be of importance, though not in a dominant way, in affecting users’ perceptions (Zhang and von Dran, 2000). Although not measuring aesthetics directly, some studies indicate that web site design is a major determinant of perceived credibility and trustworthiness of e-commerce sites (Fogg et al., 2002; McKnight et al., 2002). Research suggests that aesthetics increases the pleasure experienced by the user during the interaction (Jordan, 1998). It was found to be highly correlated with perceptions of the systems’ usability both before (Tractinsky, 1997) and after (Tractinsky et al., 2000) the interaction, and with user satisfaction (Lindgaard and Dudek, 2003).

Thus, despite the paucity of direct empirical evidence regarding the role of aesthetics in human-computer interaction, the above findings as well as theoretical, empirical, and anecdotal evidence from other disciplines indicate that this role is not trivial. We present this evidence in the next section.

2 Arguments for Considering Aesthetics in the Design of Human-Computer Interaction

The case for incorporating the aesthetic aspect into the IT artifact in terms of both practice and research is based on four arguments: three theoretical and one practical. The arguments do not imply that aesthetics should become the paramount consideration in HCI. Obviously, aesthetics matters differently for different types of systems, users, tasks and contexts and its significance varies accordingly. The point, though, is that while aesthetic issues have until recently been ignored by HCI researchers and many usability experts, there are compelling arguments as to why they should receive more attention in the future.

2.1 Level of performance exceeds most users' needs

Traditionally, processing speed, cost and functionality have been the major barriers for purchasing and adopting information technology. Increasingly, though, IT products provide these elements in a way that surpasses the requirements and needs of many users and organizations. A growing body of literature indicates that this might be the case for both individuals (e.g., Norman, 1998) and organizations (e.g., Carr, 2003). Norman (1998) suggests that as a result of this process, the competition becomes more oriented towards enhancing the users' experience rather than towards improving functionality. Once IT provides all the required features at ever decreasing prices, considerations of convenience and reliability, and later on appearance and symbolic ownership become more important. Norman compares this process to the state of the watch industry, which has long ago passed users' technological requirements: watches are now often marketed as objects of fashion or emotion.

Carr (2003) indicates that basically similar developments occur at the organizational level: price reduction, sufficient functionality, and more sophisticated consumers lead to the commoditization of IT. Many of Carr's critics indicate that it is not IT per se that creates strategic advantage. Rather, it is how organizations harness its potential that helps differentiate them from the competition. This does not diminish the potential contribution of aesthetic design. In fact, aesthetics may have an important role in differentiating IT products. A notable example of differentiating by aesthetics is the success of the iMac, which is attributed to the shifting emphasis in product features – from performance and reliability to aesthetics and style (Postrel, 2002).

To a large extent, the use of aesthetics as a differentiating factor resembles similarly crowded markets where "aesthetics is often the only way to make a product stand out" (Postrel, 2002, p.2). According to this view, aesthetics may not overcome bad usability, unreliable systems or significant lack of features, but it matters when all else is equal. And, allowing for a slight overgeneralization, "all else is equal" is becoming the state of affairs in the rapidly commoditized IT market.

2.2 Many aesthetically-based evaluations are fast and persistent

The basic assumptions of usability engineering rest on a dominant research paradigm that presumed that human decision making rely entirely on cognitive processes. Current findings and theories, however, challenge these assumptions, stressing the importance of affective processes. One important role of affect in human behavior stems from the fact that some of its reactions are very rapid (Pham et al, 2001; Norman, 2004), so it can color subsequent cognitive processes because our thoughts normally occur after the affective system has transmitted its initial information. There are some hints that first aesthetic impressions are affective and are formed immediately at a low level and thus precede cognitive processes (Zajonc and Markus, 1982, Pham et al., 2001; Lindgaard et al., in press). Hence, the imme-

mediate affective reactions may color and potentially sway successive cognitive processes (Pham et al, 2001; Duckworth et al., 2002).

A couple of things should be noted. Firstly, aesthetic evaluations are by no means purely the result of immediate affective response. Clearly, given sufficient time they will also be based on more elaborated cognitive and affective processes (Csikszentmihalyi and Robinson, 1990; Norman, 2004). Those later evaluations may be based on different aesthetic criteria (e.g., symbolic references hidden in the artifact; fine details that escape first impressions; relations with other objects in the environment), but they, too, serve an important function in shaping our attitudes towards objects. Secondly, it is not necessary for aesthetic impressions to be extremely rapid or purely affective in order to leave their traces on subsequent decision processes. This is because in many cases aesthetic evaluations of an object are made faster than evaluations of other attributes of the object, since those other attributes (e.g., functionality, ease of learning) do not reveal themselves immediately. Thus, we are introduced to a well known phenomenon from the social sciences in which aesthetic perceptions of an object color other perceived attributes of the same object. In what is known as the "beautiful is good" stereotype, a person's attractiveness was found to affect how people perceive other attributes of that person (Dion et al., 1972; Eagly et al., 1991). The effects of the "beautiful is good" stereotype are not merely academic. For example, beautiful people earn more on the marketplace (Hamermesh and Biddle, 1994), and better looking university instructors receive higher teaching evaluations (Hamermesh and Parker, 2005).

