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EMPHASIS ON THE STUDY OF ART AND INFORMATION TECHNOLOGY

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Abstract

This paper argues that an increasingly important dimension of the human-computer interaction is missing fromtheMISandtheHCIresearchagenda.Thisdimension—esthetics—playsamajorroleinourprivate,social,andbusinesslives.Itisarguedthataestheticsisrelevanttoinformationtechnologyresearchandpracticeforthree theoretical reasons. (1) For many users, other aspects of the interaction hardly matter anymore. (2)Ourevaluations of the environment are primarily visual, and the environment becomes increasingly replete withinformation technology. (3)Aesthetics satisfies basic human needs, and human needs are increasingly suppliedbyinformationtechnology.Aestheticsmattersforapracticalreasonaswell:itisheretostay.Weproposeageneral framework for the study of aesthetics in information technology and provide some examples of researchquestionsto illustrate the viability of this topic.

Keywords: Aesthetics,beauty,design,human-computerinteraction,informationtechnology,visualappearance

Introduction

Thefirstknownsystematictheoreticianofarchitecture,Vitruvius(firstcenturyBC),arguedthatarchitecturemustsatisfythreedistinctrequirements:*firmitas*(strength)—whichcoversthefieldofstatics,construction,andmaterials;*utilitas*(utility)—theuseof the building and its functioning; and *venustas*(beauty)—the aesthetic[1] requirements (Kruft 1994). Although architecturaltheorieshavesinceevolvedconsiderably,Vitruvianprinciplesstillholdmuchintuitiveandtheoreticalappealtothisdate(Kruft1994). Consider, for our purpose, the field of information systems. Much of the work in this field relates to the soundness andthe robustness of the artifacts created by professionals in the field (*firmitas*). Traditionally, the various computing an informationtechnologydisciplineshaveemphasizedareasrelatedtothefirmness,correctness,stability,andinternallogicoftheirproducts.Asecondrequirement,*utilitas*,isaddressed byacertainstreaminMISresearchandbyalargesegmentofthehuman-computerinteraction (HCI) community. It deals with the ways in which information technology can be designed to meet individual andorganizational needs with regard to the systems' functionality and ease of use. A sizeable body of research in the field of

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MISshas dealt with the effects of IT on users.This stream of research can be traced back some three decades ago to the Minnesotaexperiments(Dicksonetal.1977),whereth eutility(i.e.,efficiencyandeffectiveness)ofaninformationsystemwasmeasuredmainlybyobjectivemeans(e.g.,decisionqualityandspeed).Subjectiveevaluationsoftheinformationsystemplayedaminorrole in the Minnesota experiments, but gained more attention during the next decade. Davis's (1989) technology acceptance model(TAM)isperhapsthebestknownexampleforastreamofresearchthatfocusesonusers'subjectiveevaluationofITandtheir intention to use it. Later, researchers began including aspects of subjective experience that go beyond mere utility valuations (e.g.,Webster and Martocchio 1992). Almost in parallel, but with somewhat different emphases, the field of HCI emerged as acounterforce to the traditional *firmitas*-oriented computing disciplines. Here, issues of usability and the degree to which the systemcanfacilitateachievingusers'goalswerebroughttothefore.Themainemphasisoftheseresearcheffortshasbeenonstudyingandpromoting efficiency (e.g., Butler 1996).

Until very recently, however, the third Vitruvian requirement, *venustas*, was almost completely absent from research in the variousIT disciplines. This absence is particularly glaring in studies of interactive systems. While some schools of thought in other designdisciplinesmayrejecttheimportanceofaesthetics,thesedisciplineshavenonethelesspaidmuchattentionandspawnedlivelydebates on this issue. This has not been the case in either the field of MIS or in HCI. Texts in these fields hardly make anyreference to matters of aesthetics. Whenever aesthetic issues are discussed in the HCI literature, they are likely to be qualifiedby warnings against its potentially detrimental effects (Tractinsky 1997). There may be a couple of reasons for the neglect ofaestheticsinthecomputingdisciplines.Onereasonmaystemfromresentmentofattemptsbysomeinthecomputerindustrytooversell glitz and fashion in lieu of substance and usefulness. Another reason may lie in the computing disciplines' origins indisciplines that emphasize hard science, efficiency, and utility. Thus, other aspects of the interaction were not recognized asbelongingin the field (Tractinsky et al. 2000).

