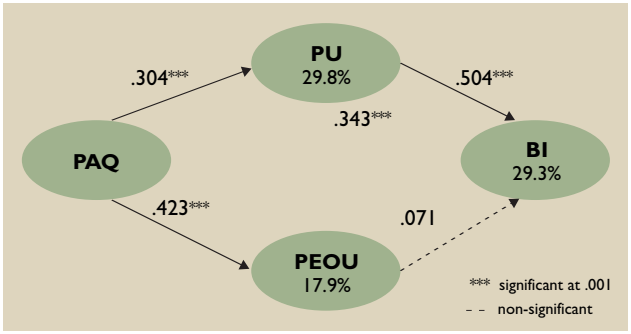
The Importance of Affective Quality

By Ping Zhang and Na Li

Users aren't always rational logical beings—emotion plays an often overlooked role in user acceptance of technology.

Affect, a term that encompasses mood, emotions, and feelings, is a fundamental aspect of human beings, one that influences reflex, perception, cognition, and behavior [5, 6]. Studies in organizational behavior, marketing, and management have confirmed the strong impact of affect on job satisfaction, decision-making behavior, and consumer shopping behavior. Affective quality is the ability of an object or stimulus to cause changes in one's affect. Limited empirical evidence in human-computer interaction and information systems research suggests that perceived affective or hedonic quality of an interface has a positive impact on users' perceived usability of the system [8–10]. Essentially, pleasing things work better, are more regularly used, are easier to learn, influence future purchase choices, and produce a more harmonious result. Thus affect and emotion have an important place in design; usability and aesthetics are both instrumental in creating pleasurable electronic products [5].

Empirical evidence is scarce on whether perceived affective quality of a system influences user perceptions of usefulness and ease of use of the system. This evidence can be extremely important for a better understanding of the causal sources of user's IT-related behavior. Perceived usefulness (PU) is the degree to which a person believes using a particular system enhances his or her job performance [1]. Perceived ease of use (PEOU) is the extent to which a person believes using a particular system is free of effort [1]. Abundant empirical studies in user technology acceptance literature show that PU and PEOU predict a user's acceptance and actual usage of a system. Thus, knowing the determinants of these predictors can have strong implications for IT designers, trainers, and stockholders, enabling them to better strategize their resources and emphases.



The empirical model.

Identifying affective qualities of various systems for supporting user tasks in different domains or contexts can be daunting. Fortunately, related studies are already on the way. Besides reporting an empirical investigation on the antecedent role of perceived affective quality on perceived usefulness and ease of use, this article also briefly describes some existing studies that identify affective qualities.

Affect and Perceived Affective Quality

Although cognition has received more attention than affect in the past several decades, researchers in several disciplines have realized the importance of affect and emotion. Studies in neuropsychology and social psychology assert that affect or emotion occurs before cognition but also intervenes with cognition [5, 6]. According to Norman, affect and cognition can both be considered information processing systems, but with different functions and operating parameters. The affective system is judgmental, assigning positive and negative valence to the environment rapidly and efficiently. The cognitive system interprets and makes sense of the world [5].

Core affect (also known as affect, feeling, mood) is a neurophysiological state that is consciously accessible as a simple, nonreflective feeling. It is considered an integral blend of hedonic/valence (pleasure/displeasure, the extent to which one is generally feeling good or bad); and arousal/activation (sleepy/activated, the extent to which one is feeling engaged or energized) values [6]. Research indicates that core affect is primitive, universal, ubiquitous, and is the core of all emotion-laden events [6].

Affective quality (AQ) is the ability to cause a change in core affect [6]. Whereas core affect exists within the person, affective quality exists in the stimulus. Objects, places, and events all have affective quality. They enter consciousness as they are affectively interpreted. The perception of the affective quality of stimuli typically impinges at any one time (based on how pleasant, unpleasant, exciting, boring, upsetting, or soothing each stimulus is), then influences subsequent reactions to those stimuli [6, 7]. Perceived affective quality (PAQ) is an individual's perception of the ability of a stimulus such as IT to change his or her core affect. PAQ is normally measured by the same dimensions of core affect: valence and activation [7]. This perception thus influences subsequent reactions this person has to the stimulus [6].