Similar results to those obtained in the social world were also observed in human-computer interaction. A strong evidence for the immediacy of first aesthetic impression in IT was provided by Fernandes et al (2003). They found that attractiveness evaluations of web pages to which participants were exposed for only 500ms were very highly correlated with attractiveness evaluations of the same pages under unlimited exposure. We have recently replicated and validated these findings (Tractinsky et al, 2004). This may partially explain why aesthetic impressions may affect how people perceive other system attributes, such as usability (Tractinsky et al., 2000). We still do not have direct evidence that the aesthetics of IT impacts users' decision processes, but evidence regarding the influence of affect on decision making exist in other fields (e.g. Isen, 2001).

Obviously, the fact that some aesthetic impressions are formed immediately does not imply any deterministic consequences in human-computer interaction, just as human-human interactions are not determined by aesthetic perceptions alone (Eagly et al., 1991). Many factors can potentially mitigate the effect of aesthetic characteristics of an IT artifact on users' attitudes and behavior (I'll return to this issue in the next section). Thus, some responses to aesthetic stimuli are innate and relatively invariant, but some are learned and depend on culture, education, and other experiences and acquired tastes.

2.3 Aesthetics satisfies basic human needs

Incorporating aesthetic considerations in the design process is a contested issue. Some view this as gratuitous or even manipulative. In his seminal book, "The Psychology of Everyday Things," Norman (1988) criticized designers' tendency to emphasize aesthetics at the expense of practical features of the artifact, such as usability and functionality. This criticism reflects a practical recognition that artifacts should primarily satisfy basic requirements, such as reliability and usability. Recently, however, with the increased recognition of the role of emotion in decision making the reverse has been argued: modern design has placed too much emphasis on performance issues and not enough on emotional aspects, such as pleasure, fun and excitement. These are fundamental motivators of human behavior to which aesthetics is a major contributor (e.g., Green and Jordan, 2002, Norman, 2002; Coates, 2003, Hassenzahl, 2003).

Aesthetics satisfies our needs and motivates us (Maslow, 1954; Zhang and von Dran, 2000). Postrel (2002) suggests that for most people, aesthetic objects have intrinsic value above and beyond their functional value. There is little to suggest that the need for aesthetics disappears in front of the computer. IT users strive for a more complete and satisfying interactive experience; an experience that not only achieves certain well-defined goals but also involves the senses and generates affective responses (Bly et al., 1998; Hassenzahl, 2003).

Fogarty et al. (2001) claim that since computer technology has moved beyond the confinements of the work environment and into the rest of our lives, its use has expanded into wider aspects and its requirements have shifted as well. If once the value of computing technology was measured mostly by its usefulness for solving problems and by its ease of use, additional requirements, such as desirability, have now emerged. Issues of visual appeal and aesthetics have become an integral part of interactive system designs. This claim can be easily verified by randomly browsing web sites. Another demonstration of the validity of this claim can be found in the trend to personalize the application's appearance. This trend seems to answer the quest for richer and more affective experience (Blom and Monk, 2003). It is characterized by the proliferation of skins -- alternative interfaces to commonly used applications. Skins allow users to change the application's appearances while preserving its functionality (although it may change its usability!). "Skinnability" (the ability to tailor the application's appearance) has become a common feature in many types of personal computing applications. Our studies indicate that the choice of skins by individual users has much to do with the skins' aesthetic properties (Tractinsky and Lavie, 2002; Tractinsky and Zmiri, in press).

2.4 Practical, realistic considerations require attention to aesthetics

We may not like the idea that style overcomes substance or that looks influence perceptions of seemingly unrelated attributes of people, objects, or interactive systems. We can argue the desirability of these phenomena, but we cannot deny their existence nor can we ignore the positive effects of aesthetics on our well-being. More importantly, we cannot ignore the fact

that aesthetic issues have become more pervasive than they used to be. Postrel (2002) argues that “sensory appeals are everywhere, they are increasingly personalized, and they are intensifying.” (p.5). According to Postrel, today's aesthetics pleases and liberates the masses. Probably as a result of all of the previous arguments, there appears to be an increasing cycle of aesthetics supply and demand, fueled to a large extent by information technology.

