Psychologically Targeted Persuasive Advertising and Product Information in E-Commerce

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ABSTRACT
In this paper, we describe a framework for a personalization system to systematically induce desired emotion and attention related states and promote information processing in viewers of online advertising and e-commerce product information. Psychological Customization entails personalization of the way of presenting information (user interface, visual layouts, modalities, structures) per user to create desired transient psychological effects and states, such as emotion, attention, involvement, presence, persuasion and learning. Conceptual foundations and empiric evidence for the approach are presented.

Categories and Subject Descriptors
H.1.2 [User/machine systems]: Human factors, human information processing, software psychology

General Terms
Performance, Design, Human Factors, Theory

Keywords
E-commerce, advertising, personalization emotion, persuasion.

1. INTRODUCTION
Advertising and presentation of product information is done both to inform people about new products and services and to persuade them into buying them. Persuasion can be thought of as influencing peoples´ attitudes and behavior. Advertising done in a mass medium, such as television or magazines can be segmented to desired audiences. However, there is a possibility to personalize or mass customize advertising in the internet and for instance in mobile phones. Similarly, in the internet also product information of various items for sale can be personalized to desired users. These two areas are introduced here together as they represent interesting opportunities for personalization.

Consequently, personalization may turn out to be an important driver for future commercial applications and services in a one-to-one world in which automatic and intelligent systems tailor the interactions of users, contexts and systems in real-time. This paper describes the foundations of information personalization systems that may facilitate desired psychological states in individual users of internet based advertising and product information presentation in e-commerce thereby creating psychologically targeted messages for users of such systems. It is preliminarily hypothesized that such personalization may be one way to more efficient persuasion.

When perceiving information via media and communications technologies users have a feeling of presence. In presence, the mediated information becomes the focused object of perception, while the immediate, external context, including the technological device, fades into the background [8, 36, 37]. Empirical studies show that information experienced in presence has real psychological effects on perceivers, such as emotional responses based on the events described or cognitive processing and learning from the events [see 51]. It is likely that perceivers of advertisements and product information experience presence that may lead to various psychological effects. For instance, an attitude may be hold with greater confidence the stronger the presence experience.

Personalization and customization entails the automatic or semi-automatic adaptation of information per user in an intelligent way with information technology [see 33, 68]. One may also vary the form of information (modality for instance) per user profile, which may systematically produce, amplify, or shade different psychological effects [56, 57, 58, 59, 60, 61, 62, 63].

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2. PSYCHOLOGICAL CUSTOMIZATION

2.1 Mind-Based Technologies

Media- and communication technologies as special cases of information technology may be considered as consisting of three layers [6]. At the bottom is a *physical* layer that includes the physical technological device and the connection channel that is used to transmit communication signals. In the middle is a *code* layer that consists of the protocols and software that make the physical layer run. At the top is a *content* layer that consists of multimodal information. The content layer includes both the substance and the form of multimedia content [7, 56]. Substance refers to the core message of the information. Form implies aesthetic and expressive ways of organizing the substance, such as using different modalities and structures of information [56].

With the possibility of real-time customization and adaptation of information for different perceivers it is hypothesized that one may vary the form of information within some limits per the same substance of information. For instance, the same substance can be expressed in different modalities, or with different ways of interaction with the user and technology. This may produce a certain psychological effect in some perceivers; or shade or amplify a certain effect. In Figure 1 the interaction of media and communications technology and the user in context with certain types of tasks is seen as producing transient psychological effects, thereby creating various "archetypal technologies" that systematically facilitate desired user experiences [see 55, 56]. Media and communication technology is divided into the physical, code and content layers. The user is seen as consisting of various different psychological profiles, such as individual differences related to cognitive style, personality, cognitive ability, previous knowledge (mental models related to task) and other differences, such as pre-existing mood. [49, 56, 58, 59]

Media- and communication technologies may be called Mind-Based if they simultaneously take into account the interaction of three different key components: i) the individual differences and/or user segment differences of perceptual processing and sense making ii) the elements and factors inherent in information and technology that may produce psychological effects (physical, code and content layers), and iii) the consequent transient psychological effects emerging based on perception and processing of information at the level of each individual. [see 63]

This definition can be extended to include both context and at least short-term behavioral consequences. Regarding context, a Mind-Based system may alter its functionalities depending on type of task of the user, physical location, social situation or other ad-hoc situational factors that may have a psychological impact. Behavioral consequences of using a Mind-Based system may be thought of especially in the case of persuasion as facilitating desired instant behaviors such as impulse buying. Of course, if a Mind-Based system builds a positive image and schema of a product over longer periods of time reflected in product and brand awareness that may the influence user behaviors later on.

As the task of capturing and predicting users´ psychological state in real time is highly complex, one possible realization for capturing users´ psychological state is to have the user linked to a sufficient number of measurement channels of various i) psychophysiological signals (EEG, EMG, GSR, cardiovascular activity, other), ii) eye-based measures (eye blinks, pupil dilation, eye movements) and iii) behavioral measures (response speed, response quality, voice pitch analysis etc.). An index based on these signals then would verify to the system whether a desired psychological effect has been realized.

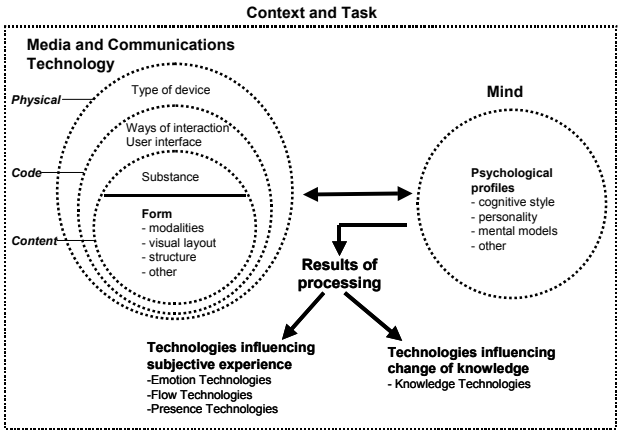

Fig. 1. Mind-Based Technologies as a framework for producing psychological effects. Adapted from [56].