User Acceptance of Technology

User evaluation or user acceptance of IT is considered as volitional behavior and has been primarily studied with a rational/cognitive orientation [1]. Abundant existing studies on user IT evaluation and acceptance have verified that PU has a strong impact on behavior intention (BI) to use the IT; PEOU has an impact on PU; PEOU can have some impact on BI (although such impact is not always consistent); and BI is a strong indicator of actual use behavior. Several studies such as [11, 12] touched upon some affect and emotional concepts.

Venkatesh [11] studied emotion via computer anxiety as one of the determinants of perceived ease of use. The study examined the direct impact of general computer anxiety on PEOU, and found that computer anxiety's impact on PU is mediated by PEOU. Among the few studies examining the possible impact of emotion on perceived usefulness, Yi and Hwang found that enjoyment, a concept that has both the valence and activation components of core affect, has a positive impact on both perceived usefulness and perceived ease of use [12]. Despite these recent efforts to bring affect and emotion concepts into user acceptance studies, most of the existing studies are based on the assumption that human beings are rational and

behave based on logical information-based thinking. Very often the affective aspects are less central or focal in these studies. Even when affective constructs are studied, they are positioned in either parallel or consequent roles with other constructs (versus an antecedent role), and there is a lack of careful definitions and thorough examination of important affective constructs, which may have to do with the less developed status of affect and emotion studies [5]. Due to these limitations of current studies, it is unclear whether affect plays a role in an individual's evaluation, reaction, acceptance, and use of IT in various contexts for various purposes.

Study	IT and Context	Affective Construct	Affective Quality/Features
Kim et al. 2003 [2]	Home pages	"Secondary emotions"	Shape, texture, and color of title, menu, and main images
Mundorf et al. 1993 [4]	Screen-based information service	"Hedonic quality"	Color, graphs, and music
Schenkman and Jonsson 2000 [8]	Telecommunication, electronics or other companies' Web sites	"First impression"	Beauty, mostly illustrations versus mostly text, overview, and structure
Tractinsky et al. 2000 [9]	ATM machine	"Perceived aesthetics"	Layout
van der Heijden 2003 [10]	A generic portal Web site in Netherlands	"Perceived visual attractiveness"	Layout and color

Identified affective quality.

Empirical Investigation

Our main position is that a user's immediate and reflexive affective reaction to IT, namely the perceived affective quality (PAQ), has a positive impact on his or her consequent cognition-oriented evaluations such as PU and PEOU of the IT, which in turn can influence a user's behavioral intention to use the IT.

A field study was conducted to collect empirical data. The constructs were measured using multi-item scales drawn from previously validated instruments. PU, PEOU, and BI measures were adopted from the original instrument in [1]. PAQ was measured by four aspects of quality as validated by Russell and Pratt [7]: arousing, sleepy, pleasant, and unpleasant. Study participants were 194 students in a major Northeastern university in the U.S., and were classified as follows: 63% male, 45% freshmen and sophomore, 35% juniors and seniors, 20% master's students, 53% White, 25% Asian/Pacific Rim, and 22% other ethnicity. The technology studied was the university Web site, which students used on a voluntary basis.

The researchers attended 12 classes in which students could access the university Web site during class, and recruited subjects on a voluntary basis. The questionnaire directed each participant to open the university Web site via a Web browser, and to explore the site for several minutes, assessing its potential for usefulness in his or her college life. The questionnaire continued with measures of PAQ, PU, PEOU, BI, as well as a section on demographics.

Data analysis was performed using Partial Least Square (PLS-Graph 03.00). First, measurement models were estimated to assess reliabilities and convergent and discriminant validities of the constructs. We used a method known as hierarchical component model to estimate the PAQ measures because PAQ is a second-order factor with four dimensions: Arousal, Sleepy, Pleasant, and Unpleasant qualities. Three items did not load with the rest of the items at the required level thus were eliminated from further analyses. Measurement models were then reestimated and showed satisfactory statistical characteristics. Second, the structural model was estimated to test the relationships among PAQ, PU, PEOU, and BI. For PAQ, we used scores from the four indicators derived from the first stage.