Thereislittledoubt,though,that,ingeneral,theaestheticcriterionisinseparablefromeffectivedesignofinteractiveIT(Alben1996). The importance of beauty, or aesthetics—terms that are used interchangeably in this work—has been recognized sinceantiquity.FollowingVitruvios,Albertidefinedbeauty asthewholenessofabody,"agreatandholymatter"(inJohnson1994, 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. Betterlooking people earn more (Hamermesh and Biddle 1994) and receive higher teaching evaluations (Hamermesh and Parker 2005).Peopleareaffectedbytheaestheticsofnatureandofarchitecture(e.g.,Nasar1988;Porteous1996)aswellasbytheaestheticsof artifacts (Coates 2003; Norman 2004a; Postrel 2002). Aesthetics was found to play an important role in new productdevelopment, marketing strategies, and the retail environment (Kotler and Rath 1984; Russell and Pratt 1980; Whitney 1988).Bloch (1995) concluded that the "physical form or design of a product is an unquestioned determinant of its marketplace success"(p.16).

Interest in visual aesthetics (as distinguished from abstract elegance) is growing in the computing community as well. Forexample, the Aesthetic Computing community (Fishwick 2002, 2003) is targeting the application of art theory and practice tocomputinginanattempttoaugmentexistingrepresentationsandnotionsofaestheticsincomputingbycapitalizingoncreativityandinnovative exploration of media.

The robust findings regarding the importance of aesthetics in most walks of life make its absence from the agenda of the ITdisciplines even more conspicuous. Lately, evidence in support of the importance of aesthetics in HCI has started to emerge. Thisevidenceencompassesbothhardwareandsoftwareissues.Forexample,Apple'siMacwasheraldedasthe"aestheticrevolutionin computing," and an indication that the visual appearance of IT has become a major factor in buyers' purchase decisions (Postrel2001). Recent empirical studies have found a prominent role of the aesthetic aspect of various computing products in general andspecifically in the context of the Web (Kim et al. 2002; Schenkman and Jonsson 2000; van der Heijden 2003).Other studies havefound aesthetics to be of importance, though not in a dominant way, in affecting users' perceptions (Tarasewich et al. 2001; Zhangand von Dran 2000).Although not measuring aesthetics directly, some studies indicate that Web site design is a majordeterminant of perceived credibility and trustworthiness of e-commerce sites (Fogg et al. 2002; McKnight et al. 2002). Researchsuggeststhataestheticsisanimportantdeterminantofpleasureexperiencedbytheuserduringtheinteraction(Jor

[1]The term *aesthetics* was introduced into philosophical terminology in the 18th century by Baumgarten. It has evolved through the years andhasdifferentmeaningsfordifferentschoolsofthought(seeLaviеandTractinsky2004).Herewеareinterestedinitscommonmeaningas"*anartisticallybeautifulorpleasingappearance*"(TheAmericanHeritageDictionaryoftheEnglishLanguage),oras"*apleasingappearanceoreffect:Beauty*"(Merriam-Webster'sCollegiateDictionary).AmoreencompassingviewofaestheticsinITcanbefoundinStolterman(1994).

dan1998).Itwasfoundtobehighlycorrelatedwithperception softhesystems'usabilitybothbefore(Tractinsky1997)anda fter(Tractinskyetal. 2000)the interaction, andwith user satisfaction(Lindgaard and Dudek2003).

Despite the paucity of scientific evidence regarding the role of aesthetics in interactive systems, there is enough theoretical,practical,andanecdotalevidencetosupportthep ropositionthatsucharoleexists.Wepresentthisevidenceinth enextsection.

WhyDoesAestheticsMatter

Inthissection,wewillarguethatthetimehascomeforincorpo ratingtheaestheticelementintoconsiderationsintheprocess esof developing and managing information technology. In addition to the empirical studies reported above, in which aesthetics wasshowntohavearoleonusers'interactionswithinformatio ntechnologies,wepresentbelowthreetheoreticalandonepra ctical

argument as to why researchers and practitioners who are concerned with the design, development, and use of interactive systemsneed to devote more attention to aesthetics in IT. A few words of caveat are in place here:our thesis does not imply thatconsiderations of aesthetics should become the most important factor in those activities or in their products. Obviously, aestheticsmatters differently for different types of systems, users, tasks, and contexts. Rather, the premise is that while aesthetic issues havethusfarbeenignoredinITresearch,therearecompelling argumentsastowhytheyshouldreceivemoreattentioninthef uture.

