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The Role of Emotions in the Design of Personalized eServices Applications

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Abstract

Research on modelling affect and on interfaces adaptation based on affective factors has matured considerably over the past several years, so that even designers of commercial products are now considering the inclusion of components that take affect into account. Emotions are considered to play a central role in guiding and regulating choice behaviour and decision making, by modulating numerous cognitive and physiological activities. By coordinating specific instances of cognitive processing and physiological functioning, emotions are one of the tools that allow agents to make adaptive inferences and choices in the design of Web-based E-Services systems.

Keywords: emotions, personalization, e-marketing

1. Introduction

One of the universally-recognized properties of any good interface is that it keeps the user in control of anything that might be important to him. Product designers and engineers must maintain a balance between controllable and uncontrollable parameters. Users need to be given a certain amount of personal freedom and control in order to feel confident with a website, software, or consumer product. If something is too restrictive, users may be frustrated and find reaching their goals difficult or impossible. Designers should recognize that users have unique needs that are related to their broader personal goals, and offer personalization that is simple and context-sensitive. Intelligent systems have been shown to increase their effectiveness by adapting to their individual users. Affective factors can play an important role in this adaptation. Such factors include both long-term personality traits and shorter-term states such as dispositions, attitudes, moods, and emotions.

The basic objective of this paper is to analyze the way that individuals process their emotions and how they interact with other elements of their information-processing system. It will further underpin their significance with regards to the regulation of consumers' behaviour, based on which they expect to receive the most apt personalized provider's content.

2. Personalization and Adaptation of E-Services

From the aspect of marketing, personalization represents the effort to provide near real-time responses to consumer-initiated interactions with an organization. Typical applications for personalization interaction include call centers, where marketing offers and communications are changed based on a customer's answers, or Web sites, where offers, communication and page design can change based on the pages a customer visits in a session. In both cases, marketing offers and communications vary based not only on the data from that actual visit but also on historical information about a customer's transactions or past behaviour [Price, (2002)].

To realize the true benefits of personalization, a company must be able to effectively learn from each customer interaction and record the results of that learning. By gaining a better understanding of each customer's needs and preferences, the company can determine how to best service each customer over his or her lifetime. Historically, personalization required marketing professionals to update the customer data analysis and IT professionals to implement those updates every three to six months to remain current. This approach is a never-ending process that is extremely time-consuming and expensive.

There have been three significant generations of personalization, each building upon the previous. All three processes are still in use today, although their capabilities and limitations are quite varied. These three processes are summarized as follows:

Rules Based: First generation personalization efforts were dependent on companies performing analysis of customer and sales data. Once this analysis was complete, the project team designed a set of complex business rules that controlled the presentation of personalized content. This approach was effective, but it forced companies to keep business rules simple and relatively static.

Profiling: Second generation personalization efforts became more sophisticated by allowing companies to profile customers into a small number of distinct segments. Business rules are written to personalize content based on a visitor's profile. This approach allowed companies to increase the complexity of the business rules, but was still limited.

Dynamic: The latest trend in personalization technology is dynamic personalization, a process that replaces fixed business rules with the capabilities of a real-time data mining engine. This data mining engine uses learned information to determine which

content to present to customers, a process called "arbitration." As each offer is presented, the self-learning analytics of the software will register each customer's response to the offer and will develop an ideal profile of the customer most likely to accept each offer. Each time an offer is accepted or rejected by a customer, the ideal profile is further refined [Hannigan, T. & Palendrano, C. (2002)].

The dynamic personalization process begins with the marketing team selecting a set of key customer attributes. These are the attributes that the marketing team believes will have the greatest influence on a customer's propensity to accept an offer. The marketing team can deploy multiple offers, allowing the real-time data miners to arbitrate the best offer for each customer. By understanding and predicting customer behavior, companies can create a competitive advantage - but that can be highly dependent on the personalization technique used.

Dynamic personalization technology allows companies to provide their customers with an entirely new experience of personalized offers and content. The process requires the collection, analysis and distribution of information about the customer. This technology enables a more precise matching of offers to customer needs, which can improve customer relationships and build loyalty. The real-time data mining capabilities of dynamic personalization provide greater accuracy and the flexibility to adapt to changing trends.