It is worth noting, then, that not only do designers are more conscious of, and put more effort into, the aesthetics of IT artifacts; information technology in itself is increasingly becoming a vehicle to create and disseminate aesthetics. One of the unintended results of IT is that it is particularly friendly to aesthetic applications. Users can create, edit, transmit and receive aesthetic designs in almost any imaginable domain. One of the major genres of visual aesthetics – photography – is gradually becoming dominated by information technology: In 2000, 19% of the cameras sold in the United States were digital. In 2004, 73% of camera sales were digital. In terms of digital camera resolution, the average price per megapixel decreased in half between January 2003 and December 2004 (Photo Marketing Association International, 2005). Digital cinematography follows suit. Designers in industries such as fashion, mass media, art, business documents and Web development are equipped with applications that offer many more design options, and much more time to explore them. Thus IT increases society's creative potential.

The role of IT in establishing the pervasiveness of aesthetics in today's business world is described by Schroeder (2002), who argues that “web design has brought visual issues into the mainstream of strategic thinking... The Web mandates visualizing almost every aspect of corporate strategy, operations and communication” (p. 22). Moreover, Postrel (2002) suggests that “the computer-driven democratization of design has made more people sensitive to graphic quality. Bit by bit, the general public has learned the literal and metaphorical language of graphic design. Carried by computers, aesthetics has spread to places and professions that were formerly off-limits to any such frivolity... Over time people learn. They discover more about what's aesthetically possible and more about what they like” (P. 55). An aesthetic cycle is in the working, where aesthetic supply creates more demand, which in turn feeds even more supply.

3 Looking Forward: Studying and Practicing Aesthetics in HCI

How do we proceed? How can we better understand the influence of aesthetics on human-computer interaction? How do we design more aesthetic IT artifacts? What are the limits of aesthetics positive effects? What types of visual aesthetics exist and do they relate to specific IT genres, specific usage contexts, or specific user populations? To answer these and related questions we would need to more consciously address aesthetic issues in HCI research.

Most of the empirical research on aesthetics can be classified as belonging to either the "experimentalist" or the "exploratory" traditions (Lavie and Tractinsky, 2004; Porteous, 1996). To some extent, the two methods reflect a philosophical debate as to whether aesthetics lies in the object or in the viewer. The objective view of aesthetics is associated with the "experimental aesthetics" stream of research (e.g., Berlyne, 1974) that sought to identify general laws of aesthetic qualities. Recent research, though, have questioned the efficacy of the experimental aesthetics program (e.g., Arnheim, 1992; Martindale et al., 1990; Whitfield, 2000). The subjective approach can be captured by research in the exploratory tradition, which has tried to delineate higher order factors that represent peoples' perceptions of the evaluated objects. This stream of research is typified by the evaluation of complete and ecologically valid stimuli (e.g., works of art, buildings, landscapes, and web-pages) rather than manipulated, artificial stimuli in controlled setting.

Because of the prevalence of IT in our world it serves as a natural context for the study of contemporaneous artifacts and aesthetic phenomena. There are probably two basic approaches to the empirical study of aesthetics in HCI. The first approach requires the identification of relevant variables that can be manipulated or measured in relatively controlled settings. This approach is more suitable for the study of specific design factors and their effects on users' perceptions, attitudes and behavior. The second approach is more open-ended, identifying issues and general research questions that are difficult to study within the former approach. This approach may be necessary if we wish to render a more comprehensive picture of IT aesthetics. Here I will only outline some research ideas that can stem from the two approaches.

3.1 Studying design factors from aesthetic perspective

Perhaps the most obvious research direction is the study of how the aesthetics of design characteristics affect users' performance, satisfaction, willingness to accept a system or to pay for it, and so on. Such research can concentrate on objective design characteristics or on subjective (or perceived) ones. An example of an objective design element might be the use of homogeneous, as opposed to partitioned, background for a web page (e.g., Kim et al., 2003). Subjective design characteristics refer to how users interpret the aesthetic qualities of the artifact. For example, we found that users distinguish between two aesthetic dimensions of web pages: "classical" and "expressive" (Lavie and Tractinsky, 2004). The titles of these

dimensions are of course arbitrary, but they reflect a real difference in terms of how users perceive web pages.