LevelofPerformanceExceedsMostUsers'Needs

The advances in information technology have, to a large degree, exceeded the requirements and needs of many users andorganizations. A growing body of literature indicates that this might be the case for both individuals (e.g., Norman 1998) andorganizations(e.g.,Carr2003).Norman(1998)suggeststh atasthefunctionalityofnewITproductsexceedsusers'need s,andas the price of systems decrease, the competition becomes more oriented toward enhancing the users' experience rather thantoward improving functionality. Once IT provides all the required features at ever-decreasing prices, considerations ofconvenienceandreliability,and,later,ofappearanceandsy mbolicownership,becomemoreimportant.Normancompar esthisprocess to the state of the watch industry, which long ago passed users' technological requirements: watches are now oftenmarketedas objects of fashion or emotion.

Carr(2003)indicatesthatbasicallysimilardevelopmentsocc urattheorganizationallevel:pricereduction,sufficientfuncti onality,and more sophisticated consumers lead to the commoditization of IT. While Carr's prescriptions for IT strategy have been heavilydebated,hisdescriptionofthedevelopmentsinthefiel dappliestomanyorganizations.ManyofCarr'scriticsindicat ethatitisnot IT per se that creates strategic advantage. Rather, it is how organizations harness its potential that helps differentiate them fromthe competition. This does not diminish the potential contribution of aesthetic design. A notable example of differentiating byaesthetics is the success of the iMac, which is attributed to the shifting emphasis in product features—from performance andreliabilitytoaestheticsandstyle(Postrel2002).Infact,given recentandforeseeabledevelopmentsinIT,onecanalsoarguetha ta new role is forming for IT, which is becoming a designer and a carrier of aesthetics. Today's IT expands the possibilities ofsensoryexpression,andisparticularlyfriendlytoaesthetic applications(Postrel2002).Inthelastdecade,theaestheticall yrichentertainmentindustryhas beentransformed byITingeneral andby theInternet inparticular.

Toalargeextent,theuseofaestheticsasadifferentiatingfacto rresemblessimilarlycrowdedmarketswhere"aestheticsisof tenthe only way to make a product stand out" (Postrel 2002, p. 2).According to this view, aesthetics may not overcome badusability,unreliablesystemsorsignificantlackoffeature s,butitmatterswhenallelseisequal.And,allowingforaslight over-generalization,"allelseisequal"isbecomingthestateofaffai rsinthe rapidlycommoditizedITmarket.

SomeAesthetically-BasedValuationsAreImmediateandHardtoOvercom e

Recent research into the potential effects of emotions generated by artifacts has yielded several theoretical frameworks.Normanandhiscolleagues(Norman2002,2004 a;Ortonyetal.inpress),suggestathree-leveltheoryofhumanbehaviorthatintegratestwoinformatio nprocessingsystems:affectiveandcognitive.Ineachlevel,th eworldisbeingevaluated(affect)andinterpreted(cognition). The lowest level processes take place at the visceral level, which surveys the environment and rapidly communicatesaffectivesignalstothehigherlevels.Theroutine(orbehavioral)leveliswheremostofourlearnedbehaviortakespl ace.Finally,the reflection level is where the highest-level processes occur. The important role of affect in human behavior stems from the factthatitcancolorsubsequentcognitiveprocessesbecauseo urthoughtsnormallyoccuraftertheaffectivesystemhastrans

mitteditsinitialinformation.Itisimportanttonotethattheaffectivesystemandthecognitivesystemareintertwined(Barghinpress;Ortony et al. in press; Russell 2003).Thus, while previous research in MIS and in HCI largely presumed that human decisionmakingreliesentirelyoncognitiveprocesses,currentresearchondecisionmakingportraysadifferentpicture.