On the other hand, the main challenges of adaptation can be identified in the Adaptive Hypermedia research which is primarily concerned with the alleviation of users' orientation difficulties, as well as making appropriate selection of knowledge resources, since the vastness of the hyperspace has made information retrieval a rather complicated task [De Bra, Aroyo, Chepegin, (2004)]. Adaptivity is a particular functionality that distinguishes between interactions of different users within the information space [Eklund, & Sinclair, (2000); Brusilovsky & Nejd, (2004)]. Adaptive Hypermedia Systems employ adaptivity by manipulating the link structure or by altering the presentation of information, on the basis of a dynamic understanding of the individual user, represented in an explicit user model [Brusilovsky, (2001)].

A system can be classified as an Adaptive Hypermedia System if it is based on hypermedia, has an explicit user model representing certain characteristics of the user, has a domain model which is a set of relationships between knowledge elements in the information space, and is capable of modifying some visible or functional parts of the system, based on the information maintained in the user model [Brusilovsky, (2001); Brusilovsky & Nejd, (2004)].

In further support of the aforementioned concept of adaptivity and personalization, when referring to information retrieval and processing, one cannot disregard the top-down individual cognitive and emotional processes [Eysenck & Keane, (2005)], that

significantly affect users' interactions within the hyperspace, especially when such interactions involve choice behavior or decision making, in general, goals.

Consequently, besides "traditional" demographic characteristics that commonly comprise the user model in hypermedia environments, we believe that a user model that incorporates individual cognitive and emotional characteristics and triggers corresponding mechanisms of personalization, increases the effectiveness of Web-applications in e-marketing environments.

3. E-Services and Emotions

Recent studies are trying to analyze the role of emotions as markers, mediators, and moderators of consumer responses [Bagozzi, (1999)]. There is a growing body of evidence about the influence of emotions on cognitive processes, which is usually followed by a study of the implications of emotions for volitions, goal-directed behavior, and decisions to help [Spake et al, (2003), Levenson, (1999)]. Emotions and customer satisfaction are briefly explored as well.

An effort to construct a model that predicts the role of emotion, in general, is beyond the scope of our research, due to the complexity and the numerous confounding variables that would make such an attempt rather impossible. However, there is a considerable amount of references concerning the role of emotion and its implications on consumer behaviour and decision making [Lewis & Haviland-Jones, (2004), Ruth et al. (2002)]. Because of the nature of our study which is the information-processing human system and the role of emotions, we came up with the term of emotional processing.

Emotional processing is a pluralistic construct which is comprised of two mechanisms: emotional arousal, which is the capacity of a human being to sense and experience specific emotional situations, and emotion regulation, which is the way in which an individual is perceiving and controlling his emotions. We focus on these two sub-processes because they are easily generalized, inclusive and provide some indirect measurement of general emotional mechanisms. These sub-processes manage a number of emotional factors like anxiety, boredom effects, anger, feelings of self efficacy and user satisfaction which is extremely important in a marketing setting.

4. Investigating Principle E-Services Variables

The goal of our research in general is to integrate individual cognitive and emotional characteristics as main parameters of an adaptive system. Currently we are in the process of developing such a system (AdaptiveWeb system – www3.cs.ucy.ac.cy/adaptiveweb) which is going to be applied in various e-services fields. For testing purposes our system focuses mainly on educational purposes, and its personalization mechanism relies on mapping the provided content on each user's

preferences and inclinations, but it can easily be adjusted to other settings such as an E-Commerce environment.

Emotional and decision factors can be proven significant in defining consumer behavior in e-commerce, taking into consideration psychometric challenges, as well as the complicated matter of quantifying and subsequently mapping emotions on a hypermedia environment [Kort and Reilly, (2002)].

E-Marketing is a component of electronic commerce. It can sometimes include information management, public relations, customer service, and sales. Electronic commerce and Internet marketing have become popular as Internet access is becoming more widely available and used. Well over one third of consumers who have Internet access in their homes report using the Internet to make purchases [Malala, (2003)]. In the research and design of E-Marketing environments there are some terms that can influence the consumer in his choice or decision such as knowledge or information management and decision making. We have to examine these two terms in relation to emotions to establish a pattern of how they interact with each other.

