KEER2010, PARIS | MARCH 2-4 2010
INTERNATIONAL CONFERENCE ON KANSEI ENGINEERING AND EMOTION RESEARCH 2010

THE ROLE OF EMOTIONS AS ANTECEDENTS OF COGNITIVE ASSESSMENT IN THE EVALUATION OF INCREMENTAL VERSUS REALLY NEW PRODUCTS

Jonas HOFFMANN[a*], Gilles ROEHRICH[b] and Jean–Pierre Mathieu[c]

[a] *CERAM Business School, France*
[b] *CERAG UMR 5820 - IAE Grenoble, France*
[c] *AUDENCIA Nantes Ecole de Management, France*

ABSTRACT

The study of emotions in the innovation adoption process has received increased attention in the new product development and marketing literature. We explore in this paper the role of emotion as an antecedent of utilitarian and hedonic benefits. The model was tested with a national representative sample of the French on-line population composed of 1516 individuals. Results validate the role of emotion as an antecedent of functional and hedonic benefits and show that their impact varies according to emotion valence. Our paper presents one of the first empirical validations of emotion influence in the innovation adoption process.

Keywords: *Innovation adoption, Emotion, Novelty degree*

---

* **Rue Dostoïevski – BP 85 – 06902 Sophia Antipolis Cedex France – email: jonas.hoffmann@ceram.fr**

1. THE ROLE OF EMOTIONS AS ANTECEDENTS OF COGNITIVE ASSESSMENT IN THE EVALUATION OF INCREMENTAL VERSUS REALLY NEW PRODUCTS

New products appeal largely to consumer feelings, fantasies and fun. Apple is among the companies who during the 2000s best succeeded in marrying functionality and aesthetics to create a superior value proposition as iPod and iPhone successful launches testify. The growing importance of design in several consumer goods companies presents evidence of this trend. Thus, emotions *de facto* play a role in new product adoption. However, despite agreement that emotions serve as primary motivators of behavior (Izard, 1977; Damasio, 1994), its role in new product adoption remains understudied.

The objective of this article is to increase the understanding of the role of emotions in new product adoption. We focus on the role of emotions as antecedents of cognitive assessment, i.e. we measure the influence of emotions on perceived characteristics of the new product. This is in line with propositions of Berkowitz (1993), Damasio (1994), and Shiv and Fedorikhin (1999) that emotions emerge before the cognitive appraisal of the stimulus and therefore has an impact on it. Further, approach/avoidance theory (Watson et al. 1999) shows that emotions do vary according to perceived environment threat/friendliness. Since really new products may by their disruptive nature represent some kind of threat to consumers (Lehmann, 1994), we will additionally explore the role of novelty degree.

The contribution of this study is twofold. First, despite growing interest in the role of emotions in domains such as advertising (e.g., Burke and Edell, 1989; Batra and Stayman, 1990), consumer satisfaction (Westbrook and Oliver, 1991; Mano and Oliver, 1993) or the influence of task-induced affect on choice (Luce, 1998; Shiv and Fedorikhin, 1999) its influence in the adoption process of innovation has yet to be fully understood. Ignoring the role of emotions in adoption behavior leads to the same bias as its ommission in the above cited fields. Moreover, we also test the influence of emotions on hedonic benefits, thus empirically testing an enlarged inventory of perceived benefits.

Second, the replication of the first study with stimuli of varied novelty degrees provides extra understanding of the interaction between emotions and cognitive assessment under a situation of higher uncertainty concerning cognitive assessment. The exploration of the impact of positive and negative affect in this condition provides revealing information about the role of emotions in the evaluation of really new products.

The figure below presents our conceptual model. We hypothesize emotions to influence perceived benefits and those to influence adoption intention. Two studies were developed to assess these hypotheses. The first one tests the conceptual model using a new product with a low to moderate novelty degree as stimulus. The second study looks to validate the results of the first study by using instead a new product with a moderate to high novelty degree as stimulus. The following sections will allow us to review the role of emotions in new product adoption, the reasons to consider emotions as antecedents of cognitive assessment, why higher novelty degree may elicit a distinct emotional reaction, and the influence of individual-level determinants on adoption intention.

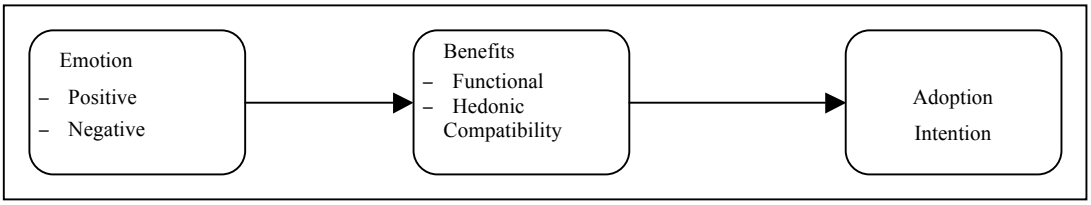

Figure 1: Conceptual Model

Emotions in New Product Adoption

The study of emotions in new product adoption has been at best marginal. New product adoption studies are in fact characterized by a predominant cognitive/functional paradigm derived from Rogers (1962) diffusion of innovations theory. As a result, emotions are not integrated in the dominant models of this field (Midgley and Dowling, 1978; Gatignon and Robertson, 1985). Accordingly, empirical results of individual level determinants of new product adoption have constantly attested the major role of perceived characteristics (Ostlund, 1974; Roehrich, 2004).

Nevertheless, Rogers (2003) acknowledges the potential role of feelings at the perception stage of the innovation adoption process. In fact, evidence for the role of emotions in new product adoption (NPA) has been accumulating over the last decade. Mick and Fournier (1998) first highlighted the importance of integrating emotions in the NPA. The authors propose a structural framework of the sociohistory of technology paradoxes and consumer coping strategies in daily life. They identify eight paradoxes of technology that are potential sources of ambivalent feelings and conflict, thus possibly leading to anxiety and stress, then generating adaptive strategies from consumers. Their results empirically show the role of emotional reactions in innovation adoption. However, the issue of the primacy of cognitions or feelings in consumer evaluation was not assessed by Mick and Fournier (1998).

Three other articles have approached emotion in the innovation adoption process from a cognitive appraisal standpoint (Lazarus, 1991; Bagozzi, Gopinath and Nyer, 1999). First, Bagozzi and Lee (1999) developed a conceptual proposition identifying the importance of emotions in the formation of attitudes of acceptance or resistance towards innovations. Second, the E^3 (expectation→emotion→evaluation) model of Wood and Moreau (2006) observe that the evaluation and early use of innovations is impacted by the complexity of expectations. The authors consider emotions as a result of a cognitive assessment of complexity expectations; they are similar to attitude. Third, Kulviwat et al. (2007) enlarged the Technology Acceptance Model (Venkatesh et al. 2003) by including affect as an antecedent of attitude toward adoption. Results show that the prediction of technology adoption decisions is improved with the integration of both affect and cognition. The model however doesn't establish any hierarchy between cognition and affect.

Therefore, no study to our knowledge has empirically tested the primacy of emotion over cognition in new product adoption. The following hypothesis will therefore be tested.

Table 1: Hypothesis

Hypothesis
H_{1a} : Positive affect positively impact perceived benefits
H_{1b} : Negative affect negatively impact perceived benefits
H_{1c} : Negative affect will have a greater impact on perceived benefits in the evaluation of new products with a higher novelty degree
H_{2a} : Functional benefits positively impact adoption intention
H_{2b} : Compatibility positively impact adoption intention
H_{2c} : Hedonic benefits positively impact adoption intention

2. STUDY I – TESTING THE CONCEPTUAL MODEL

Research Method

Stimulus definition. The base stimulus was developed by a combination of technologies belonging to one major European Telecom Operator (Orange) and a major European R&D microelectronics center (CEA-Leti): a concept of a mobile terminal with functions of navigation and tracking of places and humans (integrating technologies as Wi-Fi, RFID and GPS). This new concept introduces an important behavioural change, i.e., the possibility of tracking other individuals possessing the same device with their authorization. Discussion with industry experts involved in the concept development suggested that it could be *a priori* characterized as a dynamically continuous innovation (Robertson, 1967).

Measures. All scales ranged from 1 to 6 and were translated from English to French, and validated by expert judges.

Functional benefits: *Relative advantage* was measured with three items adapted from the scales of Roehrich (1993) and Rijsdijk and Hultink (2003). *Compatibility* was measured with three factors based on Mallein et al. (1998). Hedonic benefits: *Aesthetics* was measured with three items based on Mathwick et al. (2001) and Richins (1994). The measurement for *Play* was adapted from Bruner II and Kumar (2005) measure. Emotion. Emotion was measured by a combination of emotions associated with an innovation identified by Bagozzi and Lee (1999), the pleasure and arousal dimensions of Mehrabian and Russel (1974) PAD scale, and some items of the CES (Richins, 1997). The use of self-reports of emotional experiences is used in accordance with previous studies (e.g. Mano and Oliver, 1993), despite the possible limitations in cognitive retrieval of emotions. Adoption intention. It was our aim to have an extended measure of adoption that not just included purchase intention, but also attempted to capture potential future usage of the innovation (Shih and Venkatesh, 2004), we therefore used a composed measure including attitude, usage intention and purchase intention (Bagozzi, Baumgartner; Youjae, 1992 Lichtenstein and Bearden, 1989; Kim and Malhotra, 2005; Roehrich, 1993; Mackenzie, Lutz and Belch, 1986; Kim and Malhotra, 2005).

Sample and procedure. An on-line survey was conducted with a representative sample of the potential target market for the stimulus. After clicking on the questionnaire link, each respondent was first exposed to some questions about information and communications technologies (ICT) usage, followed by the presentation of the 3D concept illustration (Dahan and Srinivasan, 2000). Comprehension of the concept was verified and participants were prompted to imagine using the concept in their daily activities for one minute [†]. Emotion was then measured followed by questions about perceived benefits, novelty degree, adoption intention and demographics.

The survey was executed by a market research company with a panel of respondents. The survey was administered online through the market research company's web site. A total of more than 9000 invitations were sent by e-mail to a randomly selected pool of panellists from the database. No panel member was allowed to complete the survey more than once. The survey was administered until 800 completed responses were obtained. Of the 6937 invitations, 1874 logged on to answer the survey, accounting for a participation rate of 27%.The 800 completed surveys were collected over a period of approximately one week. According to the firm policy, people who completed the survey were added to a lottery for a prize draw. Appendix A presents the demographic distribution of the sample that completed the survey (age, gender, education) and how it relates to the French population. Results show that the sample is younger and has a higher education level than the general population. Since we were looking for a population representative of consumers of the concept, these results were expected. After screening for outliers and missing values, 37 observations were deleted; the final sample is thus composed of 763 individuals.

Results

Testing the proposed model.

We used the SEPATH module of Statistica 7 to analyse the data. We first tested the measurement model through confirmatory factor analysis. To evaluate the validity of the measurement model, we considered the following criteria (Hair et al. 1998): a) the fit of the model, which indicated that the data fit well ($\chi^2(231)=701,49$ ($P<.001$), RMSEA=0,05; Gamma I=0,95; CFI=0,97); b) the reliabilities of the measures (Jöreskog Rhô – ρ), which were all above the threshold of .70 (positive emotion=0,85; negative emotion=0,91; relative advantage=0,90; aesthetics=0,96; play=0,89; compatibility=0,85; adoption intention=0,92); c) the convergent validity rhô - ρ (Roussel et al. 2002), that exceeded the minimum of .50 for each construct (positive emotion=0,66; negative emotion=0,77; relative advantage=0,76; aesthetics=0,89; play=0,72; compatibility=0,65; adoption intention=0,66); d) the factor loadings of each indicator and its construct, that were all significant at $P<.001$; and e) discriminant validity, in which the average variance extracted for each construct was higher than the squared multiple correlation between that construct and any other construct (Fornell and Larcker, 1981). The correlation between positive and negative emotion was

[†] Mental simulation is estimated to be the technique that best enhances predictive accuracy of preference for really new products (Hoeffler, 2003). Mental simulation was controlled by the measure of mental imagery ease and vividness, and processing style (MacInnis and Price, 1987; Ellen and Bone, 1991).

significant (r=-0,35) in accordance with previous results of Westbrook (1987) and Laros and Steemkamp (2005).

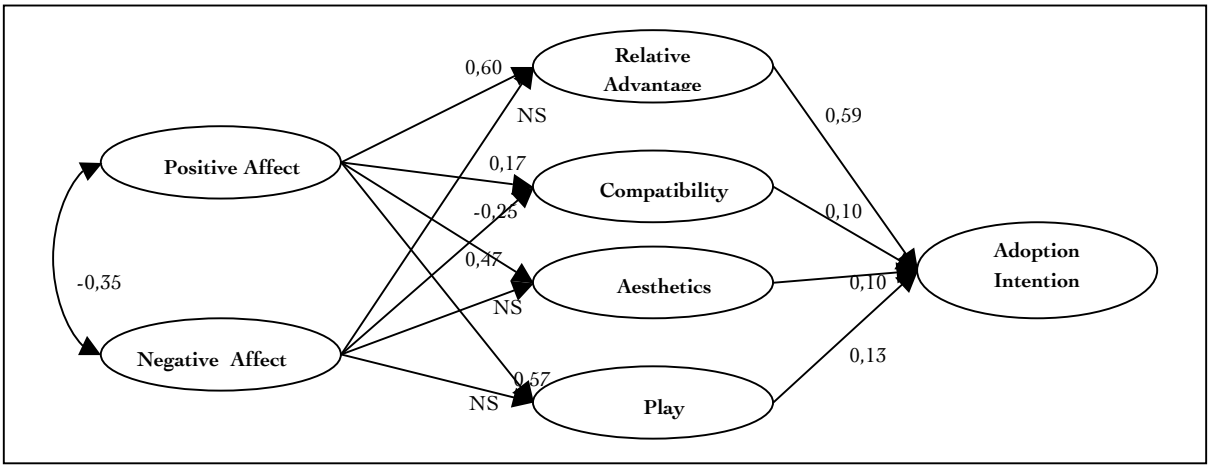

Figure 2: Structural Relations – Study I, Legend: NS=non-significant relations

After the examination of the measurement model, we analyzed the structural model presented in figure 1. The hypotheses were tested through the adjustment indexes of the model, its parameters magnitudes and significance values (Kline, 1998). The structural model was estimated using maximum-likelihood criterion. The hypothesized model showed good fit indexes ($\chi^2(239)=998,89$ ($P<.001$), RMSEA=0,07; Gamma I=0,91; CFI=0,95).

Emotion as Antecedents of Cognitive Assessment

Although results confirm the influence of emotion on functional and hedonic benefits, results vary according to emotion valence. Positive affect significantly influences relative advantage (γ=0,60), play (γ=0,57), aesthetics (γ=0,47), and in a smaller degree, compatibility (0,17). Negative affect does so just for compatibility (γ=-0,25). Here we gather evidence from the distinction among perceived benefits and compatibility with values. One possible explanation is that an innovation with a moderate amount of discontinuity gives users a familiar feeling that stimulates them to have an approach attitude (Watson et al. 1999). When solicited to assess a higher-level in its personal goal hierarchy (compatibility with values), then negative affect has a significant impact (avoidance attitude). Study two will allow us to shed extra light on this issue. Positive and negative emotion explain 39% of the variance of relative advantage, 11,7% of compatibility, 34,8% of play and 21,8% of the variance of aesthetics.

Individual-level Determinants of Adoption

Results also show the positive influence of relative advantage (γ=0,59), compatibility (γ=0,10), aesthetics (γ=0,10) and play (γ=0,10) on adoption intention. Functional benefits are shown to have a greater influence than hedonic benefits and compatibility highlighting the concept is perceived as having mainly a functional aim. The empirical validation of the influence of play and aesthetics on adoption intention is a contribution to a research literature mainly focused in the functional aspects of innovation adoption. These four constructs explain 50,3% of the variance of adoption intention.

As a summary, this study allowed us to identify that emotions act as antecedents of cognitive assessment; their impact on perceived characteristics varies according to emotion valence; and functional benefits have a greater influence than hedonic benefits on adoption intention.

3. STUDY II – INCLUDING NOVELTY DEGREE

The objective of this study was to validate the results of the first study by testing the conceptual model with a new product possessing a higher novelty degree. We aim to verify also if negative affect plays a more prominent role in this situation.