One of the key characteristics of the affective system is that some of its reactions are very rapid (Norman 2004a; Pham et al.2001).Other affective responses often involve considerable cognitive mediation and are decidedly slower.Aesthetic evaluationsmaytakeplaceonallthreelevelsoftheNormanmodel,buttherearesomehintsthatfirstaestheticimpressionsareaffectiveandareformedimmediatelyatalowlevelandthusprecedecognitiveprocesses(Fernandesetal.2003;Norman2004a;Phametal.2001;ZajoncandMarkus1982).Hence,theimmediateaffectivereactionsmaycolorandpotentiallyswaysuccessivecognitiveprocesses(Duckworth et al. 2002; Phamet al. 2001).

The phenomenon of aesthetic perceptions of an object coloring other perceived attributes of the same object is familiar in thesocial sciences. Cowley (1996) suggests that "we're designed to care about looks, even though looks aren't earned and revealnothing about character" (p. 193). Thus, in what is known as the "beautiful is good" stereotype, a person's attractiveness wasfoundtoaffecthowpeopleperceiveotherattributesofthatperson(Dionetal.1972,Eaglyetal.1991).HamermeshandBiddle(1994)foundthatmorebeautifulpeopleearnmoreonthemarketplace,andbetterlookinguniversityinstructorsreceivehigherteaching evaluations (Hamermesh and Parker 2005). Under certain conditions, those immediate aesthetic impressions may affecthow people perceive and use other system attributes. For example, more aesthetic systems were perceived to be more usable thanless aesthetic systems (Tractinsky et al. 2000). We still do not have direct evidence that the aesthetics of IT impact decisionprocesses,butevidenceregardingtheinfluenceofaffectondecisionmakingexistinotherfields(e.g.,Isen2001).

Thusaestheticsmaysetthetonefortherestoftheinteraction.Astrongevidencefortheimmediacyoffirstaestheticimpressionin IT was provided by Fernandes et al. (2003). They found that attractiveness evaluations of Web pages to which participants wereexposed for only 500 milliseconds were very highly correlated with attractiveness evaluations of the same pages under unlimitedexposure.We haverecently replicatedand validated thesefindings (Tractinskyet al. 2004).

It is important to note that the fact that some aesthetic evaluations are formed immediately does not imply any deterministicconsequences. This is for two reasons:First, as mentioned above, some aesthetic evaluations are also made based on moreelaboratedcognitiveandaffectiveprocesses.Second,thereareman ypotentialmoderatorsthatcanaffecttherelationsbetweenaesthetic characteristics of an IT artifact and the attitudinal or behavioral consequences of the interaction (some of thesemoderators are referred to briefly in the next section).Thus, some responses to aesthetic stimuli are innate and relatively invariant,butsomeare learnedand dependon culture,education, otherexperiences, andacquired tastes.

AestheticsSatisfiesBasicHumanNeeds

The degree to which aesthetics considerations gained (or should gain) importance in the industrial landscape remains a contestedissue. Designing aesthetic information systems may be viewed by some as manipulative, or a gratuity at best. In his seminal book,*The Psychology of Everyday Things*, Norman (1988) suggested that the pendulum might have swung too much in favor of puttingaesthetics ahead of practical features of the artifact, such as usability, utility, and functionality. Recently, however, with theincreased recognition of the role of emotion in decision making, it has been argued that modern design has placed too muchemphasis on performance issues and not enough on emotional aspects, such as pleasure, fun, and excitement, which arefundamental motivators of human behavior, and which are clearly affected by aesthetics (e.g., Coates 2003; Green and Jordan2000;Hassenzahl 2003; Norman 2002, 2004a).

According to Maslow's (1970) self-actualization theory, the need for aesthetic pleasure is one of the higher order (growth) needs,which are manifested after the lower level, more basic needs have been fulfilled to a satisfactory degree.Moreover, Maslowsuggeststhat,contrarytobasicneeds,theneedforaestheticsincreasesthemoreitissatisfied.Inasense,aestheticsmayalsobeviewed as a motivator (as opposed to a hygienic factor) to use Herzberg's terminology (Zhang and von Dran 2000). Postrelsuggests that aesthetic pleasure has intrinsic value:"People seek it out, they reward those who offer new-and-improved pleasures,andtheyidentifywiththosewhosharetheirtastes"(2002,p.75).UsersofITarenotdifferent.Theystriveforamorecompleteand satisfying interactive experience; an experience that not only achieves certain well-defined goals but also involves the sensesandgenerates affective responses(Blyet al. 1998;Venkatesh and Brown2001).