4.1. Knowledge Management

Knowledge management comprises a range of practices used by organisations to identify, create, represent, and distribute knowledge for reuse, awareness, and learning across the organisations. Knowledge Management programs are typically tied to organisational objectives and are intended to lead to the achievement of specific outcomes, such as shared intelligence, improved performance, competitive advantage, or higher levels of innovation.

There is a broad range of thought on Knowledge Management with no unanimous definition. The approaches vary by author and school. For example, Knowledge Management may be viewed from a Techno-centric perspective which emphasizes and focuses on technologies, ideally those that enhance knowledge sharing/growth, and any technology that manipulates and personalizes information. It is by knowledge management standards that a personalized interface can be correctly designed [Davenport & Prusak, (1997)].

In order for the potential users/consumers to capture knowledge (product information), a set of principles has to be applied to the system design. Considerations driving a knowledge management program might include making available increased knowledge content in the development and provision of products and services, managing the proliferation of data and information in complex environments and allowing users to rapidly access useful and relevant knowledge resources and best guidelines, facilitate collective and personal learning [Malhotra, (2005)].

4.2. Decision Making

Most theories of choice assume that decisions derive from an assessment of the future outcomes of various options and alternatives through some type of cost-benefit analyses. The influence of emotions on decision-making is largely ignored. The studies of decision-making in neurological patients who can no longer process emotional information normally suggest that people make judgments not only by evaluating the consequences and their probability of occurring, but also and even sometimes primarily at a gut or emotional level [Damasio, (1994)].

Decision-making is a cognitive process where the outcome is a choice between alternatives. We often have different preferences as to our preferred, approach, varying between thinking and feeling. When we use logic to make decisions, we seek to exclude emotions, using only rational methods, and perhaps even mathematical tools. The foundation of such decisions is the principle of utility, whereby the value of each option is assessed by assigning criteria (often weighted).

There is a whole range of decision-making that uses emotion, depending on the degree of logic that is included in the process. A totally emotional decision is typically very fast. This is because it takes time (at least 0.1 seconds) for the rational cortex to get going. This is the reactive (and largely subconscious) decision-making that you encounter in heated arguments or when faced with immediate danger.

Common emotional decisions may use some logic, but the main driving force is emotion, which either overrides logic or uses a pseudo-logic to support emotional choices (this is extremely common) [Bechara, (2000)]. Another common use of emotion in decision is to start with logic and then use emotion in the final choice. Consumer behaviour is in its final analysis a decision making process. The nature of its activity is strongly correlated with emotions, that is why the role of emotions is extremely important in a setting like this. The mediating role of technology can help the designers to understand the emotional mechanisms of the consumers/users and adjust more efficiently to their needs.

4.3. Emotional Processing

One possible implementation of a Web-based E-Services system's interface that can appraise human emotion is through the use of a set of parameters that can adapt according to the emotional condition of the user. An emotionally tense or unstable individual will be able to adjust the contents of a webpage based to what he considers boring or entertaining and exciting etc. A certain emotional condition demands a personalization of equivalent proportions. The user will have the capability to respond emotionally either after being asked or after a question from the system. Another important aspect of a related system should be the ability to inform the database about the user preferences and inclinations.

Such a system should be designed in a way that it can create a detailed profile for every user and can provide two basic services. One application-based that will have to do with the interface and one content-based that will have to do with the database. The first service will extract user preferences based on aesthetics or usability aspects and will shape the interface in a way that it will be perceived from the user as functional or/and aesthetical, while the second will gather information about the user like his personal options, his preferences, his interests etc. Using these, the interface will take the form that the user wishes so that he can work there more efficiently and less anxiously. User satisfaction is after all related to consumer behaviour [Ajzen, (1985)].

5. Conclusion and Discussion

More than a technologically driven determinism, adaptation and personalization can provide a very flexible platform for individual differences to be taken into account, and to assess their importance and role in emotional processes.

Still, there is the issue of which users' characteristics are to comprise the basis of personalization, since it is not yet clarified which cognitive science theories apply to e-commerce and e-marketing more specifically.