But in order to understand the effects of design characteristics we need to improve our measures of aesthetics. To date, most studies of aesthetics in IT have only measured a general aesthetic evaluation of the IT artifact. Such a measure can be a one- or a multiple-item scale assessing the system's aesthetics. For example, Kurosu and Kashimura (1995) Tractinsky (1997), Schenkman and Jonsson (2000) and Hassenzahl (2004) have all used a single item asking about the beauty of the IT artifact, while van der Heijden (2003) employed a 3-item scale measuring perceived attractiveness. However, it is crucial to fine-tune the measurement of aesthetic evaluations in order to better understand how design characteristics of interactive systems relate to users' perceptions and behavior. There are already a few examples of such research. For example, Kim et al. (2003) have identified specific elements of aesthetic design and were able to link them to various emotional dimensions experienced while browsing the web. Similarly, specific (as opposed to general) aesthetic evaluations can improve our understanding of how design attributed influence various outcome variables (e.g., Lavie and Tractinsky, 2004; Hassenzahl, 2004).

The specific effects of aesthetics on users are not likely to be universal. One can think of various contingencies such as the type of system used, the social context, cultural differences and whether using the system is voluntary or not. In addition, individual differences should be considered as well. While at one extreme some people crave aesthetics so much that they become physically ill by ugliness (Maslow, 1954), at the other extreme some remain relatively indifferent to aesthetic variations. While there is some evidence for common aesthetic preferences, it is clear that people also differ in terms of their aesthetic preferences. Research findings indicate that education influences aesthetic preferences (Getzels and Csikszentmihalyi 1969, Devlin and Nasar, 1989; Csikszentmihalyi and Robinson, 1990). Thus, an interesting research direction with considerable practical implications would be to try to identify common and uncommon aesthetic preferences among users of information technology.

3.2 The greater picture

Under this title I chose to include a few questions that cannot be easily studied under traditional scientific methods. Consider, for example, the idea of IT as a vehicle for aesthetic creation and communication (Postrel, 2002). IT has considerably augmented our ability to copy, produce, reproduce and distribute aesthetics. Digital photography, editing equipment, scanners, powerful and easy-to-use graphic applications and Internet-based communication methods are just a few examples of how this is done. What are the psychological, organizational, economic and societal impacts of this IT-based aesthetic revolution?

This question is closely related to the value of IT aesthetics. How much are people willing to invest in improving the aesthetics of IT? What are they willing to trade-off for more aesthetics? For illustrative purposes, consider the endowment effect, a situation in which owners of an object request more money to give it up they would be willing to pay to acquire it (Thaler,

1980). In the context of evaluating mobile phones, Hassenzahl (personal communication) found that the endowment effect was stronger for hedonic qualities (e.g., beauty) relative to utilitarian qualities (e.g., functionality). If replicated in other IT contexts, such findings would suggest that the aesthetics of IT is perceived and is valued separately from other attributes of the IT artifact, and that quite often its effects on users are even more pronounced than the effects of the other attributes.

Aesthetics can also be used to create, change or preserve the identity of individuals and organizations (e.g., Rafaeli and Vilnai-Yavetz, 2004; Schroeder, 2002). This is manifested in the popularity of skins and personalization of desktops, applications, PDAs or cell phones, and in the emergence of aesthetic genres, mainly in web design. While personalization reflects individual identities, genres reflect group identity by creating shared aesthetics within groups and distinction from other groups.

Finally, aesthetic considerations should eventually be translated into actual guidelines and blueprints for design activities. This will be difficult if anything can be learnt from attempts to incorporate usability practices to the development life cycle. But incorporating *venustas* alongside *firmitas* and *utilitas* is necessary if we strive for products that facilitate richer interaction experiences.

4 Conclusion

In this paper I tried to explain why it is important to practice and to study aesthetics in the context of human-computer interaction. While evidence accumulated regarding the role of aesthetics in almost every aspect of our lives, we know very little about this role in the context of HCI. The rapid proliferation of IT and the increasing migration of applications from corporate and academic settings to everyday activities necessitate a much more rigorous attempt at understanding this role. Only a few out of many potential research and design questions have been outlined in this manuscript. Given the complexity of the questions, the nature of design problems and the time scale of scientific investigation, one should not expect quick and definitive answers to many of those questions. Thus, it is inevitable that many of the issues will be tackled first by eager designers. Hopefully this will be done judiciously. It is important to remember that while we should welcome more concern for aesthetic IT artifacts, we do not suggest the supremacy of aesthetics over other design considerations. Instead, we call for IT designers to improve the balance among *venustas*, *firmitas* and *utilitas* for the benefit of the user experience.

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Contact

Noam Tractinsky
Department of Information Systems Engineering
Ben-Gurion University of the Negev
P.O.B. 653
Beer Sheva 84105
Israel
noamt@bgu.ac.il

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