The accompanying figure depicts the empirical structural model with path coefficients and variances explained in variables. The result indicates that PAQ has a significant positive impact on both PU and PEOU. It does not have a direct impact on BI; rather, its effect on BI is mediated by PU and PEOU. Consistent with many technology acceptance studies, PU has a significant positive impact on BI; while PEOU does not significantly affect BI; and PEOU has a significant impact on PU.

The empirical evidence supports our position that a user's immediate and reflexive affective reaction to IT has a positive impact on his or her consequent cognition-oriented evaluations of the IT.

Desirable Affective Quality

Knowing that PAQ is more fundamental and important in determining the ultimate outcome of user's evaluation and use of IT has implications for design. Next, we need to determine whether it's possible to manipulate affective qualities and thus to influence users, and also what specific affective features yield high PAQ.

Studies in psychology identify the properties of external stimuli that can evoke or elicit certain human emotions. In the computing environment, Kim and colleagues classified the specific emotional dimensions users normally experience while viewing diverse home pages; they identified the design factors that professional designers frequently use when developing emotionally evocative home pages; and they empirically

confirmed that the identified emotional dimensions can be reliably explained by the selected design factors. These researchers concluded that it is possible to manipulate the design factors of the interface in order to induce a target emotion [2].

Users utilize IT for various purposes and in various contexts. Research is needed to identify specific affective features for specific types of IT, or to verify whether there are universal affective features that apply to various types of IT for supporting various user tasks. Fortunately, researchers have already started working on identifying affective qualities. The table here lists a limited number of existing studies with corresponding IT and context studied, along with the identified affective quality. One should note that not every study defines and uses the same affective constructs in the same ways. Hedonic quality [4], perceived aesthetics [9], and perceived visual attractiveness [10] are concerned with the hedonic/valence dimension of PAQ of the Web sites or other artifacts. First impression [8] emphasizes a user's immediate and reflexive reactions toward IT, which often are affectively interpreted. Secondary emotion refers to "emotion elicited by external stimuli" [2], which is equivalent to the core affect influenced by the PAQ of the stimuli.

More studies are needed to validate, expand, synthesize, and generalize these results. In addition, much research is needed to develop validated instruments for measuring perceived affective quality. Lavie and Tractinsky [3], in developing a measurement instrument of perceived Web site aesthetics, identify two dimensions of user aesthetic perception. The classical aesthetics dimension emphasizes orderly and clear design and is closely related to many of the design rules advocated by usability experts. The expressive aesthetics dimension is manifested by designers' creativity and originality and by the ability to break design conventions. These two dimensions seem to be consistent with empirical evidence in other studies as shown in the table.

Conclusion

This study empirically investigates the antecedent effect of users' perceived affective quality of IT on users' cognitive evaluations of IT. Despite some limitations such as using a particular user group (college students) in a particular context for a particular IT (university Web site), this research examines a predicting factor of user's technology use intention that has not been widely recognized. This new predictor, perceived affective quality, is more fundamental as it has positive impacts on the well-known predictors such as perceived usefulness and perceived ease of use. Our study shows that PU and PEOU mediate the impact of perceived affective quality on intention to use IT. IT use intention has been robustly tested to predict IT use behavior, which should be a concern for IT designers who want their products to be eventually accepted and used. This can lead practitioners to adjust their focus and effort accordingly when designing information technologies. IT designers or IT acquirers should pay attention not only to usefulness (IT suitability for tasks or jobs), and ease of use (the longtime goal of the human-computer interaction field), but also to affective quality (the degree to which emotional reactions are evoked). With this understanding, IT designers and acquirers can invest in identifying affective qualities of various systems for supporting various tasks in different domains, thus producing better systems that are more likely to be accepted and used. C

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