Another approach would be to conduct a large number of user studies on certain tasks and contexts with certain user groups, psychological profiles and content-form variations and measure various psychological effects as objectively as possible. Here, both subjective methods (questionnaires and interviews) and objective measures (psychophysiological measures or eye-based methods) may be used as well interviews [for a review on the use of psychophysiological methods in media research, see 46]. This would constitute a database of design-rules for automatic adaptations of information per user profile to create similar effects in highly similar situations with real applications. Naturally, a hybrid approach would combine both of these methods for capturing and facilitating the users´ likely psychological state.

Capturing context and short-term user behavior is a challenge. Computational approach to context utilizes a mass of sensors that detect various signals in an environment. AI-based software then massively computes from the signal flow significant events either directly or with the help of some simplifying rules and algorithms. Capturing user behavior in context is easier if the user is using an internet browser to buy an item, for instance. In this case action, or behavior can be captured by the system as the user clicks his mouse to buy an item. If the user is wondering around in a supermarket with a mobile phone that presented a persuasive message to buy the item on aisle 7 it may be difficult to verify this other than cross-reference his checkout bill with the displayed adverts inside the store. However, it is beyond the scope of this paper to fully elaborate on the contextual and behavioral dimensions of Mind-Based Technologies.

2.2 Description of a Psychological Customization System

Psychological Customization is one possible way of implementing of Mind-Based Technologies in system design. It can be applied to various areas of HCI, such as Augmentation Systems (augmented and context sensitive financial news), Notification Systems (alerts that mobilize a suitable amount of attention per task or context of use), Affective Computing (emotionally adapted games), Collaborative Filtering (group-focused information presentation), Persuasive Technology

(advertising for persuasion, e-commerce persuasion), Computer Mediated Social Interaction Systems (collaborative work, social content creation templates), Messaging Systems (emotionally adapted mobile multimedia messaging and email) and Contextually Sensitive Services (psychologically efficient adaptation of presentation of information sensitive to physical, social or situational context, such as available menus to control a physical space, available information related to a particular situation, such as social interaction or city navigation with a mobile device).

It can be hypothesized that the selection and manipulation of substance of information takes place through the technologies of the various application areas of Psychological Customization. Underlying the application areas is a basic technology layer for customizing design. This implies that within some limits one may automatically vary the form of information per a certain category of substance of information. The design space for Psychological Customization is formed in the interaction of a particular application area and the possibilities of the technical implementation of automated design variation Initially, Psychological Customization includes modeling of individuals, groups, and communities to create psychological profiles and other profiles based on which customization may be conducted. In addition, a database of design rules is needed to define the desired cognitive and emotional effects for different types of profiles. Once these components are in place, content management technologies can be extended to cover variations of form and substance of information based on psychological profiles and design rules to create the desired psychological effects. [see 63]

At the technically more concrete level, a Psychological Customization System is a new form of middleware between applications, services, content management systems and databases. It provides an interface for designing desired psychological effects and user experiences for individual users or user groups. The most popular framework for building customized Web-based applications is Java 2 Enterprise Edition. J2EE-based implementation of the Psychological Customization System for Web-based applications is depicted in Figure 2. The basic J2EE three-tiered architecture consisting of databases, application servers, and presentation servers has been extended with three middleware layers: content management layer, customer relationship management layer, and psychological customization layer. The profiles of the users and the communities are available in the profile repository. [see 69]

The Content Management System is used to define and manage the content repositories. This typically is based on metadata descriptions of the content assets. The metadata of the content repositories is matched against the user and community profiles by the Customer Relationship Management (CRM) system. The CRM system includes tools for managing the logic behind content, application and service customization. Rules can be simple matching rules or more complex rule sets. A special case of a rule set are scenarios, which are rule sets involving sequences of the interactions on the Web site. The Customer Relationship Management layer also includes functionality for user and community modeling. This layer can also perform automated customer data analysis, such as user clustering. [see 69]

The Psychological Customization System layer performs the optimization of the form of the content as selected by the Customer Relationship Management layer. This functionality can be considered similar to the device adaptation by using content transformation rules (for example XSL-T). In the case of the psychological customization, the transformation rules are produced based on the design rules for content presentation variation and the contents of the psychological profile of the user. After this optimization, the content is passed to the Web presentation layer.

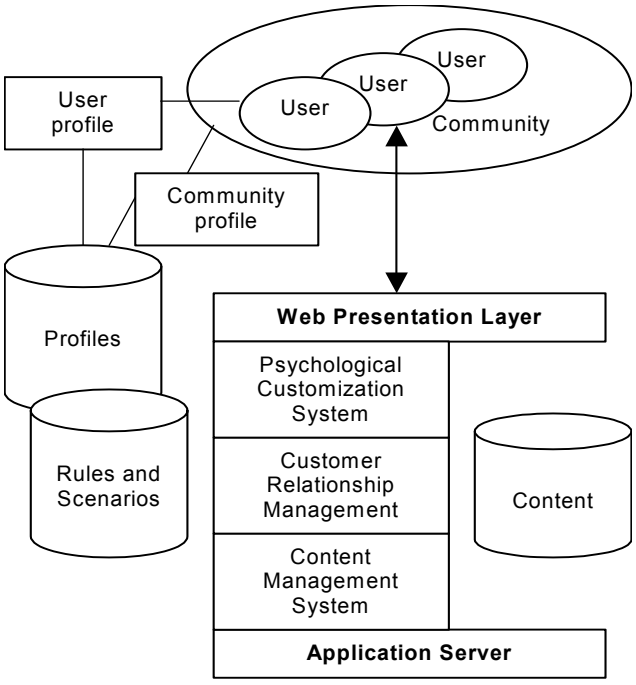

Figure 2. J2EE implementation of the Psychological Customization System [69]

Even though a working prototype of Psychological Customization has not been built yet, several empirical studies support the feasibility of a user-experience driven system that matches the form of information to the psychologically relevant properties and other profile factors of individual users and user groups.

For instance, there are individual differences in cognitive processes such as attention, working memory capacity, general intelligence, perceptual-motor skills and language abilities. These individual differences have a considerable effect on computer-based performance and may product sometimes quite large variance in the intensity or type of psychological effects, such as depth of learning, positive emotion, persuasion, presence, social presence and other types of psychological states and effects as well as consequent behavior [13, 14, 18, 56, 57, 58, 59, 60, 61, 62, 63, 70].

There is considerable evidence in literature and in our own experimental research that varying the form of information, such as modality, layouts, background colors, text types, emotionality of the message, audio characteristics, presence of image motion and subliminality creates for instance emotional, cognitive and attentional effects [9, 25, 27, 28, 29, 30, 31, 32, 33, 34, 48]. Some of these effects are produced in interaction with individual differences, such as cognitive style, personality, age and gender [21, 46, 47], or pre-existing mood [49]. The role of hardware should not be neglected. A device with a large screen or a

portable device with smaller screen with user-changeable covers may also influence the emerging effects [e.g. 30].

Table 1. Key factors influencing psychological effects. Adapted from [56].

Layer of technology	Key factors
Physical	**Hardware** - large or small vs. human scale - mobile or immobile - close or far from body (intimate-personal-social distance)
Code	**Interaction** - degree of user vs. system control and proactivity through user interface
	Visual-functional aspects - way of presenting controls in an interface visually and functionally
Content	**Substance** - the essence of the event described - type of substance (factual/imaginary; genre, other) - narrative techniques used by authors
	Form 1. Modalities - text, video, audio, graphics, animation, etc. 2. Visual layout - ways of presenting various shapes, colours, font types, groupings and other relationships or expressive properties of visual representations - ways of integrating modalities into the user interface 3. Structure - ways of presenting modalities, visual layout and other elements of form and their relationships over time - linear and/or non-linear structure (sequential vs. parallel; narrative techniques, hypertextuality)

This empiric evidence partly validates the possibility for Psychological Customization Systems at least with mobile devices and user interface prototypes used in our own research. Typical experiments we have conducted on the influence of form of information on psychological effects have included such manipulations as animation and movement (for orientation response), fonts of text, layout of text, background colors of text, user interface navigation element shapes (round vs. sharp), user interface layout directions, adding background music to reading text, use of subliminal affective priming in the user interface (emotionally loaded faces) and use of different modalities, for instance. Table 1 addresses the key factors that may influence psychological effects of processing mediated information.

3. APPLICATION AREAS

3.1 Persuasion as a Psychological Effect

The focus of this paper is on persuasion in advertising and product information presentation in e-commerce. The key application area to realize this with Psychological Customization is Persuasive Technology. It refers to human-computer interaction in which there is an underlying goal to non-coercively change the attitudes, motivation and/or behavior of the user [15, 16]. For instance, one may motivate users to quit smoking via motivating games.

However, it is clear that how much people allocate resources to processing a particular persuasive message has to be taken into account. Further, it may be that there is not so much freedom to manipulate persuasive messages to produce effects and the effects themselves may be sometimes small. Despite this, empiric evidence in personalization, as discussed, suggests that statistically significant effects perhaps in the range of a few percentages to even tens of percents exist in the area of Psychological Customization, such as emotion, presence and efficiency of information processing. Hence, it can be at least preliminarily assumed that with persuasion similar level effects may be achievable also.

Persuasion in human computer interaction has been researched from the point of view of seeing computers as tools (increasing capabilities of the user), as a medium (providing experiences) and as a social actor (creating a relationship) [15, 16]. For the purposes of this article, technology used in Psychological Customization for presentation of e-commerce product information and online advertising is seen mostly as a medium and partly as a social actor. How then to model and explain persuasion in more detail? Evidently no universal theory of what is the process of persuasion has been created yet [17].

Candidates for explaining and modeling persuasion include i) learning theory (operant conditioning), ii) functional paradigm theory (similarity-attraction, pleasure seeking), iii) cognitive consistency theory (new information creates tension that needs to be relieved by adopting schemata), iv) congruity principle theory (interpretations of new information tend to be congruent with existing schemata), v) cognitive dissonance theory (certain actions and information produce tension that needs to be relieved by adopting mental structures or behavior), counter-attitudinal advocacy (belief-discrepant messages are persuasive), vi) inoculation theory (combining supportive and refutational information to achieve better persuasion) and vii) attribution theory (people make simple models to predict events of the world and behaviors of other people). [for a review, see 50].Some contemporary models of persuasion are i) social learning theory (environmental learning is the source of persuasion, such as social relationships), ii) the elaboration likelihood model (a specific and limited model on how a piece of information may influence the attitudes of the receiver) and iii) the communication/persuasion model (the source, the message content and form, the channel, the properties of the receiver and the immediacy of the communication influence persuasion). [2, 39, 42]

The latter approach partly resembles the approach of Mind-Based Technologies as a way of finding out the values of relevant parameters in the layers of technology, the user and the transient results of processing, such as emotion and cognition. Other frameworks have also been presented. Meyers-Levy and Malaviya (1998) have presented a framework introducing several

strategies to process persuasive messages. Each strategy represents a different amount of cognitive resources employed during processing and may influence the level of persuasion. [38]

The position of the authors is that while various theories and models for persuasion have been presented, within the context of personalized information presentation especially by varying both the substance of the message and the form of the message it is difficult to know what types of persuasive effects may emerge.

This is partly due to the fact that especially the perception of form of information is most likely not a conscious process involving in-depth processing and cognitive appraisal but a rather automatic and non-cognitive process. Hence, if one influences the conditions of perceptual processing or some early-level cognitive processing of multimodal information, no clear models are available for explaining and predicting persuasion. Also, the exact influence of the amount of cognitive resources employed during early and later processing of a persuasive message remains unknown. It is most evident that case studies with particular application are needed to verify such effects.

However, the authors present one possible way of seeing persuasion mostly via a link to transient emotional states and moods immediately before, during and after processing information presented through a Psychological Customization system. Yet, based on this approach the claim for more efficient persuasion in each application area, such as using Psychological Customization in advertising or e-commerce product information remains a complex task. Despite this difficulty, we now present a possible selection of relevant psychological principles related to perceptual processing and persuasion of advertising and e-commerce product information.

First, a similarity-attraction process may arise between the presented information and the personality of the user that may lead to the information being processed more fully [i.e., trait-congruency hypothesis; see 54]. That is, users are likely to be attracted to information with content and formal characteristics manifesting a personality similar to their own [see e.g., 21]. Second, the decrease of cognitive load in perceptual processing (i.e., high processing fluency) may induce a feeling of pleasantness that may label the information processed [for a review, see 65]. That is, fluent stimuli are associated with increased liking and positive affective responses as assessed by facial EMG, for example. Third, the creation of specific emotional reactions and moods varying in valence and arousal may label the information processed; here the effects may depend on the type of emotion. For instance, mood-congruency may provide more intensive engagement with the information presented when the mood induced by the information processed matches a pre-existing mood of the user [see 49]. Fourth, the emotional reactions may induce increased attention that may lead to more in-depth processing of information [e.g., 26]. Fifth, as suggested by excitation transfer theory, arousal induced by a processed stimuli influences the processing of subsequent stimuli [see 71, 72].

Sixth, according to selective-exposure theory, individuals are motivated to make media choices in order to regulate their affective state [i.e., to maintain excitatory homeostasis; 73]. This may mean that people use also e-commerce product information to manage their moods, i.e. neutralize an unwanted mood, such as depression by engaging with exciting and positive product information. Users may also intensify an existing mood by selecting product information content that may add to the present mood. Seventh, affective priming research indicates that the valence of subliminally exposed primes (e.g., facial expressions) influences the affective ratings of subsequent targets [40, 43], including video messages presented on a small screen [48].

Eighth, the perceived personal relevance of the particular information to the user exerts a robust influence on message processing and involvement [64]. This means that if the user is interested in the product described in the information presented, he will be quite involved when processing the information and hence his memory of the product will be enhanced. Consequently, it has been shown that information tailored to the needs and contexts of users often increases the potential for attitude and behavior change [5, 11, 41, 66, 67]. Further, there is quite a lot of research indicating that, when compared to video form, text has a greater capacity to trigger active or systematic message processing and is perceived as more involving [see 44]; this depends on the mood of the user, however [48]. Ninth, some emotional states and moods lead to secondary effects related to decision-making, judgment and behavior [4, 10, 20].

It then seems that indeed a relevant area to focus on regarding persuasion with Psychological Customization is emotion (arousal and valence) immediately before, during and right after viewing product information and ads.

One may focus on "primitive" emotional responses or emotions requiring more extensive cognitive appraisal and processing. Both of these types of emotions can be linked to various psychological consequences. Consequently, with emotionally loaded personalized information products one may focus on i) creating immediate and primitive emotional responses, ii) creating mood and iii) indirectly influencing secondary effects of emotion and mood, such as attention, memory, performance and judgment.

Known psychological mechanisms used to create desired emotions or moods would be for instance similarity attraction (trait congruency), decrease of cognitive load (high processing fluency), mood congruency, excitation transfer, mood management and affective priming.

These mechanisms are not without problems as they may have also opposite effects. For instance mood congruency may decrease attention and hence lessen the mobilization of cognitive resources in processing a persuasive message. Also, even though emotion is good candidate to look for a strong link to persuasion, the exact nature of this link is unclear.

The key idea of using emotion as a hypothesized gateway to persuasion would be that more in-depth processing of information caused by arousal, valence, attention or involvement may lead to increased memory and perceived trustworthiness of information and also influence attitudes towards the product in question [e.g. 65]. This in turn may lead to instant behavior, such as buying online, clicking through an ad or purchasing the item later in a department store based on long-term memory schemata. It should be noted that this view is based on empiric evidence of the psychological effects and their consequences in general, but they have not yet been validated with the use of e-commerce systems that personalize the form of information for persuasion.

Hence, it would be most beneficial to capture the users´ emotional states or mood before the user starts to browse a particular piece of product information to be able to automatically realize various effects with adaptation of the form of information and track the changes of the online behavior of the user.

3.2 Persuasive Advertising

The effectiveness of persuasion in advertisements in general is a complex issue. Subliminal priming, use of commonly known symbols, matching the advertisement to basic biological needs, such as food, shelter and sex, maximizing the credibility of the message, telling a compelling story, creating a desirable image of the perceiver with the product, placing TV-ads immediately after emotional (arousal) and attentional peaks of TV-programming and other approaches have been widely used. However, research into effectiveness of the form of presentation of advertising is not widely available in the scientific community. Moreover, little research has been done to understand the psychological effectiveness of online advertising. It should be also noted that advertising may be mostly a creative and design-driven high-speed field of industrial production in which various types of authors and artists collaborate like in film-production to make the advertisement rather than a field filled with scientists attempting to analyze the advertisements and their effects in great detail.

In internet-based advertising the advertisement is typically presented on a web page as a banner. The banner is embedded in editorial content, such as the front page of a magazine or online newspaper. The banners are often placed according to the number and demography of the visitors on a particular section of editorial content. This means a best guess is taken as to what may be the most efficient and visible way of placing the banner based on previous knowledge of the behavior of desired user segments on the website.

It seems that ads placed in context work best also online. This means that an ad that is related to the editorial content it is displayed with is more efficiently persuasive [3]. Another issue is that text-based ads online may work better than only graphics. This implies that most ads contain text based over a graphical surface. Overall, very simple principles (larger is better etc.) seem to guide people's choices: e.g., larger ads are thought to be more appealing and affective.

Further, in mobile contexts personalized advertising has been studied from the point of view of targeting users by emotions in addition to location and other relevant factors [19].

However, the exact transient psychological influence of a particular piece of editorial content the online advertisement is displayed with remains unknown. It is possible that the editorial content repels the user and the advertisement is also labeled by this emotion. It is also possible that the editorial content induces a positive emotion and the advertisement gets an advantage based on this emotional state. The emotional tone of the advertisements and editorial content may also interact. For example, Kamins, Marks, and Skinner (1991) showed that commercials that are more consistent in emotional tone with the TV program perform better as measured by likeability and purchase intention ratings than those that are inconsistent in tone. Sometimes advertisements are changed in real-time per type of user as the system recognizes a user segment to which a certain banner has been targeted. However, what is lacking here is i) more detailed information of the type of user (such as what may be the most efficient way to influence him psychologically) and ii) what may be the psychological impact on the same user of the editorial content within which the banner is placed. [22]

With a Psychological Customization system some of these gaps may be at least indirectly addressed as presented in Table 2.

Table 2. Technological possibilities of persuasive advertising with Psychological Customization.

Layer of Technology	Adaptations of Advertising Banners
1. Physical *-multimedia PC or mobile device*	-The advertisement substance and form may be matched to the technology used by lifestyle segments or other means of segmentation (hip ads for mobile phones etc.) -Mobile device: user changeable covers in colors and shapes that facilitate emotion
2. Code *-Windows-type user interface -Mouse, pen, speech,*	-The user interface elements (background color, forms, shapes, directions of navigation buttons etc.) may be varied in real-time per page per user in which a certain advertisement is located to create various emotions and ease of perceptual processing -audio channel may be used to create emotional effects (using audio input/output sound, varying pitch, tone, background music, audio effects etc.).
3. Content A. Substance *- Fixed multimedia content*	-The editorial content may be matched with the ad -The content of the ad may be matched to the users based on various factors (interests, use history, demography, personality etc.) -Adding subliminal extra content to create emotion
B. Form Modality *-Multimedia*	-Modality may be matched to cognitive style or pre-existing mood of the enable easier processing. -Background music, audio effects or ringing tones may be used as a separate modality to facilitate desired emotions and moods. -Animated text can be used to create more efficient processing of text facilitate some emotional effects.
Visual presentation	-Emotionally evaluated and positioned layout designs and templates for ads (colors, shapes and textures) may be utilized per type of user segment
Structure *-temporal, other*	-Offering emotionally evaluated and positioned narrative templates for creating emotionally engaging stories.

Based on Table 2 a Psychological Customization system may operate by trying to optimize desired emotional effects that may be related to persuasion. The content provider, such as a media company, is able to set desired effects per type of user group and advertiser need by using a Psychological Customization system. Also, the placement of ads within desired editorial contexts may be utilized with a more developed system. When a user logs in with his profile already to the database of the content provider the system will start real-time personalization of form of information. As the user has logged in, the front page of the service may be altered for him according to advertiser needs. As the user navigates the system and consumes information the system follows ready-set effects to be realized to the user. It is clear that such a scenario is difficult, but if it is done in a simple enough manner it may be that the persuasive efficiency of online advertising may increase.

3.3 Persuasive e-Commerce Product Information

Personalized e-commerce has not been studied widely. It has been found that while personalization of the content substance displayed to each user may provide value, the users have a strong motivation to understand why the system is displaying a particular piece of information for them. Also, users´ wish to be in control of their user profiles. [see 1, 23]

Hence, it seems that users are at least partly suspicious to the system adapting the substance of information to them. However,

in many cases it may be possible to adapt the form of information in personalized applications in conjunction to content substance variation or even without it. The adaptation of form of information to the user may even be a more transparent way of personalizing user-system- interaction as the user most likely does not question the form of a particular substance. Hence, there are emerging possibilities for personalization and customization in this area.

There are at least two different types of advanced e-commerce systems commonly used: i) systems using recommendation engines and other personalization features to present information in a media-like manner and ii) systems using persuasive interface agents, creating a relationship between the user and the agent. The focus here is mostly on presentation of product information, such as information (product properties, comparisons, pricing, functionalities and other information) of a new car, digital camera, computer or garment. Although, in the context of product presentation, users have usually been suggested to prefer a combination site including pictures and text [e.g. 35], individual differences in their preferences are likely to occur.

The technological possibilities for persuasive presentation of product information are much like those presented for persuasive advertising seen in Table 2. In other words, different layers of technology may be adapted to the user of an e-commerce system to create various psychological effects when presenting product information.

With personalized e-commerce systems for product information presentation one may facilitate positive emotional responses for instance by selecting the modalities of the information to be displayed according to the processing styles and alter visual layouts of the interface according to the personalities of the users. The ease of processing information and the similarity-attraction between visual layouts and personalities may create positive emotional states. As for brand awareness one may indirectly influence memory with the facilitation of positive emotion and increase memory-based performance on the task such as brand recognition and recall. By increasing attention one may increase the likelihood of the user of an e-commerce system to learn product information more efficiently. Positive emotion and mood also has the effect of making the user adapt a less risk-prone approach to making decisions [20]. This may be used to present product information in a familiar manner creating a safe atmosphere around the product to make it more desirable when the user is making purchasing decisions in a positive mood.

Psychological Customization may be used for persuasion also with recommendation systems. The system knows the users´ profile, such as type of personality, and the desired psychological effect is set to positive emotion in as many page-views of the recommendations as possible. The user starts using the system and finds an interesting product that the system recommends to her. The form of the recommendation information is tailored to the users´ profile and desired psychological effect in real-time when the page uploads to make the realization of positive emotion as probable as possible. The system may select the modality of recommendation from text to audio, or from audio to animation; the system may change the background colors of the page and modify the shape and color of the navigation buttons, for instance. In this case, the system will try to do everything possible to facilitate positive emotion but change the substance of the recommendation itself. Naturally in some cases depending on type of user and the type of recommendation, the available databases of recommendation information and the available means of Psychological Customization of form of recommendation information, the effect to be achieved is more or less likely to occur. However, even effects that provide some percentages or even tens of percents of more targeted positive emotion may make a difference in persuasion and hence attitudes towards the product and buying behavior. This is especially true if the recommendation system website has masses of users and hence even a slight increase in sales effectiveness may add up to significant amounts of revenue.

Further, one may discuss interface agents for product information presentation. Often with interface agents an illusion of being in interaction with another human being is created in the user via using for example animated agents that seemingly exhibit various human properties, such as gender, personality, politeness, group membership and other factors. Here one possible application would be to add an agent to float atop of a page with product information to comment or recommend it, to aid the user in navigation and finding interesting information and to act as a feedback channel for the user, such as collecting the users´ interest profile or other situational relevant information.

It is known that both the substance of the interaction (what is being sold, or what information is presented, and what the agent says, or how it acts) and the form of interaction (how information is presented, what is the appearance and personality or other factors of the agent) influence for instance trust, persuasiveness, emotion and liking of the transaction [e.g. 51].

What Psychological Customization may add here may be more systematic and efficient personalization of the way of presenting information together with customizing the selected appearance and other features of the agent in without actually changing the substance of the interaction, i.e. what the agent says or what product information is presented, for instance.

4. CONCLUSION

The authors believe that no other comprehensive framework of varying form of information to systematically create emotional and cognitive effects has been presented, specifically in persuasive presentation of online advertising and product information in e-commerce sites. Differences to other approaches to influencing user experience in general are various. Usability studies traditionally address the question of how to make difficult technology easy to use. Usability is at least partly founded on the idea of optimal human-machine performance, i.e. how well a user can manipulate and control a machine. However, there is a growing conviction that, in order to ensure high user satisfaction usability is not sufficient [see 12, 24].

The approach to system design presented in this paper may be beneficial to the fields of e-commerce and online advertising because: i) it provides a possibility to personalize the form of information that may be more transparent and acceptable to the users than adapting the substance of information, ii) it offers a way of more systematically accessing and controlling transient psychological effects of users of e-commerce and advertisement displaying systems, iii) it offers possibilities to more efficiently persuade and consequently influence behavior of individual users and iv) it is compatible with existing and new systems (recommendation engines, click-through-systems, other) as an add-on or a middleware layer in software with many potential application areas.

The potential drawbacks of the framework include the following: i) it may be costly to build the design-rule databases and actually working real-life systems for creating systematic psychological effects, ii) the rule-databases may have to be adapted also locally and culturally, iii) the method needed to create a rule-database is not easy to use and may be suspect to ecological validity (eye-tracking, behavioral and psychophysiological measures, self-report, field tests are needed to verify laboratory results etc.) and iv) if the system works efficiently it may raise privacy issues, such as the intimacy of a personal psychological user profile (personality, cognitive style, values, other). Also ethical issues related to mind-control or even propaganda may arise.

It should be noted that to build a smoothly functioning Psychological Customization system one should do much more research and gain more evidence of the systematic relationships of user profiles, information forms and psychological effects. However, in our research for the past four years we have found many feasible rules for personalization for psychological effects.

Regarding future research, content management technologies should be elaborated to provide for the platform that prototypes can be built on. Consequently, we aim to build, evaluate and field-test prototypes of Psychological Customization in various areas, specifically in mobile, urban ad-hoc contexts and situations related to mobile advertising and e-commerce, but also other areas such as mobile gaming communities, mobile content, mobile messaging, knowledge work systems and city navigation.

5. REFERENCES

[1] Alpert, S. R.; Karat, J.; Karat, C-M; Brodie, C and Vergo, J.G. (2003) User Attitudes Regarding a User-Adaptive eCommerce Web Site. User Modeling and User-Adapted Interaction 13 (4): 373-396, November 2003.

[2] Bandura (1977) Social learning theory. Englewood Cliffs, NJ: Prentice-Hall.

[3] Baudisch, P. and Leopold, D. (2000) Attention, indifference, dislike, action: Web advertising involving users. Netnomics Volume 2 , Issue 1 2000, pp. 75-83.

[4] Brave S. and Nass, C. (2003). Emotion in human-computer interaction. In Jacko, J.A. and Sears, A. (Ed.), *The Human-Computer Interaction Handbook. Fundamentals, Evolving Technologies and Emerging Applications*. (pp. 81-96). London : Lawrence Erlbaum Associates.

[5] Beniger, J. R. (1987) Personalization of mass media and the growth of pseudo-community. Communication Research, 14(3), pp 352-371.

[6] Benkler, Y. (2000) From Consumers to Users: Shifting the Deeper Structures of Regulation. Federal Communications Law Journal 52, 561-63.

[7] Billmann, D. (1998) Representations. In Bechtel, W. and Graham, G. (1998) A companion to cognitive science, 649-659. Blackwell publishers, Malden, MA.

[8] Biocca, F. and Levy, M. (1995) Communication in the age of virtual reality. Lawrence Erlbaum, Hillsdale, NJ.

[9] Cuperfain, R. and Clarke, T. K. (1985) A new perspective on subliminal perception. Journal of Advertising, 14, 36-41.

[10] Clore, G. C. and Gasper, K. (2000). Feeling is believing. Some affective influences on belief. In Frijda, N.H., Manstead, A. S. R. and Bem, S. (Ed.), *Emotions and beliefs: How feelings influence thoughts* (pp. 10-44). Paris/Cambridge: Editions de la Maison des Sciences de l´Homme and Cambridge University Press.

[11] Dijkstra, J. J., Liebrand, W.B.G and Timminga, E. (1998) Persuasiveness of expert systems. Behavior and Information Technology, 17(3), pp 155-163.

[12] Dillon, A. (2001). Beyond usability: process, outcome and affect in human computer interactions. Online: http://www.ischool.utexas.edu/~adillon/publications/beyond_usability.html.

[13] Egan, D. E. (1988). Individual differences in human-computer interaction. In: M. Helander (Ed.), Handbook of Human-Computer Interaction, p. 543 – 568. Elsevier, New York.

[14] Eysenck, M. (1994) Individual Differences: Normal and Abnormal. New Jersey: Erlbaum.

[15] Fogg, B.J. (2003) Motivating, influencing and persuading users. In Jacko, J.A. and Sears, A. (Ed.), *The Human-Computer Interaction Handbook. Fundamentals, Evolving Technologies and Emerging Applications*. (pp. 81-96). London : Lawrence Erlbaum Associates.

[16] Fogg, B. J. (2002) Persuasive technology. Using computers to change what we think and do. Morgan Kaufmann Publishers, New York.

[17] Ford, M. E. (1992) Motivating humans: goals, emotions, personal agency beliefs. Newbury Park, Ca: Sage.

[18] Hampson, S. E. & Colman, A. M. (Eds., 1995) Individual differences and personality. London: Longman.

[19] Hristova, N. and O'Hare, G. M. P. (2004) Ad-me: Wireless Advertising Adapted to the User Location, Device and Emotions. Proceedings of the Proceedings of the 37th Annual Hawaii International Conference on System Sciences (HICSS'04) - Track 9 - Volume 9

[20] Isen, A. M. (2000). Positive affect and decision making. In Lewis, M. and Haviland-Jones, J. M. (Ed.), *Handbook of emotions* (2nd ed.) (pp. 417-435). New York: Guilford Press.

[21] Kallinen, K., & Ravaja, N. (in press). Emotion-related effects of speech rate and rising vs. falling background music melody during audio news: The moderating influence of personality. Personality and Individual Differences.

[22] Kamins, M.A., Marks, L.J., & Skinner, D. (1991). Television commercial evaluation in the context of program induced mood: Congruency versus consistency effects. Journal of Advertising, 20, 1-14.

[23] Karat, M-C., Blom, J. and Karat, J. (in press) Designing Personalized User Experiences in eCommerce. Dordrecht: Kluwer.

[24] Karat, J. (2003) Beyond task completion: Evaluation of affective components of use. In Jacko, J.A. and Sears, A. (Ed.), *The Human-Computer Interaction Handbook. Fundamentals, Evolving Technologies and Emerging Applications*. (pp. 81-96). London : Lawrence Erlbaum Associates.

[25] Kihlström, J. F., Barnhardt, T. M. and Tataryn, D. J. (1992) Implicit perception. In Bornstein, R. F. and Pittmann, T. S.

(eds.) Perception without awareness. Cognitive, clinical and social perspectives, 17-54. Guilford, New York.

[26] Krohne, H.W., Pieper, M., Knoll, N., & Breimer, N. (2002). The cognitive regulation of emotions: The role of success versus failure experience and coping dispositions. Cognition and Emotion, 16, 217-243.

[27] Krosnick, J. A., Betz, A. L., Jussim, J. L. and Lynn, A. R. (1992) Subliminal conditioning of attitudes. Personality and Social Psychology Bulletin, 18, 152-162.

[28] Laarni, J. (2003). Effects of color, font type and font style on user preferences. In C. Stephanidis (Ed.) Adjunct Proceedings of HCI International 2003. (Pp. 31-32). Crete University Press, Heraklion.

[29] Laarni, J. (2002). Searching for optimal methods of presenting dynamic text on different types of screens. In: O.W. Bertelsen, S. Bödker & K. Kuutti (Eds.), Tradition and Transcendence. Proceedings of The Second Nordic Conference on Human-Computer Interaction, October 19-23, 2002, Arhus, Denmark (Pp. 217 – 220).

[30] Laarni, J. & Kojo, I.(2001). Reading financial news from PDA and laptop displays. In: M. J. Smith & G. Salvendy (Eds.) Systems, Social and Internationalization Design Aspects of Human-Computer Interaction. Vol. 2 of Proceedings of HCI International 2001. Lawrence Erlbaum, Hillsdale, NJ. (Pp. 109 – 113.)

[31] Laarni, J., Kojo, I. & Kärkkäinen, L. (2002). Reading and searching information on small display screens. In: D. de Waard, K. Brookhuis, J. Moraal, & A. Toffetti (Eds.), Human Factors in Transportation, Communication, Health, and the Workplace. (Pp. 505 – 516). Shake, Maastricht. (On the occasion of the Human Factors and Ergonomics Society Europe Chapter Annual Meeting in Turin, Italy, November 2001).

[32] Lang, A. (1990) Involuntary attention and physiological arousal evoked by structural features and mild emotion in TV commercials. Communication Research, 17 (3), 275-299.

[33] Lang, A., Dhillon, P. and Dong, Q. (1995) Arousal, emotion and memory for television messages. Journal of Broadcasting and Electronic Media, 38, 1-15.

[34] Lang, A., Newhagen, J. and Reeves. B. (1996) Negative video as structure: Emotion, attention, capacity and memory. Journal of Broadcasting and Electronic Media, 40, 460-477.

[35] Lightner, N.J., & Eastman, C. (2002). User preference for product information in remote purchase environments. Journal of Electronic Commerce Research [Online], 3, Available from http://www.csulb.edu/web/journals/jecr/issues/20023/paper6.pdf.

[36] Lombard, M. and Ditton, T. (2000) Measuring presence: A literature-based approach to the development of a standardized paper-and-pencil instrument. Project abstract submitted to Presence 2000: The third international workshop on presence.

[37] Lombard, M., Reich, R., Grabe, M. E., Bracken, C. and Ditton, T. (2000) Presence and television: The role of screen size. Human Communication Research, 26(1), 75-98.

[38] Meyers-Levy, J. & Malaviya, P. (1998). Consumers' processing of persuasive advertisements. An integrative framework of persuasion theories. Journal of Marketing 63, 45–60.

[39] McGuire, W. J. (1989) Theoretical foundations of campaigns. In R.E. Rice and C.K. Atkin (eds.) Public communication campaigns (2nd ed, pp 43-65). Newbury Park, Ca: Sage.

[40] Monahan, J.L. (1998). I don't know it but I like you: The influence of nonconscious affect on person perception. Human Communication Research, 24, 480-500.

[41] Nowak, G. J., Shamp, S., Hollander, B., Cameron, G. T., Schumann, D. W. and Thorson, E. (1999) Interactive media: A means for more meaningful advertising? Advertising and consumer psychology. Mahwah, NJ: Lawrence Erlbaum.

[42] Petty, R.E., & Cacioppo, J.T. (1986). Communication and persuasion: Central and peripheral routes to attitude change. New York: Springer-Verlag.

[43] Murphy, S.T., Monahan, J.L., & Zajonc, R.B. (1995). Additivity of nonconscious affect: Combined effects of priming and exposure. Journal of Personality and Social Psychology, 69, 589-602.

[44] Pfau, M., Holbert, R.L., Zubric, S.J., Pasha, N.H., & Lin, W.-K. (2000). Role and influence of communication modality in the process of resistance to persuasion. Media Psychology, 2, 1-33.

[45] Ravaja, N. (2004). Effects of a small talking facial image on autonomic activity: The moderating influence of dispositional BIS and BAS sensitivities and emotions. Biological Psychology, 65, 163-183.

[46] Ravaja, N. (in press). Contributions of psychophysiology to media research: Review and recommendations. Media Psychology.

[47] Ravaja, N., & Kallinen, K. (in press). Emotional effects of startling background music during reading news reports: The moderating influence of dispositional BIS and BAS sensitivities. Scandinavian Journal of Psychology.

[48] Ravaja, N., Kallinen, K., Saari, T., & Keltikangas-Järvinen, L. (in press). Suboptimal exposure to facial expressions when viewing video messages from a small screen: Effects on emotion, attention, and memory. Journal of Experimental Psychology: Applied.

[49] Ravaja, N., Saari, T., Kallinen, K., & Laarni, J. (2004). The Role of Mood in the Processing of Media Messages from a Small Screen: Effects on Subjective and Physiological Responses. Manuscript submitted for publication.

[50] Reardon, K. R. (1991) Persuasion in practice. Newbury Park, Ca: Sage.

[51] Reeves, B. and Nass, C. (1996) The media equation. How people treat computers, television and new media like real people and places. Cambridge University Press, CSLI, Stanford.

[52] Riding, R. J. and Rayner, S. (1998) Cognitive styles and learning strategies. Understanding style differences in learning and behavior. David Fulton Publishers, London.

[53] Riecken, D. (2000) Personalized views on personalization. Communications of the ACM, V. 43, 8, 27-28.

[54] Rusting, C.L. (1998). Personality, mood, and cognitive processing of emotional information: Three conceptual frameworks. Psychological Bulletin, 124, 165-196.

[55] Saari, T. (1998) Knowledge creation and the production of individual autonomy. How news influences subjective reality. Reports from the department of teacher education in Tampere university. A15/1998.

[56] Saari, T. (2001) Mind-Based Media and Communications Technologies. How the Form of Information Influences Felt Meaning. Acta Universitatis Tamperensis 834. Tampere University Press, Tampere 2001.

[57] Saari, T. (2002) Designing Mind-Based Media and Communications Technologies. Proceedings of Presence 2002 Conference, Porto, Portugal.

[58] Saari, T. (2003a) Designing for Psychological Effects. Towards Mind-Based Media and Communications Technologies. In Harris, D., Duffy, V., Smith, M. and Stephanidis, C. (eds.) Human-Centred Computing: Cognitive, Social and Ergonomic Aspects. Volume 3 of the Proceedings of HCI International 2003, pp. 557-561.

[59] Saari, T. (2003b) Mind-Based Media and Communications Technologies. A Framework for producing personalized psychological effects. Proceedings of Human Factors and Ergonomics 2003 -conference. 13.-17.10.2003 Denver, Colorado.

[60] Saari, T. (in press, a) Using Mind-Based Technologies to facilitate Positive Emotion and Mood with Media Content. Accepted to proceedings of to Positive Emotion, 2nd European Conference. Italy, July 2004.

[61] Saari, T. (in press, b) Facilitating Learning from Online News with Mind-Based Technologies. Accepted to proceedings of EDMedia 2004, Lugano, Switzerland.

[62] Saari, T. and Turpeinen, M. (in press, a) Towards Psychological Customization of Information for Individuals and Social Groups. In Karat, J., Blom, J. and Karat. M.-C. (eds.) Personalization of User Experiences for eCommerce, Kluwer.

[63] Saari, T. and Turpeinen, M. (in press, b) Psychological customization of information. Applications for personalizing the form of news. Accepted to proceedings of ICA 2004, 27.-31.5. 2004, New Orleans, USA.

[64] Schneider, S.L., & Laurion, S.K. (1993). Do we know what we've learned from listening to the news? Memory and Cognition, 21, 198-209.

[65] Schwarz, N. (in press). Meta-cognitive experiences in consumer judgment and decision making. Journal of Consumer Psychology.

[66] Stretcher, V. J., Kreutzer, M., Den Boer, D.-J., Kobrin, S., Hospers, H. J., and Skinner, C. S. (1994) the effects of computer-tailored smoking cessation messages in family practice settings. Journal of Family Practice, 39(3), 262-270.

[67] Stretcher, V. J. (1999) Computer tailored smoking cessation materials: A review and discussion. Special issue: Computer tailored education. Patient Education & Counceling, 36(2), 107-117.

[68] Turpeinen, M. (2000) Customizing news content for individuals and communities. Acta Polytechnica Scandinavica. Mathematics and computing series no. 103. Helsinki University of Technology, Espoo.

[69] Turpeinen, M. and Saari, T. (2004) System Architechture for Psychological Customization of Information. Proceedings of HICSS-37- conference, 5.-8.1. 2004, Hawaii.

[70] Vecchi, T., Phillips, L. H. & Cornoldi, C. (2001). Individual differences in visuo-spatial working memory. In: M. Denis, R. H. Logie, C. Cornoldi, M. de Vega, & J. Engelkamp (Eds.), Imagery, language, and visuo-spatial thinking. Psychology Press, Hove.

[71] Zillmann, D. (1971). Excitation transfer in communication-mediated aggressive behavior. Journal of Experimental Social Psychology, 7, 419-434.

[72] Zillmann, D. (1978). Attribution and misattribution of excitatory reactions. In J.H. Harvey, W.J. Ickes, & R.F. Kidd (Eds.), New directions in attribution research (Vol. 2, pp. 335-368). Hillsdale, NJ: Lawrence Erlbaum Associates.

[73] Zillmann, D., & Bryant, J. (1985). Affect, mood, and emotion as determinants of selective exposure. In D. Zillmann & J. Bryant (Eds.), Selective exposure to communication (pp. 157-190). Hillsdale, NJ: Lawrence Erlbaum.