Fogartyetal.(2001),claimthatsincecomputertechnologyhasmovedbeyondtheconfinementsoftheworkenvironmentandintotherestofourlives,itsusehasexpandedintowideraspectsanditsrequirementshaveshiftedaswell.Ifoncethevalueofcomputing 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 systemdesigns.Indeed,instarkcontrasttotheprinciplesandtheguidelinesadvocatedbyusabilityresearchersandgurus,anyrandomperusalofWebsiteswouldsuggestthataestheticconsiderationsareparamountindesigningfortheweb.Oneoftheinterestingphenomena of current IT usage is the personalization of the application's appearance. The growing demand for personalized userinterfaces seemstospringfrom thequestforricher and more affective experience (Blom and Monk 2003). The desire expressedbyuserstotailortheirapplications'appearanceaccordingtotheirtastesisepitomizedbytheproliferationofskins—alternativeinterfaces to commonly used applications—that allow users to change the appearance of their applications while preserving theirfunctionality (but not necessarily their ease of use).Recent trends in PC-based application design indicate that "skinnability" (theabilitytotailortheapplication'sappearance)hasbecomeacommonfeatureinmanytypesofpersonalcomputingapplications.

Our studies indicate that the choice of skins by individual users has much to do with their aesthetic properties (Tractinsky andLavie2002; Tractinsky and Zmiri in press).

Practically,AestheticsIsHeretoStay…

The idea that style overcomes substance or influences perceptions of seemingly unrelated attributes of people, objects, orinteractivesystemsmaysoundappalling.Itcanbearguedonethicalormoralgrounds,butwecannotdenyitsexistencenorcanwe ignore the positive effects of aesthetics on our affective *and* cognitive well-being (see Isen 2001; Norman 2004a).But, moreimportantly, we cannot ignore the fact that aesthetic matters become more pervasive than they used to be. Postrel argues that"sensory appeals are everywhere, they are increasingly personalized, and they are intensifying" (2002, p. 5). According to Postrel,today's aesthetics pleases and liberates the masses. IT is increasingly becoming a vehicle to provide aesthetics; in fact, one of theunintended results of IT is that it is particularly friendly to aesthetic applications. Users can create, edit, transmit, and receiveaesthetic designs in almost any imaginable domain. 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.Thisargumentisechoedby Schroeder(2002),whosuggeststhat"webdesignhasbroughtvisualissuesintothemainstreamofstrategicthinking….TheWebmandatesvisualizingalmosteveryaspectofcorporatestrategy,operationsandcommunication"(p.22).

Moreover, Postrel suggests that "the computer-driven democratization of design has made more people sensitive to graphicquality.Bitbybit,thegeneralpublichaslearnedtheliteralandmetaphoricallanguageofgraphicdesign.Carriedby computers,aestheticshasspreadtoplacesandprofessionsthatwereformerlyoff-limitstoanysuchfrivolity"(2002,p.55).Anaestheticcycleisintheworking,whereaestheticsupplycreatesmoredemand,whichinturnfeedsevenmoresupply."Overtimepeoplelearn.Theydiscovermoreaboutwhat'saestheticallypossibleandmoreaboutwhattheylike"(Postrel2002,p.55).And,asproposed byMaslow,the moreaesthetically awarepeople become,the greatertheir needforaesthetics.

TowardaResearchAgendaofAestheticsinInformationTechnology

Aesthetics has never been studied systematically in the context of IT. The research potential here is quite unlimited as can beattestedbythevariousstudiesofaestheticsinothercontextsthroughouttheyears(forashortreview,seeLavieandTractinsky2004).Theideaspresentedinthissectiondonotpurporttobecomprehensive,certainlynotexhaustiveordetailed,asthestudyof aesthetics is "fraught with difficulties" (Norman 2004b). The proposed framework is presented in the next subsection in amanner that conforms to the traditional experimental paradigm in IT. It treats aesthetics as a variable on par with other frequentlystudied variables in IS: in its core is an evaluative construct that is affected by some design characteristics of the IT artifact; itmay,inturn,affectotherIT-relatedvariables;andthoseeffectsaremoderatedbystillotherconventionalITvariables.Theideais to present the pervasive relevance of aesthetics to IT. An anonymous reviewer correctly commented that this framework is quiterestrictiveandmaymisssomeofthemoredistinctcontributionsofaesthetics.IntroducingabroadervisionofaestheticsinIT,however, would require considerably more space, would be much more speculative in nature, and would probably necessitatedelvingintorealmsthatarebeyond"coreIS"(BenbasatandZmud2003).Still,someideasinthisspiritarepresentedlater.

AResearchFramework…

Figure 1 depicts a general framework for the study of the effects of aesthetics in IT. Five categories of variables are presentedinthe framework as follow.

DesignCharacteristics.Theframeworkbeginswiththedesigncharacteristicsofinteractivesystemsasindependentvariables.Researchersmaystudythosecharacteristicsasobjectiveorperceivedvariables.ThehistoriesofaestheticsandITresearcharefilled with studies of both types, and the choice

of which type to use should be left for the researcher to decide. For example,research on graphics in MIS has concentrated on objective design features (e.g., Benbasat et al. 1986; Jarvenpaa and Dickson1988) whereas much of the research on technology acceptance is based on perceived system characteristics (e.g., Venkatesh andDavis2000).

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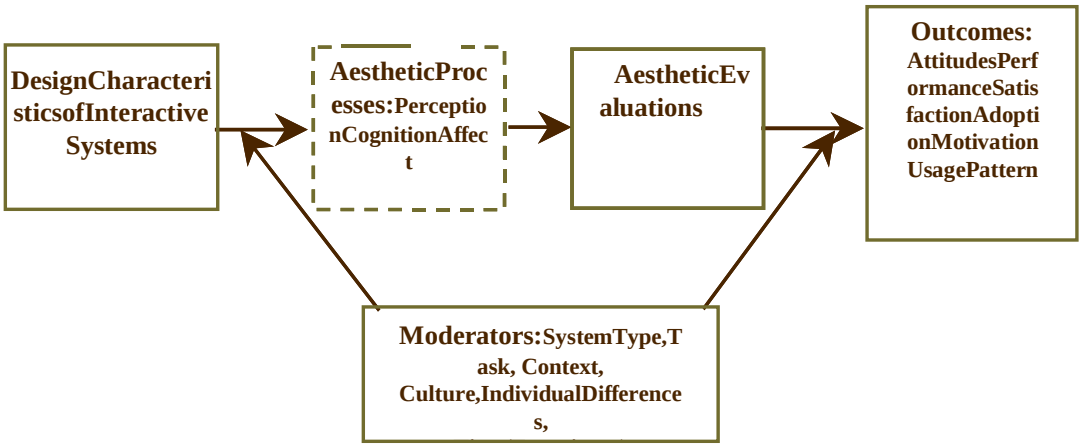

Figure1.AGeneralFrameworkfortheStudyofAestheticsinInformationTechnology

are likely immediate, strong, and stable and may dominate the ensuing interactive experience (Cowley 1996; Fernandes et al.2003; Norman 2004a). These perceptions and evaluations are tied to affective and cognitive processes, which are not yet fullyunderstood (Norman 2004a). The specifics of these processes are only tangential to IT research in the sense that they increasethedistancebetweentheITconstructsandthefinaloutcomevariablesofinterest(BenbasatandZmud2003).Theyaredepictedin the framework, however, for their central role in eventually generating a range of IT-relevant outcomes: they may form (orchange)users'attitudestowardthesystem,improve(orworsen)theirperformance,affecttheirsatisfaction,andinfluencetheirwillingness to buy or adopt the system. Thus, while the "black box" processes may not lie at the core of IS research, the studyofaestheticsinITrequiresfamiliaritywithreferencedisciplinesthatdostudythoseprocesses.Thisgroupofvariablesisdepictedin Figure 1 within adashed box, to indicatetheir auxiliary role inIS research.

Aesthetic Evaluations of IT.Whereas the low level of aesthetic processes may remain concealed in IS research, higher levelaestheticevaluationsareofgreatinterest.Thistypeofmeasuresisthemostaccessibletobehavioralresearchmethodsandcanconvey a decent degree of information about the IT antecedents of aesthetic perceptions and evaluations and about theconsequencesofsuchperceptions.Todate,moststudiesofaestheticsinITha veemployedageneralmeasureofaesthetics.Such a measure was sufficient in demonstrating the relations between aesthetic perceptions and their IT antecedents and consequences.For example, Kurosu and Kashimura (1995) and Tractinsky (1997) found that manipulating the layout of objects on an ATMmachine affects evaluations of the machine's beauty.In turn, the aesthetic evaluations affected the evaluation of other systemattributes, such as its ease of use (Tractinsky et al. 2000). Hassenzahl (2004) found that perceived beauty was related to theperceivedgoodnessofasystem.LindgaardandDudek(2003)foundthatusingaestheticWebsitesyieldedhighersatisfaction,andinSchenkmanandJonsson(2000)aestheticswasrelatedtooverallpreferencesofwebsites.Perhapsofevenmore interestistheabilitytoidentifyvariousIT-relateddimensionsofaestheticevaluations.Thiscanhelpfiner-grainanalysesofwhatlinkcertain design characteristics of interactive systems and their behavioral consequences. Example of such higher-resolutionmeasuresaretheemotionaldimensionsofWebpages (Kimetal.2003),theiraesthetics(LavieandTractinsky2004),andaspectsof the hedonic attributes of products (Hassenzahl 2003). Finally, methodological issues are always of concern when studyingaffective constructs. Thus, the study of aesthetics reactions to design calls for novel evaluation techniques (e.g., Desmet et al.2000).

Outcome Variables.In the proposed framework, the range of potential outcomes can span virtually the whole gamut of outcomevariables employed by behavioral IS researchers.

Possible outcome variables affected by aesthetics include problem solving anddecision-makingprocesses(seeIsen2001;Norman2004a);generalattitudestowardthesystem;variouspsychologicalstatessuchasflow, trustandfun;usagebehaviorandperformance;and preferencesandwillingnesstopayforthesystem.

Moderating Variables.Obviously, the effects of aesthetics are moderated by various factors.A partial list of potentialmoderators include the type of system used (e.g., a hand-held entertainment system vs. an ERP system); the task(s) to beperformed with the system; the context in which the system is used; cultural (organizational, societal, national) and individualdifferences; and motivational factors and the degree of experience with and exposure to the system. One especially intriguingquestion is whether the impact of aesthetics is confined to voluntary use of IT. While I am not familiar with direct evidenceregardingtheeffectofaestheticsinmandatedenvironment,researchsuggeststhatsucheffectexists.Forexample, inreviewing

theliteratureontheeffectsofpositiveaffect,Isen(2001)foundthatdecisionmakers'performanceimproveswhenpositiveaffectisinducedinvarioussettings(e.g.,medicaldecisionmaking). Giventhataestheticsgeneratesaffectiveresponses,itwouldnotbesurprisingtofindsimilareffectsofaestheticITevenundermandatoryuse(seeRafaeliandVilnai-Yavetzinpress).

Within the experimental tradition of studying how IT affects user behavior, the proposed framework allows for testing hypothesesregarding how design elements of the IT artifact and the usage context affect the dependent variables of interest. These issues arerelevanttoourunderstandingofhowindividualsuseIT.To illustratethetypeofstudiesthatcanbecarriedout,considertrustinWeb stores. McKnight et al. (2002) found that consumers' perceptions of Web site quality (including design elements) were avery strong predictor of trusting beliefs in the retailer and of consumers' intentions to buy from the site. In a survey of 2,684 Webusers, Fogg et al. (2002) found that users use the design look of a site as the most prominent cue in evaluating the site's credibility.Unfortunately,neitherofthesestudieshadobtainedseparatemeasuresofvisualattractivenessoraesthetics.However,giventheprominence of visual stimuli in human judgment and the demonstrated effects of IT aesthetics on users' perceptions of othersystemattributes,itwouldnotbeanoutreachtoproposethattheaestheticsofaWebsitehasaneffectontheperceivedcredibilityor trustworthiness of the Web store. An even more interesting question, perhaps, is what kind of aesthetics, or which aestheticfeatures,affecttrustworthiness.Thiswillrequirefirsttoteaseouttheaestheticelementsin IT.Someoftheseelementsmaybesharedwithothervisualmediaorartifacts,somemaybeuniquetoIT,andsome,maybeuniquetocertaintypesofIT(e.g.,aWebpagevs.aPDAapplication).Somepromisingworkhasalreadybeendoneinthislatterarea(e.g.,Kimetal.[2003]andLavieandTractinsky[2004],onWebsites;Hassenzahl[2004]onMP3players),suggestingtheviabilityofthisresearchroute.

…andBeyond

Not less interesting, though, are the possibilities and issues for research in areas that go beyond the traditional experimentalparadigm. For example, Postrel (2002) raises the idea of IT as a vehicle for aesthetic creation and communication. IT hasconsiderably augmented our ability to copy, produce, reproduce, and distribute aesthetics. Digital photography, editing equipment,scanners,powerfulandeasy-to-usegraphicapplications,andInternet-basedcommunicationmethodsarejustafewexamplesofhow this is done. What are the psychological, organizational, economic, and societal impacts of this IT-based aesthetic revolution?DoestheaestheticuseofITpromoteself-presentationofindividuals(TractinskyandMeyer1999)orof organizations?Howdoorganizationsandindustriesuseaestheticsintheir ITtocreatevalueandtocompeteinincreasingly crowdedmarkets?

Arelatedquestioncentersaroundhowindividualsandorganizationsuseaestheticstocreate,changeorpreservetheiridentity.Severalstudieshavebeenconductedonthisroleofaestheticsinorganizations(e.g.,RafaeliandVilnai-Yavetzinpress).Oneofthe most fascinating behaviors on the Web is the downloading of skins in order to personalize one's applications, whether ondesktops, PDAs, or cell-phones. Koeppel (2000) estimates that by the year 2000, more than 50 million skins had already beendownloadedfromthemajorskinsites.Currentresearchinthisareasuggeststhataestheticsplaysasignificantroleinthisdomainaswell (Blomand Monk 2003;Tractinsky and Zmiri in press).

The opening statement of this paper refers to theoretical notions from architecture, the oldest design discipline. The idea thatarchitecture can serve as a reference discipline for MIS is not new (e.g., Lee 1991), but it is quite surprising to note how smallof an impact architectural theory has made on the study of IT. A study by Kim et al. (2002) demonstrates the viability of thisresearchdirectioninexplainingonlinecustomersatisfactionandloyaltybythethreeVitruvianprinciples.Clearly,ITresearchcan benefit considerably from judicious use of theories in architecture and its related disciplines (e.g., urban and landscapeplanning).

Finally, aesthetic considerations should eventually be translated into actual blueprints for design activities. This will not be easy.Much effort had been invested in order to transform design activities in organizations to accommodate *firmitas*and *utilitas*requirements.Methodsandtechniquestoadvanceuser-centereddesignhavebeenproposed,butattemptstointegratethemintomainstream development methodologies in industrial settings were met with only limited success (Stewart 2003). Many stillmistakenlytreatinteractiondesignasanafterthought.Appropriatelyaddinganotherelement(aesthetics)tothelistofrequirementswillnotbetrivial.Buttherewardsmaybeworththeetrouble:afterall,"attractivethingsworkbetter"(Norman2004a,p.17).

Conclusion

This paper identifies aesthetics as a neglected dimension of research in the area of information technology. There is abundantevidencetosuggestthataestheticsmattersinalmosteveryaspectofhumanthoughtandbehavior.Therapidproliferationof IT

and the increasing migration of applications from corporate and academic settings to everyday activities necessitate a much morerigorous attempt at understanding how IT and aesthetics relate. The research framework proposed here is far from beingexhaustive.Inthetraditionof empirical research in IS, it identifies key variables and proposed relationships between antecedentsand consequences of aesthetic evaluations of interactive technologies. However, many other research directions are also possible,someofwhichareoutlinedabove.Itisimportanttore iteratethatthepurposeofthisworkisnottosuggestthepredom inanceofaestheticconsiderationsoverothers.Rather,itistoa dvocatebetterbalanceofmajordesigndimensionsinIT,abal ancethatismuchmore pronounced in other designdisciplines.

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