Research method

Stimulus definition. Two sources were mobilized to identify stimulus to characterize really new product or discontinuous innovation (DI). The first was an extensive review of patents in the Information and Communication Technologies field and publications from associations, companies and websites specialized in technological forecasting (e.g. British Telecom, TechCast.org, Wired, Technology Review and Fing.org) that allowed us to identify five potential concepts of DI. The desire to have a concept that was related to the base stimulus conducted us to build an enhanced version of it. This concept was described as eyeglasses allowing the vision of the surrounding environment as well as certain images; it had three applications: navigation, tracking (these first two are similar to those in the base concept) and communication (possibility to have a meeting in a virtual environment with someone using the same device). This third application is similar to virtual meetings as those allowed by simulation universes like "Second Life", but its integration in a portative device is yet to be developed. It introduces a major rupture in individual schemes and scripts, therefore possessing the characteristics of a DI (Urban et al. 1996).

Measures, sample and procedure. Measures were the same used in the first study as were the procedure. An on-line survey was again conducted with a consumer panel representative of the potential market target for the stimulus. Of the 7928 invitations, 2158 logged on to answer the survey, accounting for a opening rate of 27,2%.The 800 completed surveys were collected in approximately one week. Appendix A presents the demographic distribution of the sample. Results again show a younger sample having a higher education level than the general population. Suppression of outliers and items with missing values resulted in a final sample composed of 754 individuals.

Testing the proposed model.

Again, we first tested the measurement model through CFA. Results show that : a) the model fit was good ($\chi^2(231)=768{,}95$ ($P<.001$), RMSEA=0,06; Gamma I=0,94; CFI=0,97); b) the reliabilities of the measures (Jöreskog Rhô – ρ) were again all above the threshold of .70 (positive emotion=0,89; negative emotion=0,88; relative advantage=0,90; aesthetics=0,96; play=0,89; compatibility=0,85; adoption intention=0,94); c) the convergent validity rhô - ρ exceeded 0,50 for each construct (positive emotion=0,73; negative emotion=0,71; relative advantage=0,74; aesthetics=0,88; play=0,73; compatibility=0,66; adoption intention=0,73); d) the factor loadings were all significant at $P<.001$; and e) the average variance extracted for

each construct was higher than the squared multiple correlation between that construct and any other construct. It followed the analysis of the structural model : The hypothesized model showed good fit indexes (χ^2(239)=907,54 (*P*<.001), RMSEA=0,06; Gamma I=0,93; CFI=0,96).

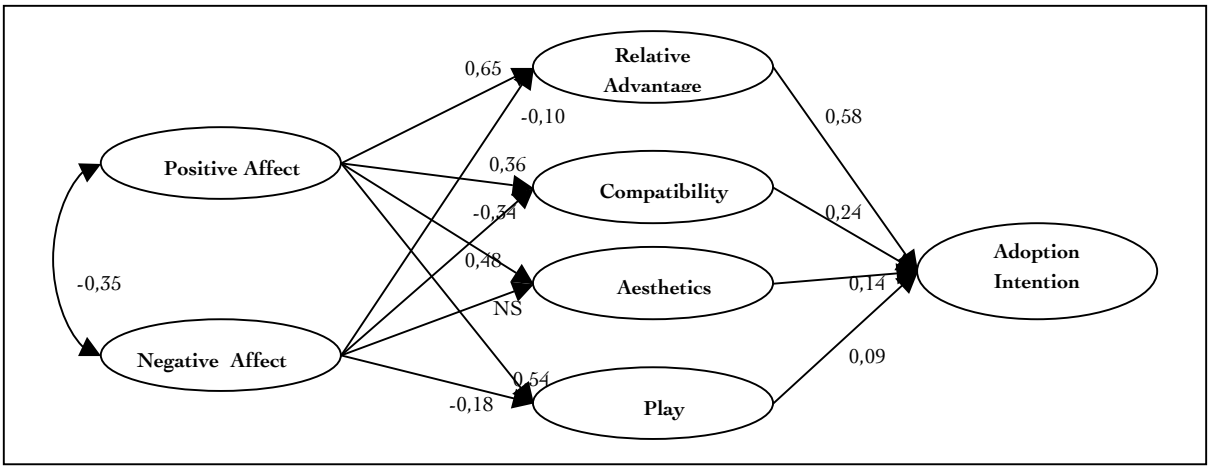

Figure 3: Structural Relations – Study II, Legend: NS=non-significant relations

Emotion as antecedents of Cognitive Assessment

Results confirm the influence of emotion on functional benefits, hedonic benefits and compatibility. They again vary according to emotion valence. Positive emotion significantly influences relative advantage (γ=0,65), play (γ=0,54), aesthetics (γ=0,48), and compatibility (γ=0,36). Differently than the first study, negative emotion influences all the constructs excepting aesthetics. It negatively impacts relative advantage (γ=-0,10), play (γ=-0,18) and compatibility (γ=-0,34). It is observed that an innovation with a higher degree of uncertainty a) does elicit mixed feelings and b) both positive and negative emotions impact cognitive assessment of the innovation.

Results of the first study about the difference among perceived benefits and compatibility are confirmed, i.e. the magnitude of the influence of positive emotion on compatibility is the lowest among the four constructs (γ=0,36) whereas the influence of negative emotion on compatibility is the highest among the four constructs (γ=-0,34). It is noteworthy that positive and negative emotion explain a higher degree of the variance of the four constructs in the evaluation of a discontinuous innovation (relative advantage-48,2%; compatibility-33,1%; play-40,1%; aesthetics-23,9%).

Individual-level Determinants of Adoption

Results confirm the positive influence of relative advantage (γ=0,58), compatibility (γ=0,24), aesthetics (γ=0,14) and play (γ=0,09) on adoption intention. Functional benefits are shown to have a greater influence than hedonic benefits highlighting the concept is again perceived as having mainly a functional aim. The highest score of the compatibility parameter does also show that this construct is mobilized in a more important way in the case of discontinuous innovation. These four constructs explain 65,9% of the variance of adoption intention.

As a summary, this study allowed us to confirm that emotions act as antecedents of cognitive assessment; their impact on perceived characteristics varies according to emotion valence; and functional benefits have a greater influence than hedonic benefits on adoption intention.

GENERAL DISCUSSION

The contribution of this study is twofold. First, it validates the role of emotions as antecedents of cognitive assessment, both functional and hedonic. Second, it provides understanding of the interaction between emotions and cognitive assessment under a situation of higher uncertainty concerning cognitive assessment. In accordance with approach/avoidance theory (Watson et al. 1999), negative affect strongly impacts perceived benefits in the evaluation of a higher novelty stimulus. This confirms previous results about the resistance elicited by discontinuous innovations (Lehmann, 1994; Steenkamp and Gielens, 2003; Anderson and Gatignon, 2005), but it goes a step further: it reveals empirically the underlying mechanism of resistance formation, e.g. negative feelings as a consequence of a threat perception. This is especially relevant because reliance on feelings should be more prominent when the judgement or decision is overly complex (Pham, 1998), as it is the case.

By exploring the role of emotions in the innovation adoption decision, this study complements previous efforts in such fields as advertising (Edell and Burke, 1987; Batra and Stayman, 1990), consumer satisfaction (Westbrook and Oliver, 1991; Mano and Oliver, 1993) or the influence of task-induced affect on choice (Luce, 1998; Shiv and Fedorikhin, 1999).

One point to be further studied is the biggest influence of positive emotions vis-à-vis negative emotions. The influence of one type of emotions is certainly related to the innovation itself, i.e. an innovation like domestic robots may elicit feelings of fear that will impact the innovation perception. It is also to be noted that Mehrabian and Russell's (1974) PAD scale, probably the most used scale in marketing to measure emotions, have two dimensions (pleasure and arousal) with a positive connotation, thus being skewed toward a positive appreciation of the object. The full test of Laros and Steenkamp (2005) hierarchical model with innovations in different product categories may be a manner to verify the influence of negative and positive emotions.

Our results confirm the importance of utilitarian benefits in adoption intention in accordance with the "classic" approach of the Innovation Adoption Process (Rogers, 2003; Midgley and Dowling, 1978; Roehrich, 1993). They also show the significant impact of both aesthetics and play in the adoption intention demonstrating the role of hedonic benefits in adoption intention (Holbrook, 1999; Lam and Parasuraman, 2005). These results extend previous results of Bruner II and Kumar (2005) about the role of play in the usage intention of a new product, and of Veryzer (1998) about the role of aesthetics in the perception of discontinuous innovations. Moreover, the empirical test of aesthetics influence on the evaluation of technological innovations is a première to our knowledge (Lam and Parasuraman, 2005).

Perceived benefits integrated functional and hedonic benefits but excluded symbolic benefits. Further studies could integrate this dimension to verify its importance. It may be the

case that this dimension is somehow category dependent; mainly functional innovations will be a limited source of symbolic benefits (as it was the case with hedonic benefits in the present study). Otherwise, a product like Apple iPhone should score high on that dimension. In addition, clarification about the capacity of aesthetics to fully capture product design (Veryzer and Borja de Mozota, 2005) is to be studied. These points deserve further exploration.

Among limitations concerning previous studies of emotion in consumer behavior, we did not manipulate task-induced affect/mood as Garbarino and Edell (1997) and Luce (1998) nor availability of cognitive resources (see Shiv and Fedorikhin, 1999, p. 280) neither we are able to test for the continuous assessment of the relevance of feelings in decision making (late inclusion vs early selection hypothesis). Methodological issues are as well identified; we used a self-report measure of emotion, whereas Pham et al. (2001) captured time reaction to emotions. Use of more sophisticated emotion capture tools, such as eye-tracking, physiological measures or brain activation may allow a better understanding of phenomena.

Among other potential research venues, the validation of results with other stimuli, and the study of personal characteristics moderating role (Roehrich, 2004; Lam and Parasuraman, 2005) seem promising. Our results have some implications for makers and marketers of technology-based products and services. Concerning product positioning, the decision to categorize the product on a utilitarian versus hedonic axis has impact in the way consumers will evaluate the product. This is as well the case for marketing communications, consumers will judge the product according to competitors categorized belonging to the same group. Finally, product design is also impacted by this choice, the schemas and scripts elicited by a certain positioning may facilitate or hinder product acceptance.

References[*‡]

[1] Bagozzi, R. P., Gopinath, M. and Nyer, P. U. (1999), "The Role of Emotions in Marketing", *Journal of the Academy of Marketing Science*, **27**, 2, 184-206.

[2] Damasio, A. (1994), *Descartes' Error: Emotion, Reason, and the Human Brain*, New York, G. P. Putnam.

[3] Hoeffler, S. (2003), "Measuring Preferences for Really New Products", *Journal of Marketing Research (JMR)*, **40**, 4, 406-420.

[4] Holbrook, M. B. (1996), "Customer Value - A Framework For Analysis and Research", *Advances in Consumer Research*, **23**, 1, 138-142.

[5] Izard, C.E (1977), *Human Emotions*, Kluwer Academic Publishers.

[6] Lam, S. and Parasuraman, A. (2005), "Individual-level Determinants of Consumers' Adoption and Usage of Technological Innovations: A Propositional Inventory", *Review of Marketing Research*, **2**.

[7] Laros, F.J.M. and Steenkamp, J.-B.E.M, (2005), "Emotions in consumer behavior: a hierarchical approach", *Journal of Business Research*, **58**, 10, 1437-1445.

[8] Mano, H. and Oliver, R. (1993), "Assessing the Dimensionality and Structure of the Consumption Experience: Evaluation, Feeling, and Satisfaction", *Journal of Consumer Research,* **20**, 3, 451-466.

[9] Ortony A. and Turner, T.J. (1990), "What's basic about basic emotions", *Psychological Review*, **97**, 3, 315-331.

[*] Due to space constraints, the full list of references is not listed. The authors will be glad to provide them, please contact Prof. Hoffmann – jonas.hoffmann@ceram.fr

[10] Richins, M. L. (1997), "Measuring emotions in the consumption experience", *Journal of Consumer Research*, **24**, 2, 127-146.
[11] Shih, C.-F. and Venkatesh, A. (2004), "Beyond Adoption: Development and Application of a Use-Diffusion Model", *Journal of Marketing*, **68**, 1, 59-72.