In order to manipulate the parameters of an adaptive system according to user characteristics, the research has to go through the stage of extracting quantified elements that represent deeper psychological and emotional abilities. The latter cannot be directly used in a Web environment, but a numerical equivalent can define a personalization parameter.

Web-based information systems are increasingly being used for decision and consumer support applications. Computers are becoming better and more sophisticated every day. They can already perceive information related to user emotionality and user preference. Since designers can manipulate this knowledge and build machines and systems that can influence human emotion and user satisfaction, an ethical question about confidence, personal life and choice is being raised. Emotion and other sensitive data may be detected only after user consent and only when he chooses to allow this form of communication in favour of some form of direct profit on his behalf [Picard. (1997)].

6. References

- Ajzen, I., (1985). *From intentions to actions: A theory of planned behavior*. In: J. Kuhl and J. Beckmann (Eds.), *Action-control: From cognition to behavior* (pp. 11-39). Heidelberg: Springer-Verlag.
- Bagozzi, R.P. (1999). *The role of emotion in Marketing*. *Journal of the Academy of Marketing Science*, vol. 27, No. 2, pp. 184-206.

- Bechara, A., Damasio, H., & Damasio, A. R. (2000). *Emotion, decision-making, and the orbitofrontal cortex*. *Cerebral Cortex*, vol. 10, pp. 295–307.
- Brusilovsky, P. (2001). *Adaptive Hypermedia*, User Modeling and User-Adapted Interaction, vol. 11, pp. 87-110.
- Brusilovsky, P. & Nejdil, W. (2004). *Adaptive Hypermedia and Adaptive Web*. CSC Press LLC.
- Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain*. New York: Putnam Publishing Group.
- Davenport, T. and Prusak, L. (1997), *Working Knowledge*, Harvard 1998.
- De Bra, P., Aroyo L. & Chepegin, V. (2004). *The Next Big Thing: Adaptive Web-Based Systems*, *Journal of Digital Information*, vol. 5, Issue 1, Article No 247.
- Eklund, J. & Sinclair, K. (2000). *An empirical appraisal of the effectiveness of adaptive interfaces of instructional systems*. *Educational Technology and Society*, 3 (4), ISSN 1436-4522.
- Eysenck, M. W. & Keane, M. T. (2005), *Cognitive Psychology*. Psychology Press.
- Hannigan, T. & Palendrano, C. (2002). *Personalization Can Be Quite Dynamic*. Article published in DM Review Magazine. October 2002 Issue
- Kort, B. & Reilly, R. (2002). *Analytical Models of Emotions, Learning and Relationships: Towards an Affect-Sensitive Cognitive Machine*. Conference on Virtual Worlds and Simulation (VWSim2002), <http://affect.media.mit.edu/projectpages/lc/vworlds.pdf>.
- Levenson, R. W. (1999). The intrapersonal functions of emotion. *Cognition and Emotion*, vol. 13, pp. 481-504.
- Lewis, M. & Haviland-Jones, J.M. (2004). *Handbook of emotions* (2nd Ed.). New York: The Guildford Press.
- Malala, J. N. (2003). *The Relationship Between Computer Literacy, Online Marketing, and B2B Electronic Commerce*. Business Research Yearbook.
- Malhotra, Y. (2005). *Integrating Knowledge Management Technologies in Organizational Business Processes: Getting Real Time Enterprises to Deliver Real Business Performance*. *Journal of Knowledge Management*. vol. 9 no.1 pp. 7-28.
- Picard, R.W. (1997). *Affective Computing*. MIT Press, Cambridge.
- Price, M. (2002). *The Personalization Challenge: Building the Personalization Team*. Column published in DMReview.com
- Ruth, J.A., Brunel, F.F. & Otnes, C.C. (2002). *Linking Thoughts to Feelings: Investigating Cognitive Appraisals and Consumption Emotions in a Mixed-Emotions Context*. *Journal of the Academy of Marketing Science*, vol. 30(1), pp. 44 - 58.
- Spake, D.F., Beatty, S.E., Brockman, B.K. & Crutchfield, T.N. (2003). *Consumer Comfort in Service Relationships: Measurement and Importance*. *Journal of Service Research*, vol. 5(4), pp. 316